Configuration and Use Manual
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Micro Motion® 9739 MVD Transmitters

Micro Motion®

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Process Management

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Part I
Getting Started

Chapters covered in this part:

- *Before you begin*
- *Quick start*

1 Before you begin

Topics covered in this chapter:

- *About this manual*
- *Transmitter model code*
- *Communications tools and protocols*
- *Additional documentation and resources*

1.1 About this manual

This manual provides information to help you configure, commission, use, maintain, and troubleshoot the Micro Motion 9739 MVD transmitter.

Important
This manual assumes that the transmitter has been installed correctly and completely, according to the instructions in the transmitter installation manual, and that the installation complies with all applicable safety requirements.

1.2 Transmitter model code

Your transmitter can be identified by the model number on the transmitter tag.

1.3 Communications tools and protocols

You may use different tools in different locations or for different tasks.

Table 1-1: Communications tools, protocols, and related information

Communications tool	Supported protocols	Scope	In this manual	For more information
Display	Not applicable	Basic configuration and commissioning	Complete user information. See *Appendix A*.	Not applicable
ProLink II	• HART/RS-485 • HART/Bell 202 • Modbus/RS-485 • Service port	Complete configuration and commissioning	Basic user information. See *Appendix B*.	User manual • Installed with software • On Micro Motion user documentation CD • On Micro Motion web site (www.micromotion.com

Table 1-1: Communications tools, protocols, and related information *(continued)*

Communications tool	Supported protocols	Scope	In this manual	For more information
Field Communicator	HART/Bell 202	Complete configuration and commissioning	Basic user information. See *Appendix C*.	User manual on Micro Motion web site (www.micromotion.com

Tip

You may be able to use other communications tools from Emerson Process Management, such as AMS Suite: Intelligent Device Manager, or the Smart Wireless THUM™ Adapter. Use of AMS or the Smart Wireless THUM Adapter is not discussed in this manual. The AMS interface is similar to the ProLink II interface. For more information on the Smart Wireless THUM Adapter, refer to the documentation available at www.micromotion.com.

1.4 Additional documentation and resources

Micro Motion provides additional documentation to support the installation and operation of the transmitter.

Table 1-2: Additional documentation and resources

Topic	Document
Sensor	Sensor documentation
Transmitter installation	*Micro Motion 9739 MVD Transmitters: Installation Manual*
Hazardous area installation	See the approval documentation shipped with the transmitter, or download the appropriate documentation from the Micro Motion web site at www.micromotion.com.
Transmitter electronics module upgrade	*Micro Motion 9739 MVD Transmitter Electronics Module Installation Guide*

All documentation resources are available on the Micro Motion web site at www.micromotion.com or on the Micro Motion user documentation CD.

2 Quick start

Topics covered in this chapter:

- *Power up the transmitter*
- *Check flowmeter status*
- *Make a startup connection to the transmitter*
- *Characterize the flowmeter (if required)*
- *Verify mass flow measurement*
- *Verify the zero*

2.1 Power up the transmitter

The transmitter must be powered up for all configuration and commissioning tasks, or for process measurement.

1. Ensure that all transmitter and sensor covers and seals are closed.

   ⚠ **CAUTION!**

   To prevent ignition of flammable or combustible atmospheres, ensure that all covers and seals are tightly closed. For hazardous area installations, applying power while housing covers are removed or loose can cause an explosion.

2. Turn on the electrical power at the power supply.

   The transmitter will automatically perform diagnostic routines. During this period, Alarm 009 is active. The diagnostic routines should complete in approximately 30 seconds. For transmitters with a display, the status LED will turn green and begin to flash when the startup diagnostics are complete. If the status LED exhibits different behavior, an alarm condition is present.

Postrequisites

Although the sensor is ready to receive process fluid shortly after power-up, the electronics can take up to 10 minutes to reach thermal equilibrium. Therefore, if this is the initial startup, or if power is been off long enough to allow components to reach ambient temperature, allow the electronics to warm up for approximately 10 minutes before relying on process measurements. During this warm-up period, you may observe minor measurement instability or inaccuracy.

2.2 Check flowmeter status

Check the flowmeter for any error conditions that require user action or that affect measurement accuracy.

1. Wait approximately 10 seconds for the power-up sequence to complete.

   Immediately after power-up, the transmitter runs through diagnostic routines and checks for error conditions. During the power-up sequence, Alarm A009 is active. This alarm should clear automatically when the power-up sequence is complete.
2. Check the status LED on the transmitter.

Table 2-1: Transmitter status reported by status LED

LED state	Description	Recommendation
Green	No alarms are active.	Continue with configuration or process measurement.
Yellow	One or more low-severity alarms are active, and have been acknowledged.	A low-severity alarm condition does not affect measurement accuracy or output behavior. You can continue with configuration or process measurement. If you choose, you can identify and resolve the alarm condition.
Flashing yellow(1)	One or more low-severity alarms are active and have not been acknowledged.	A low-severity alarm condition does not affect measurement accuracy or output behavior. You can continue with configuration or process measurement. If you choose, you can identify and resolve the alarm condition. You may also acknowledge the alarm.
Red	One or more high-severity alarms are active, and have been acknowledged.	A high-severity alarm condition affects measurement accuracy and output behavior. Resolve the alarm condition before continuing.

Postrequisites

For information on viewing the list of active alarms, see *Section 8.3*.

For information on individual alarms and suggested resolutions, see *Section 10.2*.

2.3 Make a startup connection to the transmitter

For all configuration tools except the display, you must have an active connection to the transmitter to configure the transmitter. Follow this procedure to make your first connection to the transmitter.

Identify the connection type to use, and follow the instructions for that connection type in the appropriate appendix. Use the default communications parameters shown in the appendix.

Communications tool	Connection type to use	Instructions
ProLink II	Modbus/RS-485	*Appendix B*

(1) *If Status LED Blinking is disabled, the LED will show solid yellow rather than flashing.*

Communications tool	Connection type to use	Instructions
Field Communicator	HART	*Appendix C*

Postrequisites

(Optional) Change the communications parameters to site-specific values.

To change the communications parameters using ProLink II:

- To change the protocol, baud rate, parity, or stop bits, choose ProLink > Configuration > RS-485.
- To change the address, choose ProLink > Configuration > Device.

To change the communications parameters using the Field Communicator, choose On-Line Menu > Configure > Manual Setup > Inputs/Outputs > Communications.

Important
If you are changing communications parameters for the connection type that you are using, you will lose the connection when you write the parameters to the transmitter. Reconnect using the new parameters.

2.4 Characterize the flowmeter (if required)

Display	*Not available*
ProLink II	ProLink > Configuration > Density ProLink > Configuration > Flow
Field Communicator	Configure > Manual Setup > Characterize

Overview

Characterizing the flowmeter adjusts your transmitter to match the unique traits of the sensor it is paired with. The characterization parameters (also called calibration parameters) describe the sensor's sensitivity to flow, density, and temperature. Depending on your sensor type, different parameters are required. Values for your sensor are provided by Micro Motion on the sensor tag or the calibration certificate.

Tip
If your flowmeter was ordered as a unit, it has already been characterized at the factory. However, you should still verify the characterization parameters.

Procedure

1. Specify Sensor Type.
   - Straight-tube (T-Series)
   - Curved-tube (all sensors except T-Series)

2. Set the flow characterization parameters. Be sure to include all decimal points.
   - For straight-tube sensors, set FCF (Flow Cal or Flow Calibration Factor), FTG, and FFQ.
   - For curved-tube sensors, set Flow Cal (Flow Calibration Factor).
3. Set the density characterization parameters.
   - For straight-tube sensors, set D1, D2, DT, DTG, K1, K2, FD, DFQ1, and DFQ2.
   - For curved-tube sensors, set D1, D2, TC, K1, K2, and FD. (TC is sometimes shown as DT.)

2.4.1 Sample sensor tags

Figure 2-1: Tag on older curved-tube sensors (all sensors except T-Series)

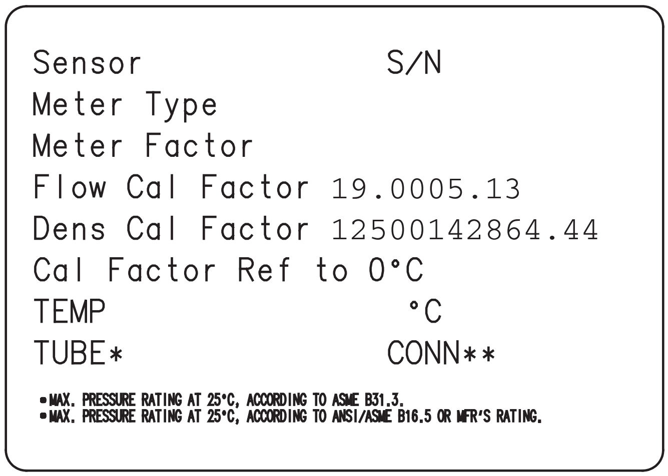


Figure 2-2: Tag on newer curved-tube sensors (all sensors except T-Series)

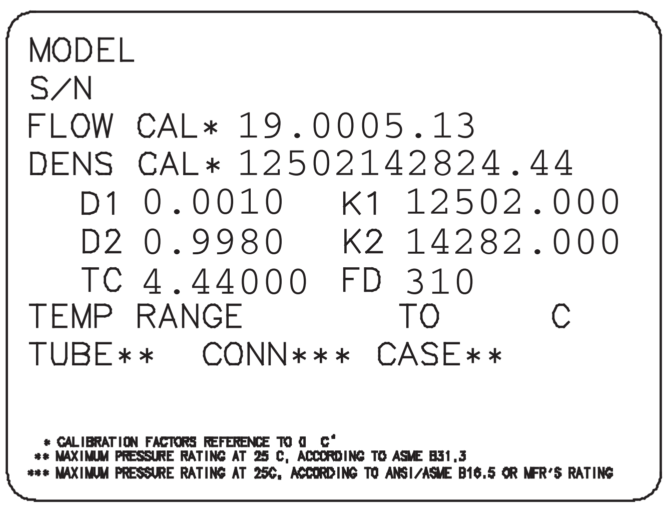


Figure 2-3: Tag on older straight-tube sensor (T-Series)

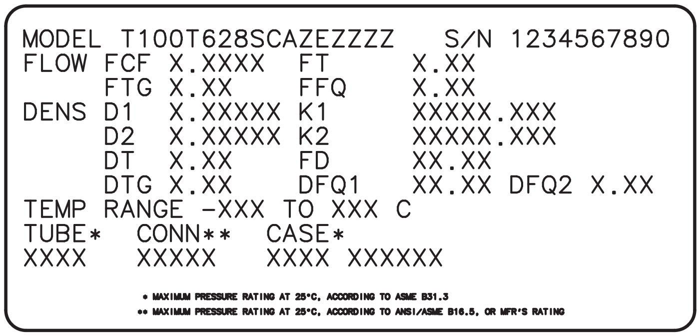
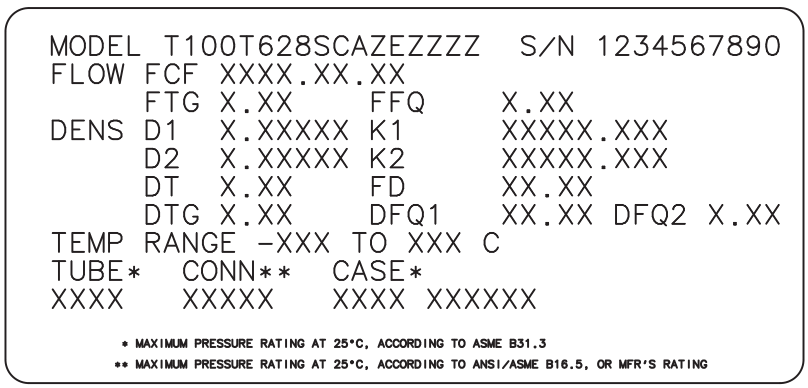


Figure 2-4: Tag on newer straight-tube sensor (T-Series)



2.4.2 Flow calibration parameters (FCF, FT)

Two separate values are used to describe flow calibration: a 6-character FCF value and a 4-character FT value. They are provided on the sensor tag.

Both values contain decimal points. During characterization, these may be entered as two values or as a single 10-character string. The 10-character string is called either Flowcal or FCF.

If your sensor tag shows the FCF and the FT values separately and you need to enter a single value, concatenate the two values to form the single parameter value.

If your sensor tag shows a concatenated Flowcal or FCF value and you need to enter the FCF and the FT values separately, split the concatenated value:

- FCF = The first 6 characters, including the decimal point
- FT = The last 4 characters, including the decimal point

Example: Concatenating FCF and FT

FCF = x.xxxx
FT = y.yy
Flow calibration parameter: x.xxxxy.yy

Example: Splitting the concatenated Flowcal or FCF value

Flow calibration parameter: x.xxxxy.yy
FCF = x.xxxx
FT = y.yy

2.4.3 Density calibration parameters (D1, D2, K1, K2, FD, DT, TC)

Density calibration parameters are typically on the sensor tag and the calibration certificate.

If your sensor tag does not show a D1 or D2 value:

- For D1, enter the Dens A or D1 value from the calibration certificate. This value is the line-condition density of the low-density calibration fluid. Micro Motion uses air. If you cannot find a Dens A or D1 value, enter 0.001 g/cm^3.
- For D2, enter the Dens B or D2 value from the calibration certificate. This value is the line-condition density of the high-density calibration fluid. Micro Motion uses water. If you cannot find a Dens B or D2 value, enter 0.998 g/cm^3.

If your sensor tag does not show a K1 or K2 value:

- For K1, enter the first 5 digits of the density calibration factor. In the sample tag, this value is shown as 12500.
- For K2, enter the second 5 digits of the density calibration factor. In the sample tag, this value is shown as 14286.

If your sensor does not show an FD value, contact Micro Motion customer service.

If your sensor tag does not show a DT or TC value, enter the last 3 digits of the density calibration factor. In the sample tag, this value is shown as 4.44.

2.5 Verify mass flow measurement

Check to see that the mass flow rate reported by the transmitter is accurate. You can use any available method.

- Read the value for Mass Flow Rate on the transmitter display.
- Connect to the transmitter with ProLink II and read the value for Mass Flow Rate in the Process Variables window (ProLink > Process Variables).
- Connect to the transmitter with the Field Communicator and read the value for Mass Flow Rate in the Process Variables menu (On-Line Menu > Overview > Primary Purpose Variables).

Postrequisites

If the reported mass flow rate is not accurate:

- Check the characterization parameters.
- Review the troubleshooting suggestions for flow measurement issues. See *Section 10.3*.

2.6 Verify the zero

Verifying the zero helps you determine if the stored zero value is appropriate to your installation, or if a field zero can improve measurement accuracy.

The zero verification procedure analyzes the Live Zero value under conditions of zero flow, and compares it to the Zero Stability range for the sensor. If the average Live Zero value is within a reasonable range, the zero value stored in the transmitter is valid. Performing a field calibration will not improve measurement accuracy.

2.6.1 Verify the zero using ProLink II

Verifying the zero helps you determine if the stored zero value is appropriate to your installation, or if a field zero can improve measurement accuracy.

Important

In most cases, the factory zero is more accurate than the field zero. Do not zero the flowmeter unless one of the following is true:

- The zero is required by site procedures.
- The stored zero value fails the zero verification procedure.

Prerequisites

ProLink II v2.94 or later

Important

Do not verify the zero or zero the flowmeter if a high-severity alarm is active. Correct the problem, then verify the zero or zero the flowmeter. You may verify the zero or zero the flowmeter if a low-severity alarm is active.

Procedure

1. Prepare the flowmeter:

    a. Allow the flowmeter to warm up for at least 20 minutes after applying power.

    b. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.

    c. Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.

d. Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.

2. Choose ProLink > Calibration > Zero Verification and Calibration > Verify Zero and wait until the procedure completes.

3. If the zero verification procedure fails:

   a. Confirm that the sensor is completely blocked in, that flow has stopped, and that the sensor is completely full of process fluid.

   b. Verify that the process fluid is not flashing or condensing, and that it does not contain particles that can settle out.

   c. Repeat the zero verification procedure.

   d. If it fails again, zero the flowmeter.

   For instructions on zeroing the flowmeter, see *Zero the flowmeter*.

Postrequisites

Restore normal flow through the sensor by opening the valves.

2.6.2 Terminology used with zero verification and zero calibration

Table 2-2: Terminology used with zero verification and zero calibration

Term	Definition
Zero	In general, the offset required to synchronize the left pickoff and the right pickoff under conditions of zero flow. Unit = microseconds.
Factory Zero	The zero value obtained at the factory, under laboratory conditions.
Field Zero	The zero value obtained by performing a zero calibration outside the factory.
Prior Zero	The zero value stored in the transmitter at the time a field zero calibration is begun. May be the factory zero or a previous field zero.
Manual Zero	The zero value stored in the transmitter, typically obtained from a zero calibration procedure. It may also be configured manually. Also called “mechanical zero” or “stored zero.”
Live Zero	The real-time bidirectional mass flow rate with no flow damping or mass flow cutoff applied. An adaptive damping value is applied only when the mass flow rate changes dramatically over a very short interval. Unit = configured mass flow measurement unit.
Zero Stability	A laboratory-derived value used to calculate the expected accuracy for a sensor. Under laboratory conditions at zero flow, the average flow rate is expected to fall within the range defined by the Zero Stability value (0 ± Zero Stability). Each sensor size and model has a unique Zero Stability value. Statistically, 95% of all data points should fall within the range defined by the Zero Stability value.
Zero Calibration	The procedure used to determine the zero value.
Zero Time	The time period over which the Zero Calibration procedure is performed. Unit = seconds.
Field Verification Zero	A 3-minute running average of the Live Zero value, calculated by the transmitter. Unit = configured mass flow measurement unit.

Table 2-2: Terminology used with zero verification and zero calibration *(continued)*

Term	Definition
Zero Verification	A procedure used to evaluate the stored zero and determine whether or not a field zero can improve measurement accuracy.

Part II
Configuration and commissioning

Chapters covered in this part:

- *Introduction to configuration and commissioning*
- *Configure process measurement*
- *Configure device options and preferences*
- *Integrate the meter with the control system*
- *Completing the configuration*

3 Introduction to configuration and commissioning

Topics covered in this chapter:

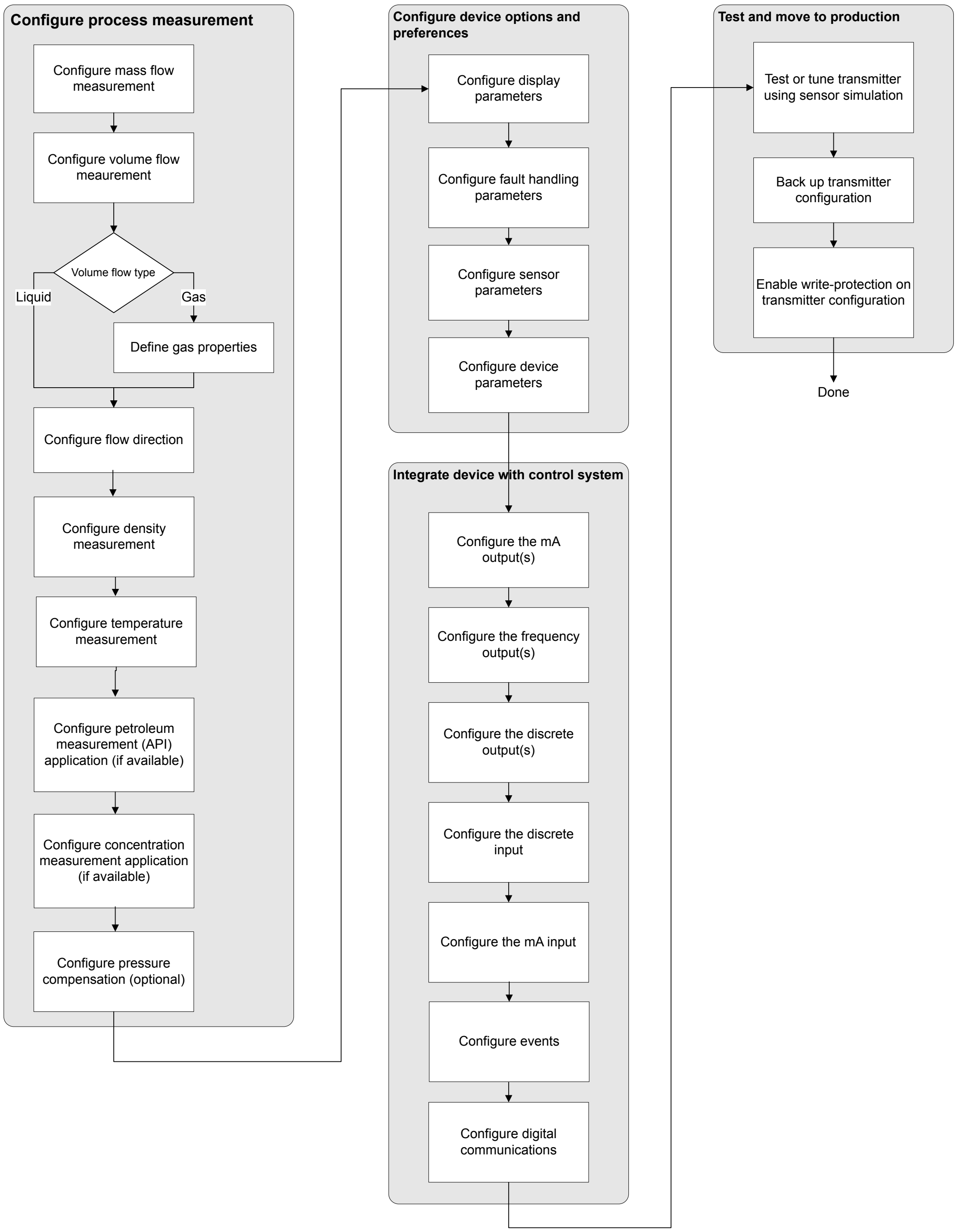
- *Configuration flowchart*
- *Default values and ranges*
- *Enable access to the off-line menu of the display*
- *Disable write-protection on the transmitter configuration*
- *HART security*
- *Restore the factory configuration*

3.1 Configuration flowchart

Use the following flowchart as a general guide to the configuration and commissioning process.

Some options may not apply to your installation. Detailed information is provided in the remainder of this manual. If you are using the Weights & Measures application, additional configuration and setup are required.

Figure 3-1: Configuration flowchart



3.2 Default values and ranges

See *Section D.1* to view the default values and ranges for the most commonly used parameters.

3.3 Enable access to the off-line menu of the display

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > OFFLN
ProLink II	ProLink > Configuration > Display > Display Options > Display Offline Menu
Field Communicator	*Not available*

Overview

By default, access to the off-line menu of the display is enabled. If it is disabled, you must enable it if you want to use the display to configure the transmitter.

Restriction

You cannot use the display to enable access to the off-line menu. You must make a connection from another tool.

3.4 Disable write-protection on the transmitter configuration

Display	OFF-LINE MAINT > CONFG > LOCK
ProLink II	ProLink > Configuration > Device > Enable Write Protection
Field Communicator	*Not available*

Overview

If the transmitter is write-protected, the configuration is locked and you must unlock it before you can change any configuration parameters. By default, the transmitter is not write-protected.

Tip

Write-protecting the transmitter prevents accidental changes to configuration. It does not prevent normal operational use. You can always disable write-protection, perform any required configuration changes, then re-enable write-protection.

3.5 HART security

HART security may be enabled on your transmitter. To configure the transmitter using HART protocol, you must disable HART security.

3.6 Restore the factory configuration

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Restore Factory Configuration
Field Communicator	*Not available*

Overview

Restoring the factory configuration returns the transmitter to a known operational configuration. This may be useful if you experience problems during configuration.

Tip

Restoring the factory configuration is not a common action. You may want to contact Micro Motion to see if there is a preferred method to resolve any issues.

4 Configure process measurement

Topics covered in this chapter:

- *Configure mass flow measurement*
- *Configure volume flow measurement for liquid applications*
- *Configure gas standard volume (GSV) flow measurement*
- *Configure Flow Direction*
- *Configure density measurement*
- *Configure temperature measurement*
- *Configure the petroleum measurement application*
- *Configure the concentration measurement application*
- *Configure pressure compensation*

4.1 Configure mass flow measurement

The mass flow measurement parameters control how mass flow is measured and reported.

The mass flow measurement parameters include:

- Mass Flow Measurement Unit
- Flow Damping
- Mass Flow Cutoff

4.1.1 Configure Mass Flow Measurement Unit

Display	OFF-LINE MAINT > OFF-LINE CONFG > UNITS > MASS
ProLink II	ProLink > Configuration > Flow > Mass Flow Units
Field Communicator	Configure > Manual Setup > Measurements > Flow > Mass Flow Unit

Overview

Mass Flow Measurement Unit specifies the unit of measure that will be used for the mass flow rate. The unit used for mass total and mass inventory is derived from this unit.

Procedure

Set Mass Flow Measurement Unit to the unit you want to use.

The default setting for Mass Flow Measurement Unit is g/sec (grams per second).

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Mass Flow Measurement Unit

The transmitter provides a standard set of measurement units for Mass Flow Measurement Unit, plus one user-defined special measurement unit. Different communications tools may use different labels for the units.

Table 4-1: Options for Mass Flow Measurement Unit

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communi-cator
Grams per second	G/S	g/sec	g/sec	g/s
Grams per minute	G/MIN	g/min	g/min	g/min
Grams per hour	G/H	g/hr	g/hr	g/h
Kilograms per second	KG/S	kg/sec	kg/sec	kg/s
Kilograms per minute	KG/MIN	kg/min	kg/min	kg/min
Kilograms per hour	KG/H	kg/hr	kg/hr	kg/h
Kilograms per day	KG/D	kg/day	kg/day	kg/d
Metric tons per minute	T/MIN	mTon/min	mTon/min	MetTon/min
Metric tons per hour	T/H	mTon/hr	mTon/hr	MetTon/h
Metric tons per day	T/D	mTon/day	mTon/day	MetTon/d
Pounds per second	LB/S	lbs/sec	lbs/sec	lb/s
Pounds per minute	LB/MIN	lbs/min	lbs/min	lb/min
Pounds per hour	LB/H	lbs/hr	lbs/hr	lb/h
Pounds per day	LB/D	lbs/day	lbs/day	lb/d
Short tons (2000 pounds) per minute	ST/MIN	sTon/min	sTon/min	STon/min
Short tons (2000 pounds) per hour	ST/H	sTon/hr	sTon/hr	STon/h
Short tons (2000 pounds) per day	ST/D	sTon/day	sTon/day	STon/d
Long tons (2240 pounds) per hour	LT/H	lTon/hr	lTon/hr	LTon/h
Long tons (2240 pounds) per day	LT/D	lTon/day	lTon/day	LTon/d
Special unit	SPECL	special	special	Spcl

Define a special measurement unit for mass flow

Display	*Not available*
ProLink II	ProLink > Configuration > Special Units
Field Communicator	Configure > Manual Setup > Measurements > Special Units > Mass Special Units

Overview

A special measurement unit is a user-defined unit of measure that allows you to report process data, totalizer data, and inventory data in a unit that is not available in the transmitter. A special measurement unit is calculated from an existing measurement unit using a conversion factor.

Note
Although you cannot define a special measurement unit using the display, you can use the display to select an existing special measurement unit, and to view process data using the special measurement unit.

Procedure

1. Specify Base Mass Unit.

   Base Mass Unit is the existing mass unit that the special unit will be based on.
2. Specify Base Time Unit.

   Base Time Unit is the existing time unit that the special unit will be based on.
3. Calculate Mass Flow Conversion Factor as follows:
   a. x base units = y special units
   b. Mass Flow Conversion Factor = x/y
4. Enter Mass Flow Conversion Factor.
5. Set Mass Flow Label to the name you want to use for the mass flow unit.
6. Set Mass Total Label to the name you want to use for the mass total and mass inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for mass flow

You want to measure mass flow in ounces per second (oz/sec).

1. Set Base Mass Unit to Pounds (lb).
2. Set Base Time Unit to Seconds (sec).
3. Calculate Mass Flow Conversion Factor:
   a. 1 lb/sec = 16 oz/sec

   b. Mass Flow Conversion Factor = 1/16 = 0.0625

4. Set Mass Flow Conversion Factor to 0.0625.
5. Set Mass Flow Label to oz/sec.
6. Set Mass Total Label to oz.

4.1.2 Configure Flow Damping

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Flow Damp
Field Communicator	Configure > Manual Setup > Measurements > Flow > Flow Damping

Overview

Damping is used to smooth out small, rapid fluctuations in process measurement. Damping Value specifies the time period (in seconds) over which the transmitter will spread changes in the reported process variable. At the end of the interval, the reported process variable will reflect 63% of the change in the actual measured value.

Procedure

Set Flow Damping to the value you want to use.

The default value is 0.8 seconds. The range is 0 to 10.24 seconds.

Tips

- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- The combination of a high damping value and rapid, large changes in flow rate can result in increased measurement error.
- Whenever the damping value is non-zero, the reported measurement will lag the actual measurement because the reported value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the reported value.
- Micro Motion recommends using the default value of 0.04 seconds.

The value you enter is automaticaly rounded down to the nearest valid value. The valid values for Flow Damping are: 0, 0.04, 0.08, 0.16, ... 10.24.

Effect of Flow Damping on volume measurement

Flow Damping affects volume measurement for liquid volume data. Flow Damping also affects volume measurement for gas standard volume data. The transmitter calculates volume data from the damped mass flow data.

Interaction between Flow Damping and Added Damping

In some circumstances, both Flow Damping and Added Damping are applied to the reported mass flow value.

Flow Damping controls the rate of change in flow process variables. Added Damping controls the rate of change reported via the mA output. If mA Output Process Variable is set to Mass Flow Rate, and both Flow Damping and Added Damping are set to non-zero values, flow damping is applied first, and the added damping calculation is applied to the result of the first calculation.

4.1.3 Configure Mass Flow Cutoff

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Mass Flow Cutoff
Field Communicator	Configure > Manual Setup > Measurements > Flow > Mass Flow Cutoff

Overview

Mass Flow Cutoff specifies the lowest mass flow rate that will be reported as measured. All mass flow rates below this cutoff will be reported as 0.

Procedure

Set Mass Flow Cutoff to the value you want to use.

The default value for Mass Flow Cutoff is 0.0 g/sec or a sensor-specific value set at the factory. The recommended setting is 0.05% of the sensor's rated maximum flow rate or a value below the highest expected flow rate. Do not set Mass Flow Cutoff to 0.0 g/sec.

Effect of Mass Flow Cutoff on volume measurement

Mass Flow Cutoff does not affect volume measurement. Volume data is calculated from the actual mass data rather than the reported value.

Interaction between Mass Flow Cutoff and AO Cutoff

Mass Flow Cutoff defines the lowest mass flow value that the transmitter will report as measured. AO Cutoff defines the lowest flow rate that will be reported via the mA output. If mA Output Process Variable is set to Mass Flow Rate, the mass flow rate reported via the mA output is controlled by the higher of the two cutoff values.

Mass Flow Cutoff affects all reported values and values used in other transmitter behavior (e.g., events defined on mass flow).

AO Cutoff affects only mass flow values reported via the mA output.

Example: Cutoff interaction with AO Cutoff lower than Mass Flow Cutoff

Configuration:

- mA Output Process Variable: Mass Flow Rate
- Frequency Output Process Variable: Mass Flow Rate
- AO Cutoff: 10 g/sec
- Mass Flow Cutoff: 15 g/sec

Result: If the mass flow rate drops below 15 g/sec, mass flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with AO Cutoff higher than Mass Flow Cutoff

Configuration:

- mA Output Process Variable: Mass Flow Rate
- Frequency Output Process Variable: Mass Flow Rate
- AO Cutoff: 15 g/sec
- Mass Flow Cutoff: 10 g/sec

Result:

- If the mass flow rate drops below 15 g/sec but not below 10 g/sec:
  - The mA output will report zero flow.
  - The frequency output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the mass flow rate drops below 10 g/sec, both outputs will report zero flow, and 0 will be used in all internal processing.

4.2 Configure volume flow measurement for liquid applications

The volume flow measurement parameters control how liquid volume flow is measured and reported.

The volume flow measurement parameters include:

- Volume Flow Type
- Volume Flow Measurement Unit
- Volume Flow Cutoff

Restriction

You cannot implement both liquid volume flow and gas standard volume flow at the same time. You must choose one or the other.

4.2.1 Configure Volume Flow Type for liquid applications

Display	OFF-LINE MAINT > OFF-LINE CONFG > VOL > VOL TYPE LIQUID
ProLink II	ProLink > Configuration > Flow > Vol Flow Type > Liquid Volume
Field Communicator	Configure > Manual Setup > Measurements > Gas Standard Volume > Volume Flow Type > Liquid

Overview

Volume Flow Type controls whether liquid or gas standard volume flow measurement will be used.

Restriction

If you are using the petroleum measurement application, you must set Volume Flow Type to Liquid. Gas standard volume measurement is incompatible with the petroleum measurement application.

Restriction

If you are using the concentration measurement application, you must set Volume Flow Type to Liquid. Gas standard volume measurement is incompatible with the concentration measurement application.

Procedure

Set Volume Flow Type to Liquid.

4.2.2 Configure Volume Flow Measurement Unit for liquid applications

Display	OFF-LINE MAINT > OFF-LINE CONFG > UNITS > VOL
ProLink II	ProLink > Configuration > Flow > Vol Flow Units
Field Communicator	Configure > Manual Setup > Measurements > Flow > Volume Flow Unit

Overview

Volume Flow Measurement Unit specifies the unit of measurement that will be displayed for the volume flow rate. The unit used for the volume total and volume inventory is based on this unit.

Prerequisites

Before you configure Volume Flow Measurement Unit, be sure that Volume Flow Type is set to Liquid.

Procedure

Set Volume Flow Measurement Unit to the unit you want to use.

The default setting for Volume Flow Measurement Unit is l/sec (liters per second).

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Volume Flow Measurement Unit for liquid applications

The transmitter provides a standard set of measurement units for Volume Flow Measurement Unit, plus one user-defined measurement unit. Different communications tools may use different labels for the units.

Table 4-2: Options for Volume Flow Measurement Unit for liquid applications

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Cubic feet per second	CUFT/S	ft3/sec	ft3/sec	Cuft/s
Cubic feet per minute	CUF/MN	ft3/min	ft3/min	Cuft/min
Cubic feet per hour	CUFT/H	ft3/hr	ft3/hr	Cuft/h
Cubic feet per day	CUFT/D	ft3/day	ft3/day	Cuft/d
Cubic meters per second	M3/S	m3/sec	m3/sec	Cum/s
Cubic meters per minute	M3/MIN	m3/min	m3/min	Cum/min
Cubic meters per hour	M3/H	m3/hr	m3/hr	Cum/h
Cubic meters per day	M3/D	m3/day	m3/day	Cum/d
U.S. gallons per second	USGPS	US gal/sec	US gal/sec	gal/s
U.S. gallons per minute	USGPM	US gal/min	US gal/min	gal/min
U.S. gallons per hour	USGPH	US gal/hr	US gal/hr	gal/h
U.S. gallons per day	USGPD	US gal/day	US gal/day	gal/d
Million U.S. gallons per day	MILG/D	mil US gal/day	mil US gal/day	MMgal/d
Liters per second	L/S	l/sec	l/sec	L/s
Liters per minute	L/MIN	l/min	l/min	L/min
Liters per hour	L/H	l/hr	l/hr	L/h
Million liters per day	MILL/D	mil l/day	mil l/day	ML/d
Imperial gallons per second	UKGPS	Imp gal/sec	Imp gal/sec	Impgal/s
Imperial gallons per minute	UKGPM	Imp gal/min	Imp gal/min	Impgal/min
Imperial gallons per hour	UKGPH	Imp gal/hr	Imp gal/hr	Impgal/h
Imperial gallons per day	UKGPD	Imp gal/day	Imp gal/day	Impgal/d
Barrels per second(1)	BBL/S	barrels/sec	barrels/sec	bbl/s

(1) Unit based on oil barrels (42 U.S. gallons).

Table 4-2: Options for Volume Flow Measurement Unit for liquid applications *(continued)*

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Barrels per minute(1)	BBL/MN	barrels/min	barrels/min	bbl/min
Barrels per hour(1)	BBL/H	barrels/hr	barrels/hr	bbl/h
Barrels per day(1)	BBL/D	barrels/day	barrels/day	bbl/d
Beer barrels per second(2)	BBBL/S	Beer barrels/sec	Beer barrels/sec	bbbl/s
Beer barrels per minute(2)	BBBL/MN	Beer barrels/min	Beer barrels/min	bbbl/min
Beer barrels per hour(2)	BBBL/H	Beer barrels/hr	Beer barrels/hr	bbbl/h
Beer barrels per day(2)	BBBL/D	Beer barrels/day	Beer barrels/day	bbbl/d
Special unit	SPECL	special	special	Spcl

Define a special measurement unit for volume flow

Display	*Not available*
ProLink II	ProLink > Configuration > Special Units
Field Communicator	Configure > Manual Setup > Measurements > Special Units > Volume Special Units

Overview

A special measurement unit is a user-defined unit of measure that allows you to report process data, totalizer data, and inventory data in a unit that is not available in the transmitter. A special measurement unit is calculated from an existing measurement unit using a conversion factor.

Note
Although you cannot define a special measurement unit using the display, you can use the display to select an existing special measurement unit, and to view process data using the special measurement unit.

Procedure

1. Specify Base Volume Unit.

   Base Volume Unit is the existing volume unit that the special unit will be based on.

2. Specify Base Time Unit.

   Base Time Unit is the existing time unit that the special unit will be based on.

3. Calculate Volume Flow Conversion Factor as follows:

(2) Unit based on U.S. beer barrels (31 U.S. gallons).

    a. x base units = y special units
    b. Volume Flow Conversion Factor = x/y
4. Enter Volume Flow Conversion Factor.
5. Set Volume Flow Label to the name you want to use for the volume flow unit.
6. Set Volume Total Label to the name you want to use for the volume total and volume inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for volume flow

You want to measure volume flow in pints per second (pints/sec).

1. Set Base Volume Unit to Gallons (gal).
2. Set Base Time Unit to Seconds (sec).
3. Calculate the conversion factor:
    a. 1 gal/sec = 8 pints/sec
    b. Volume Flow Conversion Factor = 1/8 = 0.1250
4. Set Volume Flow Conversion Factor to 0.1250.
5. Set Volume Flow Label to pints/sec.
6. Set Volume Total Label to pints.

4.2.3 Configure Volume Flow Cutoff

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Vol Flow Cutoff
Field Communicator	Configure > Manual Setup > Measurements > Flow > Volume Flow Cutoff

Overview

Volume Flow Cutoff specifies the lowest volume flow rate that will be reported as measured. All volume flow rates below this cutoff are reported as 0.

Procedure

Set Volume Flow Cutoff to the value you want to use.

The default value for Volume Flow Cutoff is 0.0 l/sec (liters per second). The lower limit is 0. The upper limit is the sensor's flow calibration factor, in units of l/sec, multiplied by 0.2.

Interaction between Volume Flow Cutoff and AO Cutoff

Volume Flow Cutoff defines the lowest liquid volume flow value that the transmitter will report as measured. AO Cutoff defines the lowest flow rate that will be reported via the mA output. If mA Output Process Variable is set to Volume Flow Rate, the volume flow rate reported via the mA output is controlled by the higher of the two cutoff values.

Volume Flow Cutoff affects both the volume flow values reported via the outputs and the volume flow values used in other transmitter behavior (e.g., events defined on the volume flow).

AO Cutoff affects only flow values reported via the mA output.

Example: Cutoff interaction with AO Cutoff lower than Volume Flow Cutoff

Configuration:

- mA Output Process Variable: Volume Flow Rate
- Frequency Output Process Variable: Volume Flow Rate
- AO Cutoff: 10 l/sec
- Volume Flow Cutoff: 15 l/sec

Result: If the volume flow rate drops below 15 l/sec, volume flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with AO Cutoff higher than Volume Flow Cutoff

Configuration:

- mA Output Process Variable: Volume Flow Rate
- Frequency Output Process Variable: Volume Flow Rate
- AO Cutoff: 15 l/sec
- Volume Flow Cutoff: 10 l/sec

Result:

- If the volume flow rate drops below 15 l/sec but not below 10 l/sec:
  - The mA output will report zero flow.
  - The frequency output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the volume flow rate drops below 10 l/sec, both outputs will report zero flow, and 0 will be used in all internal processing.

4.3 Configure gas standard volume (GSV) flow measurement

The gas standard volume (GSV) flow measurement parameters control how gas standard volume flow is measured and reported.

The GSV flow measurement parameters include:

- Volume Flow Type
- Standard Gas Density
- Gas Standard Volume Flow Measurement Unit
- Gas Standard Volume Flow Cutoff

Restriction

You cannot implement both liquid volume flow and gas standard volume flow at the same time. You must choose one or the other.

4.3.1 Configure Volume Flow Type for gas applications

Display	OFF-LINE MAINT > OFF-LINE CONFG > VOL > VOL TYPE GAS
ProLink II	ProLink > Configuration > Flow > Vol Flow Type > Std Gas Volume
Field Communicator	Configure > Manual Setup > Measurements > Gas Standard Volume > Volume Flow Type > GSV

Overview

Volume Flow Type controls whether liquid or gas standard volume flow measurement is used.

Procedure

Set Volume Flow Type to Gas Standard Volume.

4.3.2 Configure Standard Gas Density

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Std Gas Density
Field Communicator	Configure > Manual Setup > Measurements > Gas Standard Volume > Gas Density

Overview

The Standard Gas Density value is used to convert the measured flow data to the standard reference values.

Prerequisites

Ensure that Density Measurement Unit is set to the measurement unit you want to use for Standard Gas Density.

Procedure

Set Standard Gas Density to the standard reference density of the gas you are measuring.

Note
ProLink II and ProLink III provide a guided method that you can use to calculate the standard density of your gas, if you do not know it.

4.3.3 Configure Gas Standard Volume Flow Measurement Unit

Display	OFF-LINE MAINT > OFF-LINE CONFG > UNITS > VOL
ProLink II	ProLink > Configuration > Flow > Std Gas Vol Flow Units
Field Communicator	Configure > Manual Setup > Measurements > Gas Standard Volume > Gas Vol Flow Unit

Overview

Gas Standard Volume Flow Measurement Unit specifies the unit of measure that will be displayed for the gas standard volume flow rate. The measurement unit used for the gas standard volume total and the gas standard volume inventory is derived from this unit.

Prerequisites

Before you configure Gas Standard Volume Flow Measurement Unit, be sure that Volume Flow Type is set to Gas Standard Volume.

Procedure

Set Gas Standard Volume Flow Measurement Unit to the unit you want to use.

The default setting for Gas Standard Volume Flow Measurement Unit is SCFM (Standard Cubic Feet per Minute).

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Gas Standard Volume Flow Measurement Unit

The transmitter provides a standard set of measurement units for Gas Standard Volume Flow Measurement Unit, plus one user-defined special measurement unit. Different communications tools may use different labels for the units.

Table 4-3: Options for Gas Standard Volume Measurement Unit

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Normal cubic meters per second	NM3/S	Nm3/sec	Nm3/sec	Nm3/sec
Normal cubic meters per minute	NM3/MN	Nm3/min	Nm3/sec	Nm3/min

Table 4-3: Options for Gas Standard Volume Measurement Unit *(continued)*

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Normal cubic meters per hour	NM3/H	Nm3/hr	Nm3/hr	Nm3/hr
Normal cubic meters per day	NM3/D	Nm3/day	Nm3/day	Nm3/day
Normal liter per second	NLPS	NLPS	NLPS	NLPS
Normal liter per minute	NLPM	NLPM	NLPM	NLPM
Normal liter per hour	NLPH	NLPH	NLPH	NLPH
Normal liter per day	NLPD	NLPD	NLPD	NLPD
Standard cubic feet per second	SCFS	SCFS	SCFS	SCFS
Standard cubic feet per minute	SCFM	SCFM	SCFM	SCFM
Standard cubic feet per hour	SCFH	SCFH	SCFH	SCFH
Standard cubic feet per day	SCFD	SCFD	SCFD	SCFD
Standard cubic meters per second	SM3/S	Sm3/S	Sm3/sec	Sm3/sec
Standard cubic meters per minute	SM3/MN	Sm3/min	Sm3/min	Sm3/min
Standard cubic meters per hour	SM3/H	Sm3/hr	Sm3/hr	Sm3/hr
Standard cubic meters per day	SM3/D	Sm3/day	Sm3/day	Sm3/day
Standard liter per second	SLPS	SLPS	SLPS	SLPS
Standard liter per minute	SLPM	SLPM	SLPM	SLPM
Standard liter per hour	SLPH	SLPH	SLPH	SLPH
Standard liter per day	SLPD	SLPD	SLPD	SLPD
Special measurement unit	SPECL	special	special	Special

Define a special measurement unit for gas standard volume flow

Display	*Not available*
ProLink II	ProLink > Configuration > Special Units
Field Communicator	Configure > Manual Setup > Measurements > Special Units > Volume Special Units

Overview

A special measurement unit is a user-defined unit of measure that allows you to report process data, totalizer data, and inventory data in a unit that is not available in the transmitter. A special measurement unit is calculated from an existing measurement unit using a conversion factor.

Note

Although you cannot define a special measurement unit using the display, you can use the display to select an existing special measurement unit, and to view process data using the special measurement unit.

Procedure

1. Specify Base Gas Standard Volume Unit.

   Base Gas Standard Volume Unit is the existing gas standard volume unit that the special unit will be based on.

2. Specify Base Time Unit.

   Base Time Unit is the existing time unit that the special unit will be based on.

3. Calculate Gas Standard Volume Flow Conversion Factor as follows:

   a. x base units = y special units

   b. Gas Standard Volume Flow Conversion Factor = x/y

4. Enter the Gas Standard Volume Flow Conversion Factor.
5. Set Gas Standard Volume Flow Label to the name you want to use for the gas standard volume flow unit.
6. Set Gas Standard Volume Total Label to the name you want to use for the gas standard volume total and gas standard volume inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for gas standard volume flow

You want to measure gas standard volume flow in thousands of standard cubic feet per minute.

1. Set Base Gas Standard Volume Unit to SCFM.
2. Set Base Time Unit to minutes (min).
3. Calculate the conversion factor:

   a. 1 thousands of standard cubic feet per minute = 1000 cubic feet per minute

   b. Gas Standard Volume Flow Conversion Factor = 1/1000 = 0.001

4. Set Gas Standard Volume Flow Conversion Factor to 0.001.
5. Set Gas Standard Volume Flow Label to KSCFM.
6. Set Gas Standard Volume Total Label to KSCF.

4.3.4 Configure Gas Standard Volume Flow Cutoff

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Std Gas Vol Flow Cutoff
Field Communicator	Configure > Manual Setup > Measurements > Gas Standard Volume > GSV Cutoff

Overview

Gas Standard Volume Flow Cutoff specifies the lowest gas standard volume flow rate that will reported as measured. All gas standard volume flow rates below this cutoff will be reported as 0.

Procedure

Set Gas Standard Volume Flow Cutoff to the value you want to use.

The default value for Gas Standard Volume Flow Cutoff is 0.0. The lower limit is 0.0. There is no upper limit.

Interaction between Gas Standard Volume Flow Cutoff and AO Cutoff

Gas Standard Volume Flow Cutoff defines the lowest Gas Standard Volume flow value that the transmitter will report as measured. AO Cutoff defines the lowest flow rate that will be reported via the mA output. If mA Output Process Variable is set to Gas Standard Volume Flow Rate, the volume flow rate reported via the mA output is controlled by the higher of the two cutoff values.

Gas Standard Volume Flow Cutoff affects both the gas standard volume flow values reported via outputs and the gas standard volume flow values used in other transmitter behavior (e.g., events defined on gas standard volume flow).

AO Cutoff affects only flow values reported via the mA output.

Example: Cutoff interaction with AO Cutoff lower than Gas Standard Volume Flow Cutoff

Configuration:

- mA Output Process Variable for the primary mA output: Gas Standard Volume Flow Rate
- Frequency Output Process Variable: Gas Standard Volume Flow Rate
- AO Cutoff for the primary mA output: 10 SLPM (standard liters per minute)
- Gas Standard Volume Flow Cutoff: 15 SLPM

Result: If the gas standard volume flow rate drops below 15 SLPM, the volume flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with AO Cutoff higher than Gas Standard Volume Flow Cutoff

Configuration:

- mA Output Process Variable for the primary mA output: Gas Standard Volume Flow Rate
- Frequency Output Process Variable: Gas Standard Volume Flow Rate
- AO Cutoff for the primary mA output: 15 SLPM (standard liters per minute)
- Gas Standard Volume Flow Cutoff: 10 SLPM

Result:

- If the gas standard volume flow rate drops below 15 SLPM but not below 10 SLPM:
  - The primary mA output will report zero flow.
  - The frequency output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the gas standard volume flow rate drops below 10 SLPM, both outputs will report zero flow, and 0 will be used in all internal processing.

4.4 Configure Flow Direction

Display	*Not available*
ProLink II	ProLink > Configuration > Flow > Flow Direction
Field Communicator	Configure > Manual Setup > Measurements > Flow > Flow Direction

Overview

Flow Direction controls how forward flow and reverse flow affect flow measurement and reporting.

Flow Direction is defined with respect to the flow arrow on the sensor:

- Forward flow (positive flow) moves in the direction of the flow arrow on the sensor.
- Reverse flow (negative flow) moves in the direction opposite to the flow arrow on the sensor.

Tip

Micro Motion sensors are bidirectional. Measurement accuracy is not affected by actual flow direction or the setting of the Flow Direction parameter.

Procedure

Set Flow Direction to the value you want to use.

4.4.1 Options for Flow Direction

Table 4-4: Options for Flow Direction

Flow Direction **setting**			**Relationship to Flow Direction arrow on sensor**
ProLink II	**ProLink III**	**Field Communicator**	
Forward	Forward	Forward	Appropriate when the Flow Direction arrow is in the same direction as the majority of flow.
Reverse	Reverse	Reverse	Appropriate when the Flow Direction arrow is in the same direction as the majority of flow.
Absolute Value	Absolute Value	Absolute Value	Flow Direction arrow is not relevant.
Bidirectional	Bidirectional	Bi directional	Appropriate when both forward and reverse flow are expected, and forward flow will dominate, but the amount of reverse flow will be significant.
Negate Forward	Negate Forward	Negate/Forward Only	Appropriate when the Flow Direction arrow is in the opposite direction from the majority of flow.
Negate Bidirectional	Negate Bidirectional	Negate/Bi-directional	Appropriate when both forward and reverse flow are expected, and reverse flow will dominate, but the amount of forward flow will be significant.

Effect of Flow Direction on mA outputs

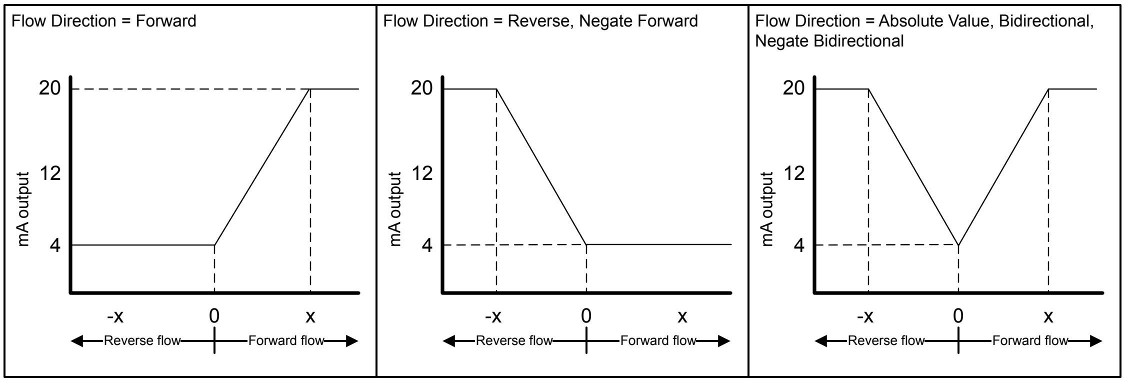
Flow Direction affects how the transmitter reports flow values via the mA outputs. The mA outputs are affected by Flow Direction only if mA Output Process Variable is set to a flow variable.

Flow Direction and mA outputs

The effect of Flow Direction on the mA outputs depend on Lower Range Value configured for the mA output:

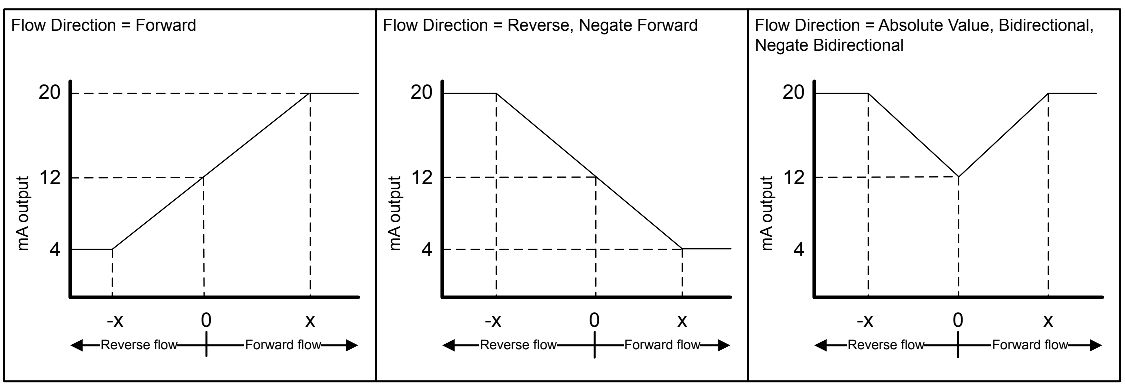
- If Lower Range Value is set to 0, see *Figure 4-1*.
- If Lower Range Value is set to a negative value, see *Figure 4-2*.

Figure 4-1: Effect of Flow Direction on the mA output: Lower Range Value = 0



- *Lower Range Value = 0*
- *Upper Range Value = x*

Figure 4-2: Effect of Flow Direction on the mA output: Lower Range Value < 0



- *Lower Range Value = −x*
- *Upper Range Value = x*

Example: Flow Direction = Forward and Lower Range Value = 0

Configuration:

- Flow Direction = Forward
- Lower Range Value = 0 g/sec
- Upper Range Value = 100 g/sec

Result:

- Under conditions of reverse flow or zero flow, the mA output is 4 mA.
- Under conditions of forward flow, up to a flow rate of 100 g/sec, the mA output varies between 4 mA and 20 mA in proportion to the flow rate.
- Under conditions of forward flow, if the flow rate equals or exceeds 100 g/sec, the mA output will be proportional to the flow rate up to 20.5 mA, and will be level at 20.5 mA at higher flow rates.

Example: Flow Direction = Forward and Lower Range Value < 0

Configuration:

- Flow Direction = Forward
- Lower Range Value = −100 g/sec
- Upper Range Value = +100 g/sec

Result:

- Under conditions of zero flow, the mA output is 12 mA.
- Under conditions of forward flow, for flow rates between 0 and +100 g/sec, the mA output varies between 12 mA and 20 mA in proportion to (the absolute value of) the flow rate.
- Under conditions of forward flow, if (the absolute value of) the flow rate equals or exceeds 100 g/sec, the mA output is proportional to the flow rate up to 20.5 mA, and will be level at 20.5 mA at higher flow rates.
- Under conditions of reverse flow, for flow rates between 0 and −100 g/sec, the mA output varies between 4 mA and 12 mA in inverse proportion to the absolute value of the flow rate.
- Under conditions of reverse flow, if the absolute value of the flow rate equals or exceeds 100 g/sec, the mA output is inversely proportional to the flow rate down to 3.8 mA, and will be level at 3.8 mA at higher absolute values.

Example: Flow Direction = Reverse

Configuration:

- Flow Direction = Reverse
- Lower Range Value = 0 g/sec
- Upper Range Value = 100 g/sec

Result:

- Under conditions of forward flow or zero flow, the mA output is 4 mA.
- Under conditions of reverse flow, for flow rates between 0 and +100 g/sec, the mA output level varies between 4 mA and 20 mA in proportion to the absolute value of the flow rate.
- Under conditions of reverse flow, if the absolute value of the flow rate equals or exceeds 100 g/sec, the mA output will be proportional to the absolute value of the flow rate up to 20.5 mA, and will be level at 20.5 mA at higher absolute values.

Effect of Flow Direction on frequency outputs

Flow Direction affects how the transmitter reports flow values via the frequency outputs. The frequency outputs are affected by Flow Direction only if Frequency Output Process Variable is set to a flow variable.

Table 4-5: Effect of the Flow Direction parameter and actual flow direction on frequency outputs

Flow Direction **setting**	**Actual flow direction**		
	Forward	**Zero flow**	**Reverse**
Forward	Hz > 0	0 Hz	0 Hz
Reverse	0 Hz	0 Hz	Hz > 0
Bidirectional	Hz > 0	0 Hz	Hz > 0
Absolute Value	Hz > 0	0 Hz	Hz > 0
Negate Forward	0 Hz	0 Hz	Hz > 0
Negate Bidirectional	Hz > 0	0 Hz	Hz > 0

Effect of Flow Direction on discrete outputs

The Flow Direction parameter affects the discrete output behavior only if Discrete Output Source is set to Flow Direction.

Table 4-6: Effect of the Flow Direction parameter and actual flow direction on discrete outputs

Flow Direction **setting**	**Actual flow direction**		
	Forward	**Zero flow**	**Reverse**
Forward	OFF	OFF	ON
Reverse	OFF	OFF	ON
Bidirectional	OFF	OFF	ON
Absolute Value	OFF	OFF	OFF
Negate Forward	ON	OFF	OFF
Negate Bidirectional	ON	OFF	OFF

Effect of Flow Direction on digital communications

Flow Direction affects how flow values are reported via digital communications.

Table 4-7: Effect of the Flow Direction parameter and actual flow direction on flow values reported via digital communications

Flow Direction setting	Actual flow direction		
	Forward	**Zero flow**	**Reverse**
Forward	Positive	0	Negative
Reverse	Positive	0	Negative
Bidirectional	Positive	0	Negative
Absolute Value	Positive(3)	0	Positive
Negate Forward	Negative	0	Positive
Negate Bidirectional	Negative	0	Positive

Effect of Flow Direction on flow totals

Flow Direction affects how flow totals and inventories are calculated.

Table 4-8: Effect of the Flow Direction parameter and actual flow direction on flow totals and inventories

Flow Direction setting	Actual flow direction		
	Forward	**Zero flow**	**Reverse**
Forward	Totals increase	Totals do not change	Totals do not change
Reverse	Totals do not change	Totals do not change	Totals increase
Bidirectional	Totals increase	Totals do not change	Totals decrease
Absolute Value	Totals increase	Totals do not change	Totals increase
Negate Forward	Totals do not change	Totals do not change	Totals increase
Negate Bidirectional	Totals decrease	Totals do not change	Totals increase

4.5 Configure density measurement

The density measurement parameters control how density is measured and reported. Density measurement (along with mass measurement) is used to determine liquid volume flow.

The density measurement parameters include:

- Density Measurement Unit
- Slug Flow Parameters
- Density Damping
- Density Cutoff

(3) Refer to the digital communications status bits for an indication of whether flow is positive or negative.

4.5.1 Configure Density Measurement Unit

Display	OFF-LINE MAINT > OFF-LINE CONFG > UNITS > DENS
ProLink II	ProLink > Configuration > Density > Density Units
Field Communicator	Configure > Manual Setup > Measurements > Density > Density Unit

Overview

Density Measurement Unit specifies the units of measure that will be displayed for density measurement.

Procedure

Set Density Measurement Unit to the option you want to use.

The default setting for Density Measurement Unit is g/cm3 (grams per cubic centimeter).

Options for Density Measurement Unit

The transmitter provides a standard set of measurement units for Density Measurement Unit. Different communications tools may use different labels.

Table 4-9: Options for Density Measurement Unit

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Specific gravity unit (not temperature-corrected)	SGU	SGU	SGU	SGU
Grams per cubic centimeter	G/CM3	g/cm3	g/cm3	g/Cucm
Grams per liter	G/L	g/l	g/l	g/L
Grams per milliliter	G/mL	g/ml	g/ml	g/mL
Kilograms per liter	KG/L	kg/l	kg/l	kg/L
Kilograms per cubic meter	KG/M3	kg/m3	kg/m3	kg/Cum
Pounds per U.S. gallon	LB/GAL	lbs/Usgal	lbs/Usgal	lb/gal
Pounds per cubic foot	LB/CUF	lbs/ft3	lbs/ft3	lb/Cuft
Pounds per cubic inch	LB/CUI	lbs/in3	lbs/in3	lb/CuIn
API gravity	D API	degAPI	degAPI	degAPI
Short ton per cubic yard	ST/CUY	sT/yd3	sT/yd3	STon/Cuyd

4.5.2 Configure slug flow parameters

Display	*Not available*
ProLink II	ProLink > Configuration > Density > Slug High Limit ProLink > Configuration > Density > Slug Low Limit ProLink > Configuration > Density > Slug Duration
Field Communicator	Configure > Manual Setup > Measurements > Density > Slug Low Limit Configure > Manual Setup > Measurements > Density > Slug High Limit Configure > Manual Setup > Measurements > Density > Slug Duration

Overview

The slug flow parameters control how the transmitter detects and reports two-phase flow (gas in a liquid process or liquid in a gas process).

Procedure

1. Set Slug Low Limit to the lowest density value that is considered normal in your process.

   Values below this will cause the transmitter to perform the configured slug flow action. Typically, this value is the lowest density value in the normal range of your process.

   Tip
   Gas entrainment can cause your process density to drop temporarily. To reduce the occurrence of slug flow alarms that are not significant to your process, set Slug Low Limit slightly below your expected lowest process density.

   You must enter Slug Low Limit in g/cm^3, even if you configured another unit for density measurement.

   The default value for Slug Low Limit is 0.0 g/cm^3. The range is 0.0 to 10.0 g/cm^3.

2. Set Slug High Limit to the highest density value that is considered normal in your process.

   Values above this will cause the transmitter to perform the configured slug flow action. Typically, this value is the highest density value in the normal range of your process.

   Tip
   To reduce the occurrence of slug flow alarms that are not significant to your process, set Slug High Limit slightly above your expected highest process density.

   You must enter Slug High Limit in g/cm^3, even if you configured another unit for density measurement.

The default value for Slug High Limit is 5.0 g/cm³. The range is 0.0 to 10.0 g/cm³.

3. Set Slug Duration to the number of seconds that the transmitter will wait for a slug flow condition to clear before performing the configured slug flow action.

   The default value for Slug Duration is 0.0 seconds. The range is 0.0 to 60.0 seconds.

Slug flow detection and reporting

Slug flow is typically used as an indicator of two-phase flow (gas in a liquid process or liquid in a gas process). Two-phase flow can cause a variety of process control issues. By configuring the slug flow parameters appropriately for your application, you can detect process conditions that require correction.

Tip

To decrease the occurrence of slug flow alarms, lower Slug Low Limit or raise Slug High Limit.

A slug flow condition occurs whenever the measured density goes below Slug Low Limit or above Slug High Limit. If this occurs:

- A slug flow alarm is posted to the active alarm log.
- All outputs that are configured to represent flow rate hold their last “pre-slug flow” value for the configured Slug Duration.

If the slug flow condition clears before Slug Duration expires:

- Outputs that represent flow rate revert to reporting actual flow.
- The slug flow alarm is deactivated, but remains in the active alarm log until it is acknowledged.

If the slug flow condition does not clear before Slug Duration expires, the outputs that represent flow rate report a flow rate of 0.

If Slug Duration is set to 0.0 seconds, the outputs that represent flow rate will report a flow rate of 0 as soon as slug flow is detected.

4.5.3 Configure Density Damping

Display	*Not available*
ProLink II	ProLink > Configuration > Density > Density Damping
Field Communicator	Configure > Manual Setup > Measurements > Density > Density Damping

Overview

Damping is used to smooth out small, rapid fluctuations in process measurement. Damping Value specifies the time period (in seconds) over which the transmitter will spread changes in the reported process variable. At the end of the interval, the reported process variable will reflect 63% of the change in the actual measured value.

Procedure

Set Density Damping to the value you want to use.

The default value is 1.6 seconds. The range is 0 to 10.24 seconds.

Tips

- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- Whenever the damping value is non-zero, the reported measurement will lag the actual measurement because the reported value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the reported value.

The value you enter is automaticaly rounded down to the nearest valid value. The valid values for Density Damping are: 0, 0.04, 0.08, 0.16, ... 10.24.

Effect of Density Damping on volume measurement

Density Damping affects liquid volume measurement. Liquid volume values are calculated from the damped density value rather than the measured density value. Density Damping does not affect gas standard volume measurement.

Interaction between Density Damping and Added Damping

In some circumstances, both Density Damping and Added Damping are applied to the reported density value.

Density Damping controls the rate of change in the density process variable. Added Damping controls the rate of change reported via the mA output. If mA Output Process Variable is set to Density, and both Density Damping and Added Damping are set to non-zero values, density damping is applied first, and the added damping calculation is applied to the result of the first calculation.

4.5.4 Configure Density Cutoff

Display	*Not available*
ProLink II	ProLink > Configuration > Density > Low Density Cutoff
Field Communicator	Configure > Manual Setup > Measurements > Density > Density Cutoff

Overview

Density Cutoff specifies the lowest density value that will be reported as measured. All density values below this cutoff will be reported as 0.

Procedure

Set Density Cutoff to the value you want to use.

The default value for Density Cutoff is 0.2 g/cm^3. The range is 0.0 g/cm^3 to 0.5 g/cm^3.

Effect of Density Cutoff on volume measurement

Density Cutoff affects liquid volume measurement. If the density value goes below Density Cutoff, the volume flow rate is reported as 0. Density Cutoff does not affect gas standard volume measurement. Gas standard volume values are always calculated from the value configured for Standard Gas Density.

4.6 Configure temperature measurement

The temperature measurement parameters control how temperature data from the sensor is reported. Temperature data is used to compensate for the effect of temperature on the sensor tubes during flow measurement .

The temperature measurement parameters include:

- Temperature Measurement Unit
- Temperature Damping

4.6.1 Configure Temperature Measurement Unit

Display	OFF-LINE MAINT > OFF-LINE CONFG > UNITS > TEMP
ProLink II	ProLink > Configuration > Temperature > Temp Units
Field Communicator	Configure > Manual Setup > Measurements > Temperature > Temperature Unit

Overview

Temperature Measurement Unit specifies the unit that will be used for temperature measurement.

Procedure

Set Temperature Measurement Unit to the option you want to use.

The default setting is Degrees Celsius.

Tip
If you are configuring the mA input to receive temperature data from an external measurement device, you must set the measurement unit to match the temperature measurement unit at the external measurement device.

Options for Temperature Measurement Unit

The transmitter provides a standard set of units for Temperature Measurement Unit. Different communications tools may use different labels for the units.

Table 4-10: Options for Temperature Measurement Unit

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Degrees Celsius	°C	degC	°C	degC
Degrees Fahrenheit	°F	degF	°F	degF
Degrees Rankine	°R	degR	°R	degR
Kelvin	°K	degK	°K	Kelvin

4.6.2 Configure Temperature Damping

Display	*Not available*
ProLink II	ProLink > Configuration > Temperature > Temp Damping
Field Communicator	Configure > Manual Setup > Measurements > Temperature > Temp Damping

Overview

Damping is used to smooth out small, rapid fluctuations in process measurement. Damping Value specifies the time period (in seconds) over which the transmitter will spread changes in the reported process variable. At the end of the interval, the reported process variable will reflect 63% of the change in the actual measured value.

Procedure

Enter the value you want to use for Temperature Damping.

The default value is 4.8 seconds. The range is 0.0 to 76.8 seconds.

Tips

- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- Whenever the damping value is non-zero, the reported measurement will lag the actual measurement because the reported value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the reported value.

The value you enter is automaticaly rounded down to the nearest valid value. Valid values for Temperature Damping are 0, 0.6, 1.2, 2.4, 4.8, ... 76.8.

Effect of Temperature Damping on process measurement

Temperature Damping affects the response speed for temperature compensation with fluctuating temperatures. Temperature compensation adjusts the process measurement to compensate for the effect of temperature on the sensor tube.

Temperature Damping affects petroleum measurement process variables only if the transmitter is configured to use temperature data from the sensor. If an external temperature value is used for petroleum measurement, Temperature Damping does not affect petroleum measurement process variables.

Temperature Damping affects concentration measurement process variables only if the transmitter is configured to use temperature data from the sensor. If an external temperature value is used for concentration measurement, Temperature Damping does not affect concentration measurement process variables.

4.7 Configure the petroleum measurement application

The petroleum measurement application enables Correction for the effect of Temperature on the volume of Liquids (CTL), by calculating and applying a Volume Correction Factor (VCF) to volume measurement. Internal calculations are performed in compliance with American Petroleum Institute (API) standards.

4.7.1 Configure petroleum measurement using ProLink II

1. Choose ProLink > Configuration > API Setup.
2. Specify the API table to use.
   a. In API Chapter 11.1 Table Type, select the API table group.
   b. In Units, select the the measurement units you want to use.

   These two parameters uniquely specify the API table.
3. If your API table is 53A, 53B, 53D, or 54C, set Reference Temperature to the appropriate value for your application. Enter the value in °C.
4. If your API table is 6C, 24C, or 54C, set Thermal Expansion Coefficient to the appropriate value for your application.
5. Determine how the transmitter will obtain temperature data for the petroleum measurement calculations, and perform the required setup.

Option	Setup
Temperature data from the sensor	a. Choose View > Preferences . b. Disable Use External Temperature.
A user-configured static temperature value	a. Choose View > Preferences . b. Enable Use External Temperature. c. Choose ProLink > Configuration > Temperature. d. Set External Temperature to the value to be used.
Polling for temperature[4]	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose View > Preferences . c. Enable Use External Temperature. d. Choose ProLink > Configuration > Polled Variables. e. Choose an unused polling slot. f. Set Polling Control to Poll As Primary or Poll as Secondary, and click Apply. g. Set External Tag to the HART tag of the external temperature device. h. Set Variable Type to External Temperature. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Choose View > Preferences . b. Enable Use External Temperature. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

4.7.2 Configure petroleum measurement using the Field Communicator

1. Choose Online > Configure > Manual Setup > Measurements > Set Up Petroleum.
2. Specify the API table to use.

   a. Open the Petroleum Measurement Source menu and select the API table number.

      Depending on your choice, you may be prompted to enter a reference temperature or a thermal expansion coefficient.

   b. Enter the API table letter.

   These two parameters uniquely specify the API table.

(4) Not available on all transmitters.

3. Determine how the transmitter will obtain temperature data for the petroleum measurement calculations, and perform the required setup.

Option	Setup
Temperature data from the sensor	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Set External Temperature to Disabled.
A user-configured static temperature value	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Set External Temperature to Enabled. c. Set Correction Temperature to the value to be used.
Polling for temperature(5)	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. c. Set External Temperature to Enabled. d. Choose External Polling. e. Set Poll Control to Poll As Primary or Poll as Secondary. f. Determine whether you will use Polling Slot 1 or Polling Slot 2. g. For the chosen slot, set Ext Dev Tag to the HART tag of the external temperature device. h. For the chosen slot, set Polled Variable to Temperature. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Set External Temperature to Enabled. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

4.7.3 API reference tables

Table 4-11: API reference tables, associated process fluids, and associated calculation values

Table name	Process fluid	CTL source data	Reference temperature	Density unit
5A	Generalized crude and JP4	Observed density and observed temperature	60 °F (non-configurable)	Degrees API Range: 0 to 100

(5) Not available on all transmitters.

Table 4-11: API reference tables, associated process fluids, and associated calculation values *(continued)*

Table name	Process fluid	CTL source data	Reference temperature	Density unit
5B	Generalized products	Observed density and observed temperature	60 °F (non-configurable)	Degrees API Range: 0 to 85
5D	Lubricating oils	Observed density and observed temperature	60 °F (non-configurable)	Degrees API Range: −10 to +40
6C	Liquids with a constant density base or known thermal expansion coefficient	User-supplied reference density (or thermal expansion coefficient) and observed temperature	60 °F (non-configurable)	Degrees API
23A	Generalized crude and JP4	Observed density and observed temperature	60 °F (non-configurable)	Relative density Range: 0.6110 to 1.0760
23B	Generalized products	Observed density and observed temperature	60 °F (non-configurable)	Relative density Range: 0.6535 to 1.0760
23D	Lubricating oils	Observed density and observed temperature	60 °F (non-configurable)	Relative density Range: 0.8520 to 1.1640
24C	Liquids with a constant density base or known thermal expansion coefficient	User-supplied reference density (or thermal expansion coefficient) and observed temperature	60 °F (non-configurable)	Relative density
53A	Generalized crude and JP4	Observed density and observed temperature	15 °C (configurable)	Base density Range: 610 to 1075 kg/m^3
53B	Generalized products	Observed density and observed temperature	15 °C (configurable)	Base density Range: 653 to 1075 kg/m^3
53D	Lubricating oils	Observed density and observed temperature	15 °C (configurable)	Base density Range: 825 to 1164 kg/m^3
54C	Liquids with a constant density base or known thermal expansion coefficient	User-supplied reference density (or thermal expansion coefficient) and observed temperature	15 °C (configurable)	Base density in kg/m^3

4.8 Configure the concentration measurement application

The concentration measurement application calculates concentration data from process temperature and density. Micro Motion provides a set of concentration matrices that provide the reference data for several standard industry applications and process fluids. If desired, you can build a custom matrix for your process fluid, or purchase a custom matrix from Micro Motion.

More information about the concentration measurement application is available in the following manual: *Micro Motion Enhanced Density Application: Theory, Configuration, and Use*.

Note
The concentration measurement application is also known as the enhanced density application.

4.8.1 Configure concentration measurement using ProLink II

This task guides you through loading and setting up a concentration matrix to use for measurement. It does not cover building a concentration matrix.

Note
Concentration matrices can be made available on your transmitter either by loading an existing matrix from a file or by building a new matrix. Up to six matrices can be available on your transmitter, but only one can be used for measurement at any given time. See *Micro Motion Enhanced Density Application: Theory, Configuration, and Use* for detailed information on building a matrix.

Prerequisites

Before you can configure concentration measurement:

- The concentration measurement application must be enabled on your transmitter.
- The concentration matrix you want to use must be available on your transmitter, or it must be available as a file on your computer.
- You must know the derived variable that your matrix is designed for.
- You must know the density unit used by your matrix.
- You must know the temperature unit used by your matrix.
- The concentration measurement application must be unlocked.

Procedure

1. Choose ProLink > Configuration > Density and set Density Units to the density unit used by your matrix.
2. Choose ProLink > Configuration > Temperature and set Temp Units to the temperature unit used by your matrix.
3. Choose ProLink > Configuration > CM Setup.

4. In Global Config, set Derived Variable to the derived variable that your matrix is designed for.

Important

- All concentration matrices on your transmitter must use the same derived variable. If you are using one of the standard matrices from Micro Motion, set Derived Variable to Mass Conc (Density). If you are using a custom matrix, see the reference information for your matrix.
- If you change the setting of Derived Variable, all existing concentration matrices will be deleted from transmitter memory. Set Derived Variable before loading concentration matrices.

---

5. Load one or more matrices.

   a. In Curve Specific Config, set Curve Configured to the location to which the matrix will be loaded.

   b. Click Load this curve from a file, navigate to the matrix file on your PC, and load it.

   c. Repeat until all required matrices are loaded.

6. Set up extrapolation alarms.

   Each concentration matrix is built for a specific density range and a specific temperature range. If process density or process temperature goes outside the range, the transmitter will extrapolate concentration values. However, extrapolation may affect accuracy. Extrapolation alarms are used to notify the operator that extrapolation is occurring.

   a. In Curve Specific Config, set Curve Configured to the matrix that you want to configure.

   b. Set Alarm Limit to the point, in percent, at which an extrapolation alarm will be posted.

   Example: If Alarm Limit is set to 5%, Enable Temp High is checked, and the matrix is built for a temperature range of 40 °F to 80 °F, an extrapolation alarm will be posted if process temperature goes above 82 °F

7. Select the label that will be used for the concentration unit.

   a. In Curve Specific Config, set Curve Configured to the matrix that you want to configure.

   b. Select the desired label from the Units list.

   c. If you set Units to Special, enter the custom label.

8. Determine how the transmitter will obtain temperature data for the concentration measurement calculations, and perform the required setup.

Option	Setup
Temperature data from the sensor	a. Choose View > Preferences . b. Disable Use External Temperature.

Option	Setup
A user-configured static temperature value	a. Choose View > Preferences . b. Enable Use External Temperature. c. Choose ProLink > Configuration > Temperature. d. Set External Temperature to the value to be used.
Polling for temperature(6)	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose View > Preferences . c. Enable Use External Temperature. d. Choose ProLink > Configuration > Polled Variables. e. Choose an unused polling slot. f. Set Polling Control to Poll As Primary or Poll as Secondary, and click Apply. g. Set External Tag to the HART tag of the external temperature device. h. Set Variable Type to External Temperature. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Choose View > Preferences . b. Enable Use External Temperature. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

9. In Global Config, set Active Curve to the matrix to be used for process measurement.

Concentration process variables are now available on the transmitter. You can view and report them in the same way that you view and report other process variables.

4.8.2 Configure concentration measurement using the Field Communicator

This task guides you through setting up a concentration matrix to use for measurement. It does not cover loading or building a concentration matrix.

Note

Concentration matrices can be made available on your transmitter either by loading an existing matrix from a file or by building a new matrix. Up to six matrices can be available on your transmitter, but only one can be used for measurement at any given time. See *Micro Motion Enhanced Density Application: Theory, Configuration, and Use* for detailed information on building a matrix.

(6) *Not available on all transmitters.*

Prerequisites

Before you can configure concentration measurement:

- The concentration measurement application must be enabled on your transmitter.
- You must know the derived variable that your matrix is designed for.
- You must know the density unit used by your matrix.
- You must know the temperature unit used by your matrix.
- The concentration measurement application must be unlocked.

Procedure

1. Choose Online > Configure > Manual Setup > Measurements > Density and set Density Unit to match the density unit used by your matrix.
2. Choose Online > Configure > Manual Setup > Measurements > Temperature and set Temperature Unit to match the temperature unit used by your matrix.
3. Choose Online > Configure > Manual Setup > Measurements > Conc Measurement (CM) > CM Configuration.
4. Set up extrapolation alerts.

   Each concentration matrix is built for a specific density range and a specific temperature range. If process density or process temperature goes outside the range, the transmitter will extrapolate concentration values. However, extrapolation may affect accuracy. Extrapolation alerts are used to notify the operator that extrapolation is occurring.

   a. Choose Online > Configure > Manual Setup > Measurements > Conc Measurement (CM) > Matrix Configuration.
   b. Set Matrix Being Configured to the matrix that you want to configure.
   c. Set Extrapolation Alert Limit to the point, in percent, at which an extrapolation alert will be posted.
   d. Choose Online > Configure > Alert Setup > CM Alerts.

   Example: If Alarm Limit is set to 5%, the high-temperature extrapolation alert is enabled, and the matrix is built for a temperature range of 40 °F to 80 °F, an extrapolation alarm will be posted if process temperature goes above 82 °F

5. Select the label that will be used for the concentration unit.

   a. Choose Online > Configure > Manual Setup > Measurements > Conc Measurement (CM) > Matrix Configuration.
   b. Set Matrix Being Configured to the matrix that you want to configure.
   c. Set Concentration Units to the desired label.
   d. If you set Units to Special, enter the custom label.
6. Determine how the transmitter will obtain temperature data for the concentration measurement calculations, and perform the required setup.

Option	Setup
Temperature data from the sensor	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Disable External Temperature.
A user-configured static temperature value	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Enable External Temperature. c. Set Correction Temperature to the value to be used.
Polling for temperature(7)	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. c. Enable External Temperature. d. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > External Polling. e. Set Poll Control to Poll As Primary Host or Poll as Secondary Host. f. Choose an unused polling slot. g. Set External Tag to the HART tag of the external temperature device. h. Set Polled Variable to Temperature. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Temperature. b. Enable External Temperature. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

7. Online > Configure > Manual Setup > Measurements > Conc Measurement (CM) > CM Configuration and set Active Matrix to the matrix to be used for measurement.

Concentration process variables are now available on the transmitter. You can view and report them in the same way that you view and report other process variables.

4.8.3 Standard matrices for the concentration measurement application

The standard concentration matrices available from Micro Motion are applicable for a variety of process fluids.

(7) *Not available on all transmitters.*

See *Table 4-12* for a list of the standard concentration matrices available from Micro Motion, along with the density and temperature measurement units used in calculation, and the unit used to report concentration data.

Tip

If the standard matrices are not appropriate for your application, you can build a custom matrix or purchase a custom matrix from Micro Motion.

Table 4-12: Standard concentration matrices and associated measurement units

Matrix name	Description	Density unit	Temperature unit	Concentration unit
Deg Balling	Matrix represents percent extract, by mass, in solution, based on °Balling. For example, if a wort is 10 °Balling and the extract in solution is 100% sucrose, the extract is 10% of the total mass.	g/cm³	°F	°Balling
Deg Brix	Matrix represents a hydrometer scale for sucrose solutions that indicates the percent by mass of sucrose in solution at a given temperature. For example, 40 kg of sucrose mixed with 60 kg of water results in a 40 °Brix solution.	g/cm³	°C	°Brix
Deg Plato	Matrix represents percent extract, by mass, in solution, based on °Plato. For example, if a wort is 10 °Plato and the extract in solution is 100% sucrose, the extract is 10% of the total mass.	g/cm³	°F	°Plato
HFCS 42	Matrix represents a hydrometer scale for HFCS 42 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm³	°C	%
HFCS 55	Matrix represents a hydrometer scale for HFCS 55 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm³	°C	%
HFCS 90	Matrix represents a hydrometer scale for HFCS 90 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm³	°C	%

4.8.4 Derived variables and calculated process variables

For each derived variable, the concentration measurement application calculates a different set of process variables.

Table 4-13: Derived variables and calculated process variables

Derived Variable	**Description**	**Calculated process variables**					
		Density at reference tempera-ture	**Standard volume flow rate**	**Specific gravity**	**Concen-tration**	**Net mass flow rate**	**Net vol-ume flow rate**
Density at reference temperature	Mass/unit volume, cor-rected to a given refer-ence temperature	✓	✓				
Specific gravity	The ratio of the density of a process fluid at a given temperature to the density of water at a given temperature. The two given temper-ature conditions do not need to be the same.	✓	✓	✓			
Mass concentration derived from refer-ence density	The percent mass of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓	✓	
Mass concentration derived from specif-ic gravity	The percent mass of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓	✓	
Volume concentra-tion derived from reference density	The percent volume of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓		✓
Volume concentra-tion derived from specific gravity	The percent volume of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓		✓
Concentration de-rived from reference density	The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the to-tal solution, derived from reference density	✓	✓		✓		

Table 4-13: Derived variables and calculated process variables *(continued)*

Derived Variable	Description	Calculated process variables					
		Density at reference temperature	**Standard volume flow rate**	**Specific gravity**	**Concentration**	**Net mass flow rate**	**Net volume flow rate**
Concentration derived from specific gravity	The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the total solution, derived from specific gravity	✓	✓	✓	✓		

4.9 Configure pressure compensation

Pressure compensation adjusts process measurement to compensate for the pressure effect on the sensor. The pressure effect is the change in the sensor's sensitivity to flow and density caused by the difference between the calibration pressure and the process pressure.

Tip

Not all sensors or applications require pressure compensation. The pressure effect for a specific sensor model can be found in the product data sheet located at www.micromotion.com. If you are uncertain about implementing pressure compensation, contact Micro Motion customer service.

4.9.1 Configure pressure compensation using ProLink II

Prerequisites

You will need the flow factor, density factor, and calibration pressure values for your sensor.

- For the flow factor and density factor, see the product data sheet for your sensor.
- For the calibration pressure, see the calibration sheet for your sensor. If the data is unavailable, use 20 PSI.

Procedure

1. Choose View > Preferences and ensure that Enable External Pressure Compensation is checked.
2. Choose ProLink > Configuration > Pressure.
3. Enter Flow Factor for your sensor.

The flow factor is the percent change in the flow rate per PSI. When entering the value, reverse the sign.

Example:

If the flow factor is 0.000004 % per PSI, enter −0.000004 % per PSI.

4. Enter Density Factor for your sensor.

   The density factor is the change in fluid density, in g/cm^3/PSI. When entering the value, reverse the sign.

   Example:

   If the density factor is 0.000006 g/cm^3/PSI, enter −0.000006 g/cm3/PSI.

5. Enter Cal Pressure for your sensor.

   The calibration pressure is the pressure at which your sensor was calibrated, and defines the pressure at which there is no pressure effect. If the data is unavailable, enter 20 PSI.

6. Determine how the transmitter will obtain pressure data, and perform the required setup.

Option	Setup
A user-configured static pressure value	a. Set Pressure Units to the desired unit. b. Set External Pressure to the desired value.
Polling for pressure(8)	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose ProLink > Configuration > Polled Variables. c. Choose an unused polling slot. d. Set Polling Control to Poll As Primary or Poll as Secondary, and click Apply. e. Set External Tag to the HART tag of the external pressure device. f. Set Variable Type to Pressure. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Set Pressure Units to the desired unit. b. Perform the necessary host programming and communications setup to write pressure data to the transmitter at appropriate intervals.

(8) *Not available on all transmitters.*

Postrequisites

If you are receiving pressure data over the mA input, ensure that the mA input is configured for your application.

If you are using an external pressure value, verify the setup by choosing ProLink > Process Variables and checking the value displayed in External Pressure.

4.9.2 Configure pressure compensation using the Field Communicator

Prerequisites

You will need the flow factor, density factor, and calibration pressure values for your sensor.

- For the flow factor and density factor, see the product data sheet for your sensor.
- For the calibration pressure, see the calibration sheet for your sensor. If the data is unavailable, use 20 PSI.

Procedure

1. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > Pressure.
2. Set Pressure Compensation to Enabled.
3. Enter Flow Cal Pressure for your sensor.

   The calibration pressure is the pressure at which your sensor was calibrated, and defines the pressure at which there is no pressure effect. If the data is unavailable, enter 20 PSI.
4. Enter Flow Press Factor for your sensor.

   The flow factor is the percent change in the flow rate per PSI. When entering the value, reverse the sign.

   Example:

   If the flow factor is 0.000004 % per PSI, enter −0.000004 % per PSI.

5. Enter Dens Press Factor for your sensor.

   The density factor is the change in fluid density, in g/cm^3/PSI. When entering the value, reverse the sign.

   Example:

   If the density factor is 0.000006 g/cm^3/PSI, enter −0.000006 g/cm3/PSI.

6. Determine how the transmitter will obtain pressure data, and perform the required setup.

Option	Setup
A user-configured static pressure value	a. Set Pressure Unit to the desired unit. b. Set Compensation Pressure to the desired value.
Polling for pressure[9]	a. Ensure that the primary mA output has been wired to support HART polling. b. Choose Online > Configure > Manual Setup > Measurements > External Pressure/Temperature > External Polling. c. Set Poll Control to Poll As Primary Host or Poll as Secondary Host. d. Choose an unused polling slot. e. Set External Tag to the HART tag of the external pressure device. f. Set Polled Variable to Pressure. **Tip** • Poll as Primary: No other HART masters will be on the network. • Poll as Secondary: Other HART masters will be on the network. The Field Communicator is not a HART master.
A value written by digital communications	a. Set Pressure Unit to the desired unit. b. Perform the necessary host programming and communications setup to write pressure data to the transmitter at appropriate intervals.

Postrequisites

If you are receiving pressure data over the mA input, ensure that the mA input is configured for your application.

If you are using an external pressure value, verify the setup by choosing Service Tools > Variables > External Variables and checking the value displayed for External Pressure.

4.9.3 Options for Pressure Measurement Unit

The transmitter provides a standard set of measurement units for Pressure Measurement Unit. Different communications tools may use different labels for the units. In most applications, Pressure Measurement Unit should be set to match the pressure measurement unit used by the remote device.

Table 4-14: Options for Pressure Measurement Unit

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Feet water @ 68 °F	FTH2O	Ft Water @ 68°F	Ft Water @ 68°F	ftH2O

(9) *Not available on all transmitters.*

Table 4-14: Options for Pressure Measurement Unit *(continued)*

Unit description	Label			
	Display	ProLink II	ProLink III	Field Communicator
Inches water @ 4 °C	INW4C	In Water @ 4°C	In Water @ 4°C	inH2O @4DegC
Inches water @ 60 °F	INW60	In Water @ 60°F	In Water @ 60°F	inH2O @60DegF
Inches water @ 68 °F	INH2O	In Water @ 68°F	In Water @ 68°F	inH2O
Millimeters water @ 4 °C	mmW4C	mm Water @ 4°C	mm Water @ 4°C	mmH2O @4DegC
Millimeters water @ 68 °F	mmH2O	mm Water @ 68°F	mm Water @ 68°F	mmH2O
Millimeters mercury @ 0 °C	mmHG	mm Mercury @ 0°C	mm Mercury @ 0°C	mmHg
Inches mercury @ 0 °C	INHG	In Mercury @ 0°C	In Mercury @ 0°C	inHG
Pounds per square inch	PSI	PSI	PSI	psi
Bar	BAR	bar	bar	bar
Millibar	mBAR	millibar	millibar	mbar
Grams per square centimeter	G/SCM	g/cm2	g/cm2	g/Sqcm
Kilograms per square centimeter	KG/SCM	kg/cm2	kg/cm2	kg/Sqcm
Pascals	PA	pascals	pascals	Pa
Kilopascals	KPA	Kilopascals	Kilopascals	kPa
Megapascals	MPA	megapascals	Megapascals	MPa
Torr @ 0 °C	TORR	Torr @ 0°C	Torr @ 0°C	torr
Atmospheres	ATM	atms	atms	atms

5 Configure device options and preferences

Topics covered in this chapter:

- *Configure the transmitter display*
- *Enable or disable operator actions from the display*
- *Configure security for the display menus*
- *Configure response time parameters*
- *Configure alarm handling*
- *Configure informational parameters*

5.1 Configure the transmitter display

You can control the process variables shown on the display and a variety of display behaviors.

The transmitter display parameters include:

- Display Language
- Display Variables
- Display Precision
- Update Period
- Auto Scroll and Auto Scroll Rate
- Backlight

5.1.1 Configure the language used for the display

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > LANG
ProLink II	ProLink > Configuration > Display > Display Language
Field Communicator	*Not available*

Overview

Display Language controls the language used for process data and menus on the display.

Procedure

Select the language you want to use.

The languages available depend on your transmitter model and version.

5.1.2 Configure the process variables shown on the display

Display	*Not available*
ProLink II	ProLink > Configuration > Display > Display Var X
Field Communicator	Configure > Manual Setup > Display > Display Variables

Overview

You can control the process variables shown on the display and the order in which they appear. The display can scroll through up to 15 process variables in any order you choose. In addition, you can repeat variables or leave slots unassigned.

Note

If you configure a display variable as a volume process variable and then change Volume Flow Type, the display variable is automatically changed to the equivalent process variable. For example, Volume Flow Rate would be changed to Gas Standard Volume Flow Rate.

Procedure

For each display variable you want to change, assign the process variable you want to use.

Example: Default display variable configuration

Display variable	Process variable assignment
Display Variable 1	Mass flow
Display Variable 2	Mass total
Display Variable 3	Volume flow
Display Variable 4	Volume total
Display Variable 5	Density
Display Variable 6	Temperature
Display Variable 7	External pressure
Display Variable 8	Mass flow
Display Variable 9	None
Display Variable 10	None
Display Variable 11	None
Display Variable 12	None
Display Variable 13	None
Display Variable 14	None
Display Variable 15	None

Configure Display Variable 1 to track the primary mA output

You can configure Display Variable 1 to track mA Output Process Variable for the primary mA output. When tracking is enabled, you can control Display Variable 1 from the display menu.

Tip
This feature is the only way to configure a display variable from the display menus, and it applies only to Display Variable 1.

Procedure

Configure Display Variable 1 to track the primary mA output.

Display Variable 1 will automatically be set to match mA Output Process Variable for the primary mA output. If you change the configuration of mA Output Process Variable, Display Variable 1 will be updated automatically.

5.1.3 Configure the precision of variables shown on the display

Display	*Not available*
ProLink II	ProLink > Configuration > Display > Display Precision
Field Communicator	Configure > Manual Setup > Display > Decimal Places > For Process Variables

Overview

Setting Display Precision determines the precision (number of decimal places) shown on the display. You can set Display Precision independently for each variable.
Setting Display Precision does not affect the actual value of the process variable.

Procedure

1. Select a process variable.
2. Set Display Precision to the number of decimal places you want shown when the process variable appears on the display.

   For temperature and density process variables, the default value is 2 decimal places. For all other process variables, the default value is 4 decimal places. The range is 0 to 5.

   Tip
   The lower the selected precision, the greater the process change must be for it to be reflected on the display. Do not set Display Precision value too low or too high to be useful.

5.1.4 Configure the refresh rate of data shown on the display

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > RATE
ProLink II	ProLink > Configuration > Display > Display Options > Update Period
Field Communicator	Configure > Manual Setup > Display > Update Period

Overview

You can set Update Period to control how frequently data is refreshed on the display.

Procedure

Set Update Period to the desired value.

The default value is 200 milliseconds. The range is 100 milliseconds to 10,000 milliseconds (10 seconds).

5.1.5 Enable or disable automatic scrolling through the display variables

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > AUTO SCRLL
ProLink II	ProLink > Configuration > Display > Display Options > Display Auto Scroll
Field Communicator	*Not available*

Overview

You can configure the display to automatically scroll through the configured display variables or to show a single display variable until the operator activates Scroll. When you set automatic scrolling, you can also configure the length of time each display variable is displayed.

Procedure

1. Enable or disable Auto Scroll as desired.

Option	Description
Enabled	The display automatically scrolls through each display variable as specified by Scroll Rate. The operator can move to the next display variable at any time using Scroll.
Disabled **(default)**	The display shows Display Variable 1 and does not scroll automatically. The operator can move to the next display variable at any time using Scroll.

2. If you enabled Auto Scroll, set Scroll Rate as desired.

   The default value is 10 seconds.

Tip
Scroll Rate may not be available until you apply Auto Scroll.

5.1.6 Enable or disable the display backlight

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > BKLT
ProLink II	ProLink > Configuration > Display > Display Options > Display Backlight On/Off
Field Communicator	*Not available*

Overview

You can enable or disable the display backlight.

Procedure

Enable or disable Backlight.

The default setting is Enabled.

5.1.7 Enable or disable Status LED Blinking

Display	*Not available*
ProLink II	ProLink > Configuration > Display > Display Options > Display Status LED Blinking
Field Communicator	*Not available*

Overview

By default, the status LED blinks (flashes) to indicate unacknowledged alarms. If you disable Status LED Blinking, the status LED does not blink, whether alarms are acknowledged or not. It still changes color to indicate active alarms.

Procedure

Enable or disable Status LED Blinking.

The default setting is Enabled.

5.2 Enable or disable operator actions from the display

You can configure the transmitter to let the operator perform specific actions using the display.

You can configure the following:

- Totalizer Start/Stop
- Totalizer Reset
- Acknowledge All Alarms

5.2.1 Enable or disable Totalizer Start/Stop from the display

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > TOTALS STOP
ProLink II	ProLink > Configuration > Display > Display Options > Display Start/Stop Totalizers
Field Communicator	*Not available*

Overview

You can control whether or not the operator is able to start and stop totalizers and inventories from the display.

Restrictions

- You cannot start and stop totalizers individually from the display. All totalizers are started or stopped together.
- You cannot start or stop inventories separately from totalizers. When a totalizer is started or stopped, the associated inventory is also started or stopped.
- If the petroleum measurement application is installed on your computer, the operator must enter the off-line password to perform this function, even if the off-line password is not enabled.

Procedure

1. Ensure that at least one totalizer is configured as a display variable.
2. Enable or disable Totalizer Reset as desired.

Option	Description
Enabled	Operators can start and stop totalizers and inventories from the display, if at least one totalizer is configured as a display variable.
Disabled **(default)**	Operators cannot start and stop totalizers and inventories from the display.

5.2.2 Enable or disable Totalizer Reset from the display

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > TOTALS RESET
ProLink II	ProLink > Configuration > Display > Display Options > Display Totalizer Reset
Field Communicator	*Not available*

Overview

You can configure whether or not the operator is able to reset totalizers from the display.

Restrictions

- This parameter does not apply to inventories. You cannot reset inventories from the display.
- You cannot use the display to reset all totalizers as a group. You must reset totalizers individually.
- If the petroleum measurement application is installed on your computer, the operator must enter the off-line password to perform this function, even if the off-line password is not enabled.

Procedure

1. Ensure that the totalizers you want to reset have been configured as display variables.

   If the totalizer is not configured as a display variable, the operator will not be able to reset it.

2. Enable or disable resetting the totalizer as desired.

Option	Description
Enabled	Operators can reset a totalizer from the display, if the totalizer is configured as a display variable.
Disabled **(default)**	Operators cannot reset totalizers from the display.

5.2.3 Enable or disable the Acknowledge All Alarms display command

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > ALARM
ProLink II	ProLink > Configuration > Display > Display Options > Display Ack All Alarms
Field Communicator	*Not available*

Overview

You can configure whether or not the operator can use a single command to acknowledge all alarms from the display.

Procedure

1. Ensure that the alarm menu is accessible from the display.

   To acknowledge alarms from the display, operators must have access to the alarm menu.

2. Enable or disable Acknowledge All Alarms as desired.

Option	Description
Enabled **(default)**	Operators can use a single display command to acknowledge all alarms at once.
Disabled	Operators cannot acknowledge all alarms at once, they must be acknowledged individually.

5.3 Configure security for the display menus

Display	OFF-LINE MAINT > OFF-LINE CONFG > DISPLAY > OFFLN
ProLink II	ProLink > Configuration > Display > Display Options > Display Offline Menu
Field Communicator	*Not available*

Overview

You can control operator access to different sections of the display off-line menu. You can also configure a password to control access.

Procedure

1. To control operator access to the maintenance section of the off-line menu, enable or disable Off-Line Menu.

Option	Description
Enabled **(default)**	Operator can access the maintenance section of the off-line menu. This access is required for configuration and calibration, but is not required to view alarms or to access Smart Meter Verification (if applicable).
Disabled	Operator cannot access the maintenance section of the off-line menu.

2. To control operator access to the alarm menu, enable or disable Alarm Menu.

Option	Description
Enabled **(default)**	Operator can access the alarm menu. This access is required to view and acknowledge alarms, but is not required for Smart Meter Verification (if applicable), configuration, or calibration.
Disabled	Operator cannot access the alarm menu.

Note
The transmitter status LED changes color to indicate that there are active alarms, but does not show specific alarms.

3. To require a password for access to the maintenance section of the off-line menu and the Smart Meter Verification menu, enable or disable Off-Line Password.

Option	Description
Enabled	Operator is prompted for the off-line password at entry to the Smart Meter Verification menu (if applicable) or entry to the maintenance section of the off-line menu.
Disabled **(default)**	No password is required for entry to the Smart Meter Verification menu (if applicable) or entry to the maintenance section of the off-line menu.

4. To require a password to access the alarm menu, enable or disable Alarm Password.

Option	Description
Enabled	Operator is prompted for the off-line password at entry to the alarm menu.
Disabled **(default)**	No password is required for entry to the alarm menu.

If both Off-Line Password and Alarm Password are enabled, the operator is prompted for the off-line password to access the off-line menu, but is not prompted thereafter.

5. (Optional) Set Off-Line Password to the desired value.

The same value is used for both the off-line password and the alarm password. The default value is 1234. The range is 0000 to 9999.

Tip
Record your password for future reference.

5.4 Configure response time parameters

You can configure the rate at which process data is polled and process variables are calculated.

Response time parameters include:

- Update Rate
- Calculation Speed (Response Time)

5.4.1 Configure Update Rate

Display	Not available
ProLink II	ProLink > Configuration > Device > Update Rate
Field Communicator	Not available

Overview

Update Rate controls the rate at which process data is polled and process variables are calculated. Update Rate = Special produces faster and "noisier" response to changes in the process. Do not use Special mode unless required by your application.

Prerequisites

Before setting Update Rate to Special:

- Check the effects of Special mode on specific process variables.
- Contact Micro Motion.

Procedure

Set Update Rate as desired.

Option	Description
Normal	All process data is polled at the rate of 20 times per second (20 Hz). All process variables are calculated at 20 Hz. This option is appropriate for most applications.
Special	A single, user-specified process variable is polled at the rate of 100 times per second (100 Hz). Other process data is polled at 6.25 Hz). Some process, diagnostic, and calibration data is not polled. All available process variables are calculated at 100 Hz. Use this option only if required by your application.

If you change Update Rate, the settings for Flow Damping, Density Damping, and Temperature Damping are automatically adjusted.

Effects of Update Rate = Special

Incompatible features and functions

Special mode is not compatible with the following features and functions:

- Enhanced events. Use basic events instead.
- All calibration procedures.
- Zero verification.
- Restoring the factory zero or the prior zero.

If required, you can switch to Normal mode, perform the desired procedures, and then return to Special mode.

Process variable updates

Some process variables are not updated when Special mode is enabled.

Table 5-1: Special mode and process variable updates

Always polled and updated	Updated only when the petroleum measurement application is disabled	Never updated
• Mass flow • Volume flow • Gas standard volume flow • Density • Temperature • Drive gain • LPO amplitude • Status [contains Event 1 and Event 2 (basic events)] • Raw tube frequency • Mass total • Volume total • Gas standard volume total • Temperature-corrected volume total • Temperature-corrected density • Temperature-corrected volume flow • Batch-weighted average temperature • Batch-weighted average density	• RPO amplitude • Board temperature • Core input voltage • Mass inventory • Volume inventory • Gas standard volume inventory	All other process variables and calibration data. They retain the values held at the time you enabled Special mode.

5.5 Configure alarm handling

The alarm handling parameters control the transmitter's response to process and device conditions.

Alarm handling parameters include:

- Fault Timeout
- Status Alarm Severity

5.5.1 Configure Fault Timeout

Display	*Not available*
ProLink II	ProLink > Configuration > Alarm > Alarm
Field Communicator	Configure > Alert Setup > Alert Severity > Fault Timeout

Overview

Fault Timeout controls the delay before fault actions are performed.

Restriction

Fault Timeout is applied only to the following alarms (listed by Status Alarm Code): A003, A004, A005, A008, A016, A017, A033. For all other alarms, fault actions are performed as soon as the alarm is detected.

Procedure

Set Fault Timeout as desired.

The default value is 0 seconds. The range is 0 to 60 seconds.

If you set Fault Timeout to 0, fault actions are performed as soon as the alarm condition is detected.

The fault timeout period begins when the transmitter detects an alarm condition. During the fault timeout period, the transmitter continues to report its last valid measurements.

If the fault timeout period expires while the alarm is still active, the fault actions are performed. If the alarm condition clears before the fault timeout expires, no fault actions are performed.

Tip

ProLink II allows you to set Fault Timeout in two locations. However, there is only one parameter, and the same setting is applied to all outputs.

5.5.2 Configure Status Alarm Severity

Display	*Not available*
ProLink II	ProLink > Configuration > Alarm > Severity
Field Communicator	Configure > Alert Setup > Alert Severity > Set Alert Severity

Overview

Use Status Alarm Severity to control the fault actions that the transmitter performs when it detects an alarm condition.

Restrictions

- For some alarms, Status Alarm Severity is not configurable.
- For some alarms, Status Alarm Severity can be set only to two of the three options.

Tip

Micro Motion recommends using the default settings for Status Alarm Severity unless you have a specific requirement to change them.

Procedure

1. Select a status alarm.
2. For the selected status alarm, set Status Alarm Severity as desired.

Option	Description
Fault	Actions when fault is detected: • The alarm is posted to the Alert List. • Outputs go to the configured fault action (after Fault Timeout has expired, if applicable). • Digital communications go to the configured fault action (after Fault Timeout has expired, if applicable). • The status LED (if available) changes to red or yellow (depending on alarm severity). Actions when alarm clears: • Outputs return to normal behavior. • Digital communications return to normal behavior. • The status LED (if available) returns to green and may or may not flash.
Informational	Actions when fault is detected: • The alarm is posted to the Alert List. • The status LED (if available) changes to red or yellow (depending on alarm severity). Actions when alarm clears: • The status LED (if available) returns to green and may or may not flash.
Ignore	No action

Status alarms and options for Status Alarm Severity

Table 5-2: Status alarms and Status Alarm Severity

Alarm code	Status message	Default severity	Notes	Configurable?
A001	EEPROM Error (Core Processor)	Fault		No
A002	RAM Error (Core Processor)	Fault		No
A003	No Sensor Response	Fault		Yes
A004	Temperature Overrange	Fault		No
A005	Mass Flow Rate Overrange	Fault		Yes
A006	Characterization Required	Fault		Yes
A008	Density Overrange	Fault		Yes
A009	Transmitter Initializing/ Warming Up	Fault		Yes
A010	Calibration Failure	Fault		No

Table 5-2: Status alarms and Status Alarm Severity *(continued)*

Alarm code	Status message	Default severity	Notes	Configurable?
A011	Zero Calibration Failed: Low	Fault		Yes
A012	Zero Calibration Failed: High	Fault		Yes
A013	Zero Calibration Failed: Unstable	Fault		Yes
A014	Transmitter Failure	Fault		No
A016	Sensor RTD Failure	Fault		Yes
A017	T-Series RTD Failure	Fault		Yes
A020	No Flow Cal Value	Fault		Yes
A021	Incorrect Sensor Type (K1)	Fault		No
A102	Drive Overrange	Informational		Yes
A104	Calibration in Progress	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A105	Slug Flow	Informational		Yes
A107	Power Reset Occurred	Informational	Normal transmitter behavior; occurs after every power cycle.	Yes
A113	mA Output 2 Saturated	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A114	mA Output 2 Fixed	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A116	Temperature Overrange (Petroleum)	Informational	Applies only to transmitters with the petroleum measurement application.	Yes
A117	Density Overrange (Petroleum)	Informational	Applies only to transmitters with the petroleum measurement application.	Yes
A120	Curve Fit Failure (Concentration)	Informational	Applies only to transmitters with the concentration measurement application.	No
A121	Extrapolation Alarm (Concentration)	Informational	Applies only to transmitters with the concentration measurement application.	Yes
A132	Sensor Simulation Active	Informational	Applies only to flowmeters with the enhanced core processor. Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes

5.6 Configure informational parameters

The informational parameters can be used to identify or describe your flowmeter but they are not used in transmitter processing and are not required.

The informational parameters include:

- Device parameters
  - Descriptor
  - Message
  - Date
- Sensor parameters
  - Sensor Serial Number
  - Sensor Material
  - Sensor Liner Material
  - Sensor Flange Type

5.6.1 Configure Descriptor

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Descriptor
Field Communicator	Configure > Manual Setup > Info Parameters > Transmitter Info > Descriptor

Overview

Descriptor lets you store a description in transmitter memory. The description is not used in processing and is not required.

Procedure

Enter a description for the transmitter.

You can use up to 16 characters for the description.

5.6.2 Configure Message

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Message
Field Communicator	Configure > Manual Setup > Info Parameters > Transmitter Info > Message

Overview

Message lets you store a short message in transmitter memory. This parameter is not used in processing and is not required.

Procedure

Enter a short message for the transmitter.

Your message can be up to 32 characters long.

5.6.3 Configure Date

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Date
Field Communicator	Configure > Manual Setup > Info Parameters > Transmitter Info > Date

Overview

Date lets you store a static date (not updated by the transmitter) in transmitter memory. This parameter is not used in processing and is not required.

Procedure

Enter the date you want to use, in the form mm/dd/yyyy.

Tip
ProLink II and ProLink III provide a calendar tool to help you select the date.

5.6.4 Configure Sensor Serial Number

Display	*Not available*
ProLink II	ProLink > Configuration > Sensor > Sensor S/N
Field Communicator	Configure > Manual Setup > Info Parameters > Sensor Information > Transmitter Serial Number

Overview

Sensor Serial Number lets you store the serial number of the sensor component of your flowmeter in transmitter memory. This parameter is not used in processing and is not required.

Procedure

1. Obtain the sensor serial number from your sensor tag.
2. Enter the serial number in the Sensor Serial Number field.

5.6.5 Configure Sensor Material

Display	*Not available*
ProLink II	ProLink > Configuration > Sensor > Sensor Matl
Field Communicator	Configure > Manual Setup > Info Parameters > Sensor Information > Tube Wetted Material

Overview

Sensor Material lets you store the type of material used for your sensor's wetted parts in transmitter memory. This parameter is not used in processing and is not required.

Procedure

1. Obtain the material used for your sensor's wetted parts from the documents shipped with your sensor, or from a code in the sensor model number.

   To interpret the model number, refer to the product data sheet for your sensor.
2. Set Sensor Material to the appropriate option.

5.6.6 Configure Sensor Liner Material

Display	*Not available*
ProLink II	ProLink > Configuration > Sensor > Sensor Matl
Field Communicator	Configure > Manual Setup > Info Parameters > Sensor Information > Tube Lining

Overview

Sensor Liner Material lets you store the type of material used for your sensor liner in transmitter memory. This parameter is not used in processing and is not required.

Procedure

1. Obtain your sensor's liner material from the documents shipped with your sensor, or from a code in the sensor model number.

   To interpret the model number, refer to the product data sheet for your sensor.
2. Set Sensor Liner Material to the appropriate option.

5.6.7 Configure Sensor Flange Type

Display	*Not available*
ProLink II	ProLink > Configuration > Sensor > Flange
Field Communicator	Configure > Manual Setup > Info Parameters > Sensor Information > Sensor Flange

Overview

Sensor Flange Type lets you store your sensor's flange type in transmitter memory. This parameter is not used in processing and is not required.

Procedure

1. Obtain your sensor's flange type from the documents shipped with your sensor, or from a code in the sensor model number.

   To interpret the model number, refer to the product data sheet for your sensor.
2. Set Sensor Flange Type to the appropriate option.

6 Integrate the meter with the control system

Topics covered in this chapter:

- *Configure the mA output*
- *Configure the frequency output*
- *Configure the discrete output*
- *Configure the discrete input*
- *Configure the mA input*
- *Configure events*
- *Configure digital communications*
- *Set up polling for temperature*
- *Set up polling for pressure*

6.1 Configure the mA output

The mA output is used to report the configured process variable. The mA output parameters control how the process variable is reported. Your transmitter has two mA outputs.

The mA output parameters include:

- mA Output Process Variable
- Lower Range Value (LRV) and Upper Range Value (URV)
- AO Cutoff
- Added Damping
- AO Fault Action and AO Fault Value

Important
Whenever you change an mA output parameter, verify all other mA output parameters before returning the flowmeter to service. In some situations, the transmitter automatically loads a set of stored values, and these values may not be appropriate for your application.

6.1.1 Configure mA Output Process Variable

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > AO 1 > SRC OFF-LINE MAINT > OFF-LINE CONFG > IO > AO 2 > SRC
ProLink II	ProLink > Configuration > Analog Output > Primary/Secondary Output > PV/SV Is
Field Communicator	Configure > Manual Setup > Inputs/Outputs > mA Output 1 > Primary Variable Configure > Manual Setup > Inputs/Outputs > mA Output 2 > Secondary Variable

Overview

Use mA Output Process Variable to select the variable that is reported over the mA output.

Prerequisites

- If you plan to configure the output to report volume flow, ensure that you have set Volume Flow Type as desired: Liquid or Gas Standard Volume.
- If you plan to configure an output to report a concentration measurement process variable, ensure that the concentration measurement application is configured so that the desired variable is available.
- If you are using the HART variables, be aware that changing the configuration of mA Output Process Variable will change the configuration of the HART Primary Variable (PV) and/or the HART Secondary Variable (SV).

Procedure

Set mA Output Process Variable as desired.

Default settings are as follows:

- Primary mA output: Mass Flow Rate
- Secondary mA output: Density

Options for mA Output Process Variable

The transmitter provides a basic set of options for mA Output Process Variable, plus several application-specific options. Different communications tools may use different labels for the options.

Table 6-1: Options for mA Output Process Variable

Process variables	Label			
	Display	ProLink II	ProLink III	Field Communicator
Standard				
Mass flow rate	MFLOW	Mass Flow Rate	Mass Flow Rate	Mass flo
Volume flow rate	VFLOW	Volume Flow Rate	Volume Flow Rate	Vol flo

Table 6-1: Options for mA Output Process Variable *(continued)*

Process variables	Label			
	Display	**ProLink II**	**ProLink III**	**Field Communicator**
Gas standard volume flow rate	GSV F	Gas Std Vol Flow Rate	Gas Standard Volume Flow Rate	Gas vol flo
Temperature	TEMP	Temperature	Temperature	Temp
Density	DENS	Density	Density	Dens
External pressure	EXT P	External Pressure	External Pressure	External pres
External temperature	EXT T	External Temperature	External Temperature	External temp
Drive gain	DGAIN	Drive Gain	Drive Gain	Driv signl
Petroleum measurement				
Temperature-corrected density	TCDEN	API: Temp Corrected Density	Density at Reference Temperature	TC Dens
Temperature-corrected (standard) volume flow rate	TCVOL	API: Temp Corrected Volume Flow	Volume Flow Rate at Reference Temperature	TC Vol
Average corrected density	AVE D	API: Avg Density	Average Density	TC Avg Dens
Average temperature	AVE T	API: Avg Temperature	Average Temperature	TC Avg Temp
Concentration measurement				
Density at reference	RDENS	CM: Density @ Reference	Density at Reference Temperature	ED Dens at Ref
Specific gravity	SGU	CM: Density (Fixed SG units)	Density (Fixed SG Units)	ED Dens (SGU)
Standard volume flow rate	STD V	CM: Std Vol Flow Rate	Volume Flow Rate at Reference Temperature	ED Std Vol flo
Net mass flow rate	NET M	CM: Net Mass Flow Rate	Net Mass Flow Rate	ED Net Mass flo
Net volume flow rate	NET V	CM: Net Vol Flow Rate	Net Volume Flow Rate	ED Net Vol flo
Concentration	CONC	CM: Concentration	Concentration	ED Concentration
Baume	BAUME	CM: Density (Fixed Baume Units)	Baume	ED Dens (Baume)

6.1.2 Configure Lower Range Value (LRV) and Upper Range Value (URV)

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > AO 1/2 > 4 mA OFF-LINE MAINT > OFF-LINE CONFG > IO > AO 1/2 > 20 mA
ProLink II	ProLink > Configuration > Analog Output > Primary/Secondary Output > Lower Range Value ProLink > Configuration > Analog Output > Primary/Secondary Output > Upper Range Value
Field Communicator	Configure > Manual Setup > Inputs/Outputs > mA Output X > mA Output Settings > PV/SV LRV Configure > Manual Setup > Inputs/Outputs > mA Output X > mA Output Settings > PV/SV URV

Overview

The Lower Range Value (LRV) and Upper Range Value (URV) are used to scale the mA output, that is, to define the relationship between mA Output Process Variable and the mA output level.

Note

If you change LRV and URV from the factory default values, and you later change mA Output Process Variable, LRV and URV will not be reset to the default values. For example, if you set mA Output Process Variable to Mass Flow Rate and change the LRV and URV, then you set mA Output Process Variable to Density, and finally you change mA Output Process Variable back to Mass Flow Rate, LRV and URV for Mass Flow Rate are reset to the values that you configured.

Procedure

Set LRV and URV as desired.

- LRV is the value of mA Output Process Variable represented by an output of 0 or 4 mA. The default value for LRV depends on the setting of mA Output Process Variable. Enter LRV in the measurement units that are configured for mA Output Process Variable.
- URV is the value of mA Output Process Variable represented by an output of 20 mA. The default value for URV depends on the setting of mA Output Process Variable. Enter URV in the measurement units that are configured for mA Output Process Variable.

Tips

For best performance:

- Set LRV ≥ LSL (lower sensor limit).
- Set URV ≤ USL (upper sensor limit).
- Set these values so that the difference between URV and LRV is ≥ Min Span (minimum span).

Defining URV and LRV within the recommended values for Min Span, LSL, and USL ensures that the resolution of the mA output signal is within range of the bit precision of the D/A converter.

Note

You can set URV below LRV. For example, you can set URV to 50 and LRV to 100.

The mA output uses a range of 4–20 mA or 0–20 mA to represent mA Output Process Variable. Between LRV and URV, the mA output is linear with the process variable. If the process variable drops below LRV or rises above URV, the transmitter posts an output saturation alarm.

Default values for Lower Range Value (LRV) and Upper Range Value (URV)

Each option for mA Output Process Variable has its own LRV and URV. If you change the configuration of mA Output Process Variable, the corresponding LRV and URV are loaded and used.

Table 6-2: Default values for Lower Range Value (LRV) and Upper Range Value (URV)

Process variable	LRV	URV
All mass flow variables	–200.000 g/sec	200.000 g/sec
All liquid volume flow variables	–0.200 l/sec	0.200 l/sec
Gas standard volume flow	–423.78 SCFM	423.78 SCFM
Concentration	0%	100%
Baume	0	10
Specific gravity	0	10

6.1.3 Configure AO Cutoff

Display	*Not available*
ProLink II	ProLink > Configuration > Analog Output > Primary/Secondary Output > AO Cutoff
Field Communicator	Configure > Manual Setup > Inputs/Outputs > mA Output 1 > mA Output Settings > MAO Cutoff Configure > Manual Setup > Inputs/Outputs > mA Output 2 > mA Output Settings > MAO Cutoff

Overview

AO Cutoff (Analog Output Cutoff) specifies the lowest mass flow rate, volume flow rate, or gas standard volume flow rate that will be reported through the mA output. Any flow rates below AO Cutoff will be reported as 0.

Restriction

AO Cutoff is applied only if mA Output Process Variable is set to Mass Flow Rate, Volume Flow Rate, or Gas Standard Volume Flow Rate. If mA Output Process Variable is set to a different process variable, AO Cutoff is not configurable, and the transmitter does not implement the AO cutoff function.

Procedure

Set AO Cutoff as desired.

The default values for AO Cutoff are as follows:

- Primary mA output: 0.0 g/sec
- Secondary mA output: Not-A-Number

Tip

For most applications, the default value of AO Cutoff should be used. Contact Micro Motion customer service before changing AO Cutoff.

Interaction between AO Cutoff and process variable cutoffs

When mA Output Process Variable is set to a flow variable (for example, mass flow rate or volume flow rate), AO Cutoff interacts with Mass Flow Cutoff or Volume Flow Cutoff. The transmitter puts the cutoff into effect at the highest flow rate at which a cutoff is applicable.

Example: Cutoff interaction

Configuration:

- mA Output Process Variable = Mass Flow Rate
- Frequency Output Process Variable = Mass Flow Rate
- AO Cutoff = 10 g/sec
- Mass Flow Cutoff = 15 g/sec

Result: If the mass flow rate drops below 15 g/sec, all outputs representing mass flow will report zero flow.

Example: Cutoff interaction

Configuration:

- mA Output Process Variable = Mass Flow Rate
- Frequency Output Process Variable = Mass Flow Rate
- AO Cutoff = 15 g/sec
- Mass Flow Cutoff = 10 g/sec

Result:

- If the mass flow rate drops below 15 g/sec but not below 10 g/sec:
  - The mA output will report zero flow.
  - The frequency output will report the actual flow rate.
- If the mass flow rate drops below 10 g/sec, both outputs will report zero flow.

6.1.4 Configure Added Damping

Display	Not available
ProLink II	ProLink > Configuration > Analog Output > Primary/Secondary Output > AO Added Damp
Field Communicator	Configure > Manual Setup > Inputs/Outputs > mA Output 1 > mA Output Settings > PV Added Damping Configure > Manual Setup > Inputs/Outputs > mA Output 2 > mA Output Settings > PV Added Damping

Overview

Damping is used to smooth out small, rapid fluctuations in process measurement. Damping Value specifies the time period (in seconds) over which the transmitter will spread changes in the reported process variable. At the end of the interval, the reported process variable will reflect 63% of the change in the actual measured value. Added Damping controls the amount of damping that will be applied to the mA output. It affects the reporting of mA Output Process Variable through the mA output only. It does not affect the reporting of that process variable via any other method (e.g., the frequency output or digital communications), or the value of the process variable used in calculations.

Note

Added Damping is not applied if the mA output is fixed (for example, during loop testing) or if the mA output is reporting a fault. Added Damping is applied while sensor simulation is active.

Procedure

Set Added Damping to the desired value.

The default value is 0.0 seconds.

When you specify a value for Added Damping, the transmitter automatically rounds the value down to the nearest valid value.

Table 6-3: Valid values for Added Damping

Valid values for Added Damping
0.0, 0.1, 0.3, 0.75, 1.6, 3.3, 6.5, 13.5, 27.5, 55, 110, 220, 440

Interaction between Added Damping and process variable damping

When mA Output Process Variable is set to a flow variable, density, or temperature, Added Damping interacts with Flow Damping, Density Damping, or Temperature Damping. If multiple damping parameters are applicable, the effect of damping the process variable is calculated first, and the added damping calculation is applied to the result of that calculation.

Example: Damping interaction

Configuration:

- Flow Damping = 1 second
- mA Output Process Variable = Mass Flow Rate
- Added Damping = 2 seconds

Result: A change in the mass flow rate will be reflected in the mA output over a time period that is greater than 3 seconds. The exact time period is calculated by the transmitter according to internal algorithms which are not configurable.

6.1.5 Configure mA Output Fault Action and mA Output Fault Level

Display	*Not available*
ProLink II	ProLink > Configuration > Analog Output > Primary/Secondary Output > AO Fault Action ProLink > Configuration > Analog Output > Primary Output > AO Fault Level
Field Communicator	Configure > Manual Setup > Inputs/Outputs > mA Output 1 > MA01 Fault Settings Configure > Manual Setup > Inputs/Outputs > mA Output 2 > MA02 Fault Settings

Overview

mA Output Fault Action controls the behavior of the mA output if the transmitter encounters an internal fault condition.

Note
For some faults only: If Last Measured Value Timeout is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

Procedure

1. Set mA Output Fault Action to the desired value.

   The default setting is Downscale.
2. If you set mA Output Fault Action to Upscale or Downscale, set mA Output Fault Level as desired.

Options for mA Output Fault Action and mA Output Fault Level

Table 6-4: Options for mA Output Fault Action and mA Output Fault Level

Option	mA output behavior	mA Output Fault Level
Upscale	Goes to the configured fault level	Default: 22.0 mA Range: 21 to 24 mA
Downscale (default)	Goes to the configured fault level	Default: 2.0 mA Range: 1.0 to 3.6 mA
Internal Zero	Goes to the mA output level associated with a process variable value of 0 (zero), as determined by Lower Range Value and Upper Range Value settings	Not applicable
None	Tracks data for the assigned process variable; no fault action	Not applicable

⚠ **CAUTION!**

If you set mA Output Fault Action **or** Frequency Output Fault Action **to** None**, be sure to set** Digital Communications Fault Action **to** None**. If you do not, the output will not report actual process data, and this may result in measurement errors or unintended consequences for your process.**

Restriction

If you set Digital Communications Fault Action to NAN, you cannot set mA Output Fault Action or Frequency Output Fault Action to None. If you try to do this, the transmitter will not accept the configuration.

6.2 Configure the frequency output

The frequency output is used to report a process variable. The frequency output parameters control how the process variable is reported.

The frequency output parameters include:

- Frequency Output Process Variable
- Frequency Output Polarity
- Frequency Output Scaling Method
- Frequency Output Maximum Pulse Width
- Frequency Output Fault Action and Frequency Output Fault Value
- Frequency Output Power Source

Important
Whenever you change a frequency output parameter, verify all other frequency output parameters before returning the flowmeter to service. In some situations, the transmitter automatically loads a set of stored values, and these values may not be appropriate for your application.

6.2.1 Configure Frequency Output Power Source

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > FO > POWER
ProLink II	ProLink > Configuration > Frequency > Power Type
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Settings > Power Source

Overview

Use Frequency Output Power Source to set the power source for the frequency output. The power configuration must match the wiring for the frequency output.

Procedure

Set Frequency Output Power Source as desired.

Option	Description
Internal	The output is powered by the transmitter.
External	The output is powered by an external power source.

6.2.2 Configure Frequency Output Process Variable

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > FO
ProLink II	ProLink > Configuration > Frequency
ProLink III	Device Tools > Configuration > I/O > Outputs > Frequency Output
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output

Overview

Frequency Output Process Variable controls the variable that is reported over the frequency output.

Prerequisites

If you plan to configure the output to report volume flow, ensure that you have set Volume Flow Type as desired: Liquid or Gas Standard Volume.

If you plan to configure an output to report a concentration measurement process variable, ensure that the concentration measurement application is configured so that the desired variable is available.

Procedure

Set Frequency Output Process Variable as desired.

The default setting is Mass Flow Rate.

Options for Frequency Output Process Variable

The transmitter provides a basic set of options for Frequency Output Process Variable, plus several application-specific options. Different communications tools may use different labels for the options.

6.2.3 Configure Frequency Output Polarity

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > FO > POLAR
ProLink II	ProLink > Configuration > Frequency > Freq Output Polarity
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Settings > FO Polarity

Overview

Frequency Output Polarity controls how the output indicates the ON (active) state. The default value, Active High, is appropriate for most applications. Active Low may be required by applications that use low-frequency signals.

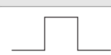
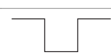
Procedure

Set Frequency Output Polarity as desired.

The default setting is Active High.

Options for Frequency Output Polarity

Table 6-5: Options for Frequency Output Polarity

Polarity	Reference voltage (OFF)	Pulse voltage (ON)
Active High 	0	As determined by power supply, pull-up resistor, and load (see the installation manual for your transmitter)
Active Low 	As determined by power supply, pull-up resistor, and load (see the installation manual for your transmitter)	0

6.2.4 Configure Frequency Output Scaling Method

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > FO > SCALE
ProLink II	ProLink > Configuration > Frequency > Scaling Method
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Scaling

Overview

Frequency Output Scaling Method defines the relationship between output pulse and flow units. Set Frequency Output Scaling Method as required by your frequency receiving device.

Procedure

1. Set Frequency Output Scaling Method.

Option	Description
Frequency=Flow **(default)**	Frequency calculated from flow rate
Pulses/Unit	A user-specified number of pulses represents one flow unit
Units/Pulse	A pulse represents a user-specified number of flow units

2. Set additional required parameters.
   - If you set Frequency Output Scaling Method to Frequency=Flow, set Rate Factor and Frequency Factor.
   - If you set Frequency Output Scaling Method to Pulses/Unit, define the number of pulses that will represent one flow unit.
   - If you set Frequency Output Scaling Method to Units/Pulse, define the number of units that each pulse will indicate.

Calculate frequency from flow rate

The Frequency=Flow option is used to customize the frequency output for your application when you do not know appropriate values for Units/Pulse or Pulses/Unit.

If you specify Frequency=Flow, you must provide values for Rate Factor and Frequency Factor:

Rate Factor
: The maximum flow rate that you want the frequency output to report. Above this rate, the transmitter will report A110: Frequency Output Saturated.

Frequency Factor
: A value calculated as follows:

$$\text{FrequencyFactor} = \frac{\text{RateFactor}}{T} \times N$$

where:

T Factor to convert selected time base to seconds

N Number of pulses per flow unit, as configured in the receiving device

The resulting Frequency Factor must be within the range of the frequency output (0 to 10,000 Hz):

- If Frequency Factor is less than1 Hz,reconfigure the receiving device for a higher pulses/unit setting.
- If Frequency Factor is greater than 10,000 Hz, reconfigure the receiving device for a lower pulses/unit setting.

Tip

If Frequency Output Scale Method is set to Frequency=Flow, and Frequency Output Maximum Pulse Width is set to a non-zero value, Micro Motion recommends setting Frequency Factor to a value below 200 Hz.

Example: Configure Frequency=Flow

You want the frequency output to report all flow rates up to 2000 kg/min.

The frequency receiving device is configured for 10 pulses/kg.

Solution:

$$\text{FrequencyFactor} = \frac{\text{RateFactor}}{T} \times N$$

$$\text{FrequencyFactor} = \frac{2000}{60} \times 10$$

$$\text{FrequencyFactor} = 333.33$$

Set parameters as follows:

- Rate Factor: 2000
- Frequency Factor: 333.33

6.2.5 Configure Frequency Output Maximum Pulse Width

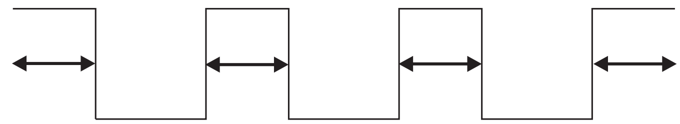
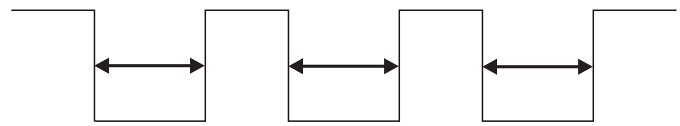
Display	*Not available*
ProLink II	ProLink > Configuration > Frequency > Freq Pulse Width
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Settings > Max Pulse Width

Overview

Frequency Output Maximum Pulse Width is used to ensure that the duration of the ON signal is great enough for your frequency receiving device to detect.

The ON signal may be the high voltage or 0.0 V, depending on Frequency Output Polarity.

Table 6-6: Interaction of Frequency Output Maximum Pulse Width and Frequency Output Polarity

Polarity	Pulse width
Active High	
Active Low	

Procedure

Set Frequency Output Maximum Pulse Width as desired.

The default value is 277 milliseconds. You can set Frequency Output Maximum Pulse Width to 0 milliseconds or to a value between 0.5 milliseconds and 277.5 milliseconds. The transmitter automatically adjusts the value to the nearest valid value.

Tip
Micro Motion recommends leaving Frequency Output Maximum Pulse Width at the default value. Contact Micro Motion customer service before changing Frequency Output Maximum Pulse Width.

6.2.6 Configure Frequency Output Fault Action and Frequency Output Fault Level

Display	*Not available*
ProLink II	ProLink > Configuration > Frequency > Freq Fault Action ProLink > Configuration > Frequency > Freq Fault Level
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Fault Parameters > FO Fault Action Configure > Manual Setup > Inputs/Outputs > Frequency Output > FO Fault Parameters > FO Fault Level

Overview

Frequency Output Fault Action controls the behavior of the frequency output if the transmitter encounters an internal fault condition.

Note
For some faults only: If Last Measured Value Timeout is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

Procedure

1. Set Frequency Output Fault Action as desired.

   The default value is Downscale (0 Hz).
2. If you set Frequency Output Fault Action to Upscale, set Frequency Fault Level to the desired value.

   The default value is 15000 Hz. The range is 10 to 15000 Hz.

Options for Frequency Output Fault Action

Table 6-7: Options for Frequency Output Fault Action

Label	Frequency output behavior
Upscale	Goes to configured Upscale value: • Range: 10 Hz to 15000 Hz • Default: 15000 Hz
Downscale	0 Hz
Internal Zero	0 Hz
None (default)	Tracks data for the assigned process variable; no fault action

⚠ CAUTION!

If you set mA Output Fault Action **or** Frequency Output Fault Action **to** None**, be sure to set** Digital Communications Fault Action **to** None**. If you do not, the output will not report actual process data, and this may result in measurement errors or unintended consequences for your process.**

Restriction

If you set Digital Communications Fault Action to NAN, you cannot set mA Output Fault Action or Frequency Output Fault Action to None. If you try to do this, the transmitter will not accept the configuration.

6.3 Configure the discrete output

The discrete output is used to report specific flowmeter or process conditions. The discrete output parameters control which condition is reported and how it is reported.

The discrete output parameters include:

- Discrete Output Source
- Discrete Output Polarity
- Discrete Output Fault Action
- Discrete Output Power Source

Important
Whenever you change a discrete output parameter, verify all other discrete output parameters before returning the flowmeter to service. In some situations, the transmitter automatically loads a set of stored values, and these values may not be appropriate for your application.

6.3.1 Configure Discrete Output Power Source

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > DO > POWER
ProLink II	ProLink > Configuration > Discrete Output > Power Type
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Output > Power Source

Overview

Use Discrete Output Power Source to set the output power source for the discrete output. The power configuration must match the wiring for the discrete output.

Procedure

Set Discrete Output Power Source as desired.

Option	Description
Internal	The output is powered by the transmitter
External	The output is powered by an external power source.

6.3.2 Configure Discrete Output Source

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > DO > SRC
ProLink II	ProLink > Configuration > Discrete Output > Discrete Output > DO Assignment
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Output > DO Assignment

Overview

Discrete Output Source controls which flowmeter condition or process condition is reported via the discrete output.

Procedure

Set Discrete Output Source to the desired option.

The default setting for Discrete Output Source is Flow Direction.

Options for Discrete Output Source

Table 6-8: Options for Discrete Output Source

Option	Label				Condition	Discrete output voltage
	Display	ProLink II	ProLink III	Field Communicator		
Discrete Event 1–5[1]	D EV x	Discrete Event x	Enhanced Event 1 Enhanced Event 2 Enhanced Event 3 Enhanced Event 4 Enhanced Event 5	Discrete Event x	ON	Site-specific
					OFF	0 V
Event 1–2[2]	EVNT1 EVNT2 E1OR2	Event 1 Event 2 Event 1 or Event 2	Event 1 Event 2 Event 1 or Event 2 Status	Event 1 Event 2 Event 1 or Event 2	ON	Site-specific
					OFF	0 V
Flow Switch	FL SW	Flow Switch Indication	Flow Switch Indicator	Flow Switch	ON	Site-specific
					OFF	0 V
Flow Direction	FLDIR	Forward/Reverse Indication	Forward Reverse Indicator	Forward/Reverse	Forward flow	0 V
					Reverse flow	Site-specific
Calibration in Progress	ZERO	Calibration in Progress	Calibration in Progress	Calibration in Progress	ON	Site-specific
					OFF	0 V
Fault	FAULT	Fault Condition Indication	Fault Indication	Fault	ON	Site-specific
					OFF	0 V

Important

This table assumes that Discrete Output Polarity is set to Active High. If Discrete Output Polarity is set to Active Low, reverse the voltage values.

Important

If you assign flow switch to the discrete output, you must also configure Flow Switch Variable, Flow Switch Setpoint, and Hysteresis.

(1) *Events configured using the enhanced event model.*

(2) *Events configured using the basic event model.*

Configure Flow Switch parameters

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > DO > CONFIG FL SW
ProLink II	ProLink > Configuration > Flow > Flow Switch Setpoint ProLink > Configuration > Flow > Flow Switch Variable ProLink > Configuration > Flow > Flow Switch Hysteresis
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Output > DO Assignment Configure > Manual Setup > Inputs/Outputs > Discrete Output > Flow Switch Source Configure > Manual Setup > Inputs/Outputs > Discrete Output > Flow Switch Setpoint

Overview

Flow Switch is used to indicate that the flow rate (measured by the configured flow variable) has moved past the configured setpoint, in either direction. The flow switch is implemented with a user-configurable hysteresis.

Procedure

1. Set Discrete Output Source to Flow Switch, if you have not already done so.
2. Set Flow Switch Variable to the flow variable that you want to use to control the flow switch.
3. Set Flow Switch Setpoint to the value at which the flow switch will be triggered (after Hysteresis is applied).
   - If the flow rate is below this value, the discrete output is ON.
   - If the flow rate is above this value, the discrete output is OFF.
4. Set Hysteresis to the percentage of variation above and below the setpoint that will operate as a deadband.

   Hysteresis defines a range around the setpoint within which the flow switch will not change. The default is 5%. The valid range is 0.1% to 10%.

   Example: If Flow Switch Setpoint = 100 g/sec and Hysteresis = 5%, and the first measured flow rate is above 100 g/sec, the discrete output is OFF. It will remain OFF unless the flow rate drops below 95 g/sec. If this happens, the discrete output will turn ON, and remain ON until the flow rate rises above 105 g/sec. At this point it turns OFF and will remain OFF until the flow rate drops below 95 g/sec.

6.3.3 Configure Discrete Output Polarity

Display	*Not available*
ProLink II	ProLink > Configuration > Discrete Output > DO1 Polarity
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Output > DO Polarity

Overview

Discrete outputs have two states: ON (active) and OFF (inactive). Two different voltage levels are used to represent these states. Discrete Output Polarity controls which voltage level represents which state.

Procedure

Set Discrete Output Polarity as desired.

The default setting is Active High.

Options for Discrete Output Polarity

Table 6-9: Options for Discrete Output Polarity

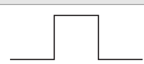
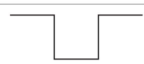
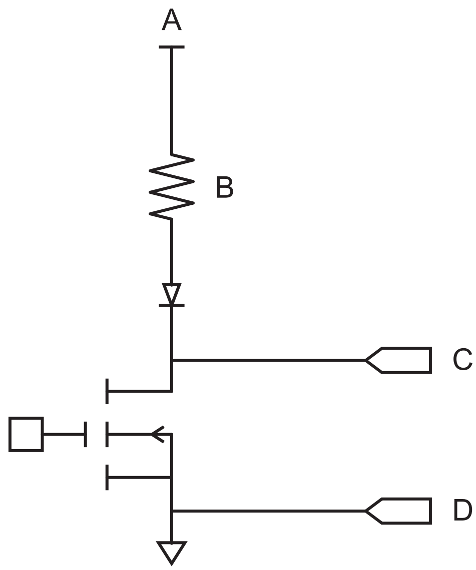
Polarity	Discrete output power supply	Description
Active High 	Internal	• When asserted (condition tied to DO is true), the circuit provides a pull-up to 15 V. • When not asserted (condition tied to DO is false), the circuit provides 0 V.
	External	• When asserted (condition tied to DO is true), the circuit provides a pull-up to a site-specific voltage, maximum 30 V. • When not asserted (condition tied to DO is false), the circuit provides 0 V.
Active Low 	Internal	• When asserted (condition tied to DO is true), the circuit provides 0 V. • When not asserted (condition tied to DO is false), the circuit provides a pull-up to 15 V.
	External	• When asserted (condition tied to DO is true), the circuit provides 0 V. • When not asserted (condition tied to DO is false), the circuit provides a pull-up to a site-specific voltage, to a maximum of 30 V.

Illustration of discrete output circuit

Figure 6-1: Typical discrete output circuit (internal power)



A. *3.2 KΩ*
B. *Out+*
C. *Out−*

6.3.4 Configure Discrete Output Fault Action

Display	*Not available*
ProLink II	ProLink > Configuration > Discrete Output > Discrete Output > DO Fault Action
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Output > DO Fault Action

Overview

Discrete Output Fault Action controls the behavior of the discrete output if the transmitter encounters an internal fault condition.

Note
For some faults only: If Last Measured Value Timeout is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

⚠ CAUTION!

Do not use Discrete Output Fault Action as a fault indicator. If you do, you may not be able to distinguish a fault condition from a normal operating condition. If you want to use the discrete output as a fault indicator, see *Fault indication with the discrete output*.

Procedure

Set Discrete Output Fault Action as desired.

The default setting is None.

Options for Discrete Output Fault Action

Table 6-10: Options for Discrete Output Fault Action

Label	Discrete output behavior	
	Polarity=Active High	**Polarity**=Active Low
Upscale	• Fault: discrete output is ON (site-specific voltage) • No fault: discrete output is controlled by its assignment	• Fault: discrete output is OFF (0 V) • No fault: discrete output is controlled by its assignment
Downscale	• Fault: discrete output is OFF (0 V) • No fault: discrete output is controlled by its assignment	• Fault: discrete output is ON (site-specific voltage) • No fault: discrete output is controlled by its assignment
None (default)	Discrete output is controlled by its assignment	

Fault indication with the discrete output

To indicate faults via the discrete output, set parameters as follows:

- Discrete Output Source = Fault
- Discrete Output Fault Action = None

Note

If Discrete Output Source is set to Fault and a fault occurs, the discrete output is always ON. The setting of Discrete Output Fault Action is ignored.

6.4 Configure the discrete input

The discrete input is used to initiate one or more transmitter actions from a remote input device. Your transmitter has one discrete input.

The discrete input parameters include:

- Discrete Input Action
- Discrete Input Polarity

Important

Whenever you change a discrete input parameter, verify all other discrete input parameters before returning the flowmeter to service. In some situations, the transmitter automatically loads a set of stored values, and these values may not be appropriate for your application.

6.4.1 Configure Discrete Input Action

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > DI > DI ACT
ProLink II	ProLink > Configuration > Discrete Input > Assignment
Field Communicator	Configure > Alert Setup > Discrete Events > Assign Discrete Action

Overview

Discrete Input Action controls the action or actions that the transmitter will perform when the discrete input transitions from OFF to ON.

⚠ CAUTION!

Before assigning actions to an enhanced event or discrete input, check the status of the event or the remote input device. If it is ON, all assigned actions will be performed when the new configuration is implemented. If this is not acceptable, wait until an appropriate time to assign actions to the event or discrete input.

Procedure

1. Select an action.
2. Select the discrete input that will perform the selected action.
3. Repeat until you have assigned all the actions to be performed by the discrete input.

Options for Discrete Input Action

Table 6-11:

Action	Label			
	Display	ProLink II	ProLink III	Field Communicator
Standard				
None (default)	NONE	None	None	None
Start sensor zero	START ZERO	Start Sensor Zero	Start Sensor Zero	Perform auto zero
Start/stop all totaliz-ers	START STOP	Start/Stop All Totalization	Start/Stop All Totalization	Start/stop totals
Reset mass total	RESET MASS	Reset Mass Total	Reset Mass Total	Reset mass total
Reset volume total	RESET VOL	Reset Volume Total	Reset Volume Total	Reset volume total

Table 6-11: *(continued)*

Action	Label			
	Display	**ProLink II**	**ProLink III**	**Field Communicator**
Reset gas standard volume total	RESET GSVT	Reset Gas Std Volume Total	Reset Gas Std Volume Total	Reset gas standard volume total
Reset all totals	RESET ALL	Reset All Totals	Reset All Totals	Reset totals
Petroleum measurement				
Reset temperature-corrected volume total	TCVOL	Reset API Ref Vol Total	Reset Volume Total at Reference Temperature	Reset corrected volume total
Concentration measurement				
Reset CM reference volume total	RESET STD V	Reset CM Ref Vol Total	Reset Volume Total at Reference Temperature	*Not available*
Reset CM net mass total	RESET NET M	Reset CM Net Mass Total	Reset Net Mass Total	*Not available*
Reset CM net volume total	RESET NET V	Reset CM Net Vol Total	Reset Net Volume Total	*Not available*
Increment CM matrix	INCr CURVE	Increment Current CM Curve	Increment Concentration Matrix	*Not available*

⚠ CAUTION!

Before assigning actions to an enhanced event or discrete input, check the status of the event or the remote input device. If it is ON, all assigned actions will be performed when the new configuration is implemented. If this is not acceptable, wait until an appropriate time to assign actions to the event or discrete input.

6.4.2 Configure Discrete Input Polarity

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > DI > DI POLAR
ProLink II	ProLink > Configuration > Discrete Input > DI1 Polarity
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Discrete Input > Polarity

Overview

The discrete input has two states: ON and OFF. Discrete Input Polarity controls how the transmitter maps the incoming voltage level to the ON and OFF states.

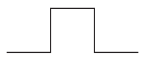
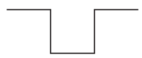
Procedure

Set Discrete Input Polarity as desired.

The default setting is Active Low.

Options for Discrete Input Polarity

Table 6-12: Options for Discrete Input Polarity

Polarity	Discrete input power supply	Voltage	Status of discrete input at transmitter
Active High 	Internal	Voltage across terminals is high	ON
		Voltage across terminals is 0 VDC	OFF
	External	Voltage applied across terminals is 3–30 VDC	ON
		Voltage applied across terminals is <0.8 VDC	OFF
Active Low 	Internal	Voltage across terminals is 0 VDC	ON
		Voltage across terminals is high	OFF
	External	Voltage applied across terminals is <0.8 VDC	ON
		Voltage applied across terminals is 3–30 VDC	OFF

6.5 Configure the mA input

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > MAI
ProLink II	ProLink > Configuration > Milliamp Input
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Milliamp Input

Overview

The mA input is used to receive pressure or temperature data from an external measurement device.

The mA input parameters include:

- mA Input Process Variable
- Lower range value (LRV)
- Upper range value (URV)

Important

Whenever you change an mA input parameter, verify all other mA input parameters before returning the flowmeter to service. In some situations, the transmitter automatically loads a set of stored values, and these values may not be appropriate for your application.

6.5.1 Configure mA Input Process Variable

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > MAI > AI SRC
ProLink II	ProLink > Configuration > Milliamp Input > PV
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Milliamp Input > mA Input Variable Assignment

Overview

mA Input Process Variable specifies the type of process data that you are receiving from the external measurement device.

Procedure

1. Set mA Input Process Variable as desired.

Option	Description
None	No external data
External pressure	The remote device measures pressure.
External temperature	The remote device measures temperature.

The default setting is None.

2. Configure the transmitter's measurement units to match the measurement units used by the remote device.
   - To configure pressure measurement units:
     - Using the display, choose OFF-LINE MAINT > OFF-LINE CONFG > UNITS > PRESS
     - Using ProLink II, choose ProLink > Configuration > Pressure > Pressure Units
     - Using the Field Communicator, press Configure > Manual Setup > Measurements > External Compensation > Pressure Unit
   - To configure temperature measurement units, see the section on configuring the temperature measurement unit.

6.5.2 Configure Lower Range Value (LRV) and Upper Range Value (URV)

Display	OFF-LINE MAINT > OFF-LINE CONFG > IO > MAI > AI 4 mA OFF-LINE MAINT > OFF-LINE CONFG > IO > MAI > AI 20 mA
ProLink II	ProLink > Configuration > Milliamp Input > Lower Range Value ProLink > Configuration > Milliamp Input > Upper Range Value
Field Communicator	mA Input LRV: Configure > Manual Setup > Inputs/Outputs > Milliamp Input > mA Input LRV mA Input URV: Configure > Manual Setup > Inputs/Outputs > Milliamp Input > mA Input URV

Overview

The Lower Range Value (LRV) and Upper Range Value (URV) are used to scale the readings received from the external measurement device, i.e., to define the relationship between mA input Process Variable and the mA input level received. Between LRV and URV, the mA input is linear with the process variable. If the process variable drops below LRV or rises above URV, the transmitter posts an external input error.

Prerequisites

Verify that you have set the measurement units for the pressure or temperature to match the units configured at the external measurement device. For example, if the external measurement device is set to send pressure data in PSI, you must set the pressure measurement units to be PSI at your transmitter.

Procedure

1. Set LRV as desired.

   Tip
   Set the LRV to match the lower range value at the remote device.

2. Set URV as desired.

   Tip
   Set the URV to match the upper range value at the remote device.

6.6 Configure events

An event occurs when the real-time value of a user-specified process variable moves past a user-defined setpoint. Events are used to provide notification of process changes or to perform specific transmitter actions if a process change occurs.

Your transmitter supports two event models:

- Basic event model
- Enhanced event model

6.6.1 Configure a basic event

Display	*Not available*
ProLink II	ProLink > Configuration > Events
Field Communicator	Configure > Alert Setup > Discrete Events

Overview

A basic event is used to provide notification of process changes. A basic event occurs (is ON) if the real-time value of a user-specified process variable moves above (HI) or below (LO) a user-defined setpoint. You can define up to two basic events. Event status can be queried via digital communications, and a discrete output can be configured to report event status.

Procedure

1. Select the event that you want to configure.
2. Specify Event Type.

Options	Description
HI	$x > A$ The event occurs when the value of the assigned process variable (x) is greater than the setpoint (Setpoint A), endpoint not included.
LO	$x < A$ The event occurs when the value of the assigned process variable (x) is less than the setpoint (Setpoint A), endpoint not included.

3. Assign a process variable to the event.
4. Set a value for Setpoint A.
5. (Optional) Configure a discrete output to switch states in response to the event status.

6.6.2 Configure an enhanced event

Display	Not available
ProLink II	ProLink > Configuration > Discrete Events
Field Communicator	Configure > Alert Setup > Discrete Events > Discrete Events 1–5

Overview

An enhanced event is used to provide notification of process changes and, optionally, to perform specific transmitter actions if the event occurs. An enhanced event occurs (is ON) if the real-time value of a user-specified process variable moves above (HI) or below (LO) a user-defined setpoint, or in range (IN) or out of range (OUT) with respect to two user-defined setpoints. You can define up to five enhanced events. For each enhanced event, you can assign one or more actions that the transmitter will perform if the enhanced event occurs.

Procedure

1. Select the event that you want to configure.
2. Specify Event Type.

Options	Description
HI	$x > A$ The event occurs when the value of the assigned process variable (x) is greater than the setpoint (Setpoint A), endpoint not included.
LO	$x < A$ The event occurs when the value of the assigned process variable (x) is less than the setpoint (Setpoint A), endpoint not included.
IN	$A \leq x \leq B$ The event occurs when the value of the assigned process variable (x) is "in range," that is, between Setpoint A and Setpoint B, endpoints included.
OUT	$x \leq A$ or $x \geq B$ The event occurs when the value of the assigned process variable (x) is "out of range," that is, less than Setpoint A or greater than Setpoint B, end-points included.

3. Assign a process variable to the event.
4. Set values for the required setpoints.
   - For HI and LO events, set Setpoint A.
   - For IN and OUT events, set Setpoint A and Setpoint B.
5. (Optional) Configure a discrete output to switch states in response to the event status.
6. (Optional) Specify the action or actions that the transmitter will perform when the event occurs.
   - With ProLink II: ProLink > Configuration > Discrete Input
   - With the Field Communicator: Configure > Alert Setup > Discrete Events > Assign Discrete Action

Options for Enhanced Event Action

Table 6-13:

Action	Label			
	Display	**ProLink II**	**ProLink III**	**Field Communicator**
Standard				
None (default)	NONE	None	None	None
Start sensor zero	START ZERO	Start Sensor Zero	Start Sensor Zero	Perform auto zero
Start/stop all totaliz-ers	START STOP	Start/Stop All Totalization	Start/Stop All Totalization	Start/stop totals
Reset mass total	RESET MASS	Reset Mass Total	Reset Mass Total	Reset mass total
Reset volume total	RESET VOL	Reset Volume Total	Reset Volume Total	Reset volume total

Table 6-13: *(continued)*

Action	Label			
	Display	ProLink II	ProLink III	Field Communicator
Reset gas standard volume total	RESET GSVT	Reset Gas Std Volume Total	Reset Gas Std Volume Total	Reset gas standard volume total
Reset all totals	RESET ALL	Reset All Totals	Reset All Totals	Reset totals
Petroleum measurement				
Reset temperature-corrected volume total	TCVOL	Reset API Ref Vol Total	Reset Volume Total at Reference Temperature	Reset corrected volume total
Concentration measurement				
Reset CM reference volume total	RESET STD V	Reset CM Ref Vol Total	Reset Volume Total at Reference Temperature	*Not available*
Reset CM net mass total	RESET NET M	Reset CM Net Mass Total	Reset Net Mass Total	*Not available*
Reset CM net volume total	RESET NET V	Reset CM Net Vol Total	Reset Net Volume Total	*Not available*
Increment CM matrix	INCr CURVE	Increment Current CM Curve	Increment Concentration Matrix	*Not available*

⚠ **CAUTION!**

Before assigning actions to an enhanced event or discrete input, check the status of the event or the remote input device. If it is ON, all assigned actions will be performed when the new configuration is implemented. If this is not acceptable, wait until an appropriate time to assign actions to the event or discrete input.

6.7 Configure digital communications

The digital communications parameters control how the transmitter will communicate using digital communications.

Your transmitter supports the following types of digital communications:

- HART/Bell 202 over the primary mA terminals
- HART/RS-485 over the RS-485 terminals
- Modbus/RS-485 over the RS-485 terminals
- Modbus RTU via the service port

Note

The service port responds automatically to a wide range of connection requests. It is not configurable.

Important
The service port clips on the user interface of the transmitter are directly connected to the RS-485 terminals (26 and 27). If you wire the transmitter for RS-485 digital communications, you cannot use the service port clips for communication with the transmitter.

6.7.1 Configure HART/Bell 202 communications

Display	N/A
ProLink II	ProLink > Configuration > Device > Digital Comm Settings
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Communications > HART Communications

Overview

HART/Bell 202 communications parameters support HART communication with the transmitter's primary mA terminals over a HART/Bell 202 network.

The HART/Bell 202 communications parameters include:

- HART Address (Polling Address)
- Loop Current Mode (ProLink II) or mA Output Action (ProLink III)
- Burst Parameters (optional)
- HART Variables (optional)

Procedure

1. Set HART Address to a unique value on your network.

   Valid address values are between 0 and 15. The default address (0) is typically used unless you are in a multidrop environment.

   Tip
   Devices using HART protocol to communicate with the transmitter may use either HART Address or HART Tag (Software Tag) to identify the transmitter. Configure either or both, as required by your other HART devices.

2. Ensure Loop Current Mode (mA Output Action) is configured appropriately.

Options	Description
Enabled	The primary mA output reports process data as configured.
Disabled	The primary mA output is fixed at 4 mA and does not report process data.

Important

If you use ProLink II or ProLink III to set HART Address to 0, the program automatically enables Loop Current Mode. If you use ProLink II or ProLink III to set HART Address to any other value, the program automatically disables Loop Current Mode. This is designed to make it easier to configure the transmitter for legacy behavior. Always verify Loop Current Mode after setting HART Address.

3. (Optional) Enable and configure Burst Parameters.

Tip

In typical installations, burst mode is disabled. Enable burst mode only if another device on the network requires burst mode communication.

4. (Optional) Configure HART Variables.

Configure burst parameters

Display	Not available
ProLink II	ProLink > Configuration > Device > Burst Setup
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Communications > HART Burst Mode

Overview

Burst mode is a mode of communication during which the transmitter regularly broadcasts HART digital information over the primary mA output. The burst parameters control the information that is broadcast when burst mode is enabled.

Tip

In typical installations, burst mode is disabled. Enable burst mode only if another device on the network requires burst mode communication.

Procedure

1. Enable Burst Mode.
2. Set Burst Mode Output as desired.

Label			
ProLink II	**ProLink III**	**Field Communicator**	**Description**
Primary Variable	Source (Primary Variable)	PV	The transmitter sends the primary variable (PV) in the configured measurement units in each burst (e.g., 14.0 g/sec, 13.5 g/sec, 12.0 g/sec).

Label			
ProLink II	**ProLink III**	**Field Communicator**	**Description**
PV current & % of range	Primary Variable (Percent Range/ Current)	% range/current	The transmitter sends the PV's percent of range and the PV's actual mA level in each burst (e.g., 25%, 11.0 mA).
Dynamic vars & PV current	Process Variables/ Current	Process variables/ current	The transmitter sends PV, SV, TV, and QV values in measurement units and the PV's actual milliamp reading in each burst (e.g., 50 g/sec, 23 °C, 50 g/sec, 0.0023 g/cm3, 11.8 mA).
Transmitter vars	Transmitter variables	Fld dev var	The transmitter sends four user-specified process variables in each burst.

3. Ensure that the burst output variables are set appropriately.
   - If you set Burst Mode Output to send four user-specified variables, set the four process variables to be sent in each burst.
   - If you set Burst Mode Output to any other option, ensure that the HART variables are set as desired.

Configure HART variables (PV, SV, TV, QV)

Display	*Not available*
ProLink II	ProLink > Configuration > Variable Mapping
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Variable Mapping

Overview

The HART variables are a set of four variables predefined for HART use. The HART variables include the Primary Variable (PV), Secondary Variable (SV), Tertiary Variable (TV), and Quaternary Variable (QV). You can assign specific process variables to the HART variables, and then use standard HART methods to read or broadcast the assigned process data.

Options for HART variables

Table 6-14: Options for HART variables

Process variable	Primary Variable (PV)	Secondary Variable (SV)	Third Variable (TV)	Fourth Variable (QV)
Standard				

Table 6-14: Options for HART variables *(continued)*

Process variable	Primary Variable (PV)	Secondary Variable (SV)	Third Variable (TV)	Fourth Variable (QV)
Mass flow rate	✓	✓	✓	✓
Line (Gross) Volume flow rate	✓	✓	✓	✓
Temperature	✓	✓		✓
Density	✓	✓		✓
Drive gain	✓	✓		✓
Mass total				✓
Line (Gross) Volume total				✓
Mass inventory				✓
Line (Gross) Volume inventory				✓
Raw Tube frequency				✓
Meter temperature (T-Series)				✓
LPO amplitude				✓
RPO amplitude				✓
Board temperature				✓
External pressure	✓	✓		✓
External temperature	✓	✓		✓
Gas standard volume flow rate	✓	✓	✓	✓
Gas standard volume total				✓
Gas standard volume inventory				✓
Live zero				✓
Petroleum measurement				
API density	✓	✓		✓
API volume flow rate	✓	✓	✓	✓
API volume total				✓
API volume inventory				✓
API average density	✓	✓		✓
API average temperature	✓	✓		✓
API CTL				✓
Concentration measurement				
CM density at reference temperature	✓	✓		✓
CM specific gravity	✓	✓		✓
CM standard volume flow rate	✓	✓	✓	✓
CM standard volume total				✓
CM standard volume inventory				✓
CM net mass flow rate	✓	✓	✓	✓

Table 6-14: Options for HART variables *(continued)*

Process variable	Primary Variable (PV)	Secondary Variable (SV)	Third Variable (TV)	Fourth Variable (QV)
CM net mass total				✓
CM net mass inventory				✓
CM net volume flow rate	✓	✓	✓	✓
CM net volume total				✓
CM net volume inventory				✓
CM concentration	✓	✓		✓
CM Baume	✓	✓		✓

Interaction of HART variables and transmitter outputs

The HART variables are automatically reported through specific transmitter outputs. They may also be reported through HART burst mode, if enabled on your transmitter.

Table 6-15: HART variables and transmitter outputs

HART variable	Reported via	Comments
Primary Variable (PV)	Primary mA output	If one assignment is changed, the other is changed automatically, and vice versa.
Secondary Variable (SV)	Secondary mA output	If one assignment is changed, the other is changed automatically, and vice versa. If your transmitter is not configured for a secondary mA output, the SV must be configured directly, and the value of the SV is available only via digital communications.
Tertiary Variable (TV)	Frequency output	If one assignment is changed, the other is changed automatically, and vice versa.
Quaternary Variable (QV)	Not associated with an output	The QV must be configured directly, and the value of the QV is available only via digital communications.

6.7.2 Configure HART/RS-485 communications

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Digital Comm Setting
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Communications > Setup RS-485 Port

Overview

HART/RS-485 communications parameters support HART communication with the transmitter's RS-485 terminals.

HART/RS-485 communication parameters include:

- HART Address (Polling Address)

Procedure

1. Set Protocol to HART RS-485.
2. Set Baud Rate to match the baud rate that will be used by your HART master.
3. Set Parity to match the parity that will be used by your HART master.
4. Set Stop Bits to match the stop bits setting that will be used by your HART master.
5. Set HART Address to a unique value on your network.

   Valid address values are between 0 and 15. The default address (0) is typically used unless you are in a multidrop environment.

   Tip
   Devices using HART protocol to communicate with the transmitter may use either HART Address or HART Tag (Software Tag) to identify the transmitter. Configure either or both, as required by your other HART devices.

6.7.3 Configure Modbus/RS-485 communications

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Digital Comm Setting
Field Communicator	Configure > Manual Setup > Inputs/Outputs > Communications > Setup RS-485 Port

Overview

Modbus/RS-485 communications parameters control Modbus communication with the transmitter's RS-485 terminals.

Modbus/RS-485 communications parameters include:

- Disable Modbus ASCII
- Protocol
- Modbus Address (Slave Address)
- Floating-Point Byte Order
- Additional Communications Response Delay

Important
To minimize configuration requirements, the transmitter uses an auto-detection scheme when responding to a connection request. With this auto-detect feature, you do not need to enter some Modbus communication parameters.

Restriction

To configure Floating-Point Byte Order or Additional Communications Response Delay, you must use ProLink II.

Procedure

1. Set Disable Modbus ASCII as desired.

   Support for Modbus ASCII limits the set of addresses that are available for the transmitter's Modbus address.

Modbus ASCII support	Available Modbus addresses
Disabled	1–127, excluding 111 (111 is reserved to the service port)
Enabled	1–15, 32–47, 64–79, and 96–110

2. Set Protocol to match the protocol used by your Modbus/RS-485 host.

Options	Description
Modbus RTU (default)	8–bit communications
Modbus ASCII	7–bit communications

   If support for Modbus ASCII is disabled, you must use Modbus RTU.

3. Set Modbus Address to a unique value on the network.
4. Set Floating-Point Byte Order to match the byte order used by your Modbus host.

Code	Byte order
0	1–2 3–4
1	3–4 1–2
2	2–1 4–3
3	4–3 2–1

   See *Table 6-16* for the bit structure of bytes 1, 2, 3, and 4.

Table 6-16: Bit structure of floating-point bytes

Byte	Bits	Definition
1	SEEEEEEE	S=Sign E=Exponent
2	EMMMMMMM	E=Exponent M=Mantissa
3	MMMMMMMM	M=Mantissa
4	MMMMMMMM	M=Mantissa

5. (Optional) Set Additional Communications Response Delay in “delay units.”

   A delay unit is 2/3 of the time required to transmit one character, as calculated for the port currently in use and the character transmission parameters. Valid values range from 1 to 255.

   Additional Communications Response Delay is used to synchronize Modbus communications with hosts that operate at a slower speed than the transmitter. The value specified here will be added to each response the transmitter sends to the host.

Tip

Do not set Additional Communications Response Delay unless required by your Modbus host.

6.7.4 Configure Digital Communications Fault Action

Display	*Not available*
ProLink II	ProLink > Configuration > Device > Digital Comm Settings > Digital Comm Fault Setting
Field Communicator	Configure > Alert Setup > Inputs/Outputs Fault Actions > Digital Communications

Overview

Digital Communications Fault Action specifies the values that will be reported via digital communications if the transmitter encounters an internal fault condition.

Procedure

Set Digital Communications Fault Action as desired.

The default setting is None.

Options for Digital Communications Fault Action

Table 6-17: Options for Digital Communications Fault Action

Label			Description
ProLink II	**ProLink III**	**Field Communicator**	
Upscale	Upscale	Upscale	• Process variable values indicate that the value is greater than the upper sensor limit. • Totalizers stop incrementing.
Downscale	Downscale	Downscale	• Process variable values indicate that the value is greater than the upper sensor limit. • Totalizers stop incrementing.

Table 6-17: Options for Digital Communications Fault Action *(continued)*

Label			Description
ProLink II	**ProLink III**	**Field Communicator**	
Zero	Zero	IntZero-All 0	• Flow rate variables go to the value that represents a flow rate of 0 (zero). • Density is reported as 0. • Temperature is reported as 0 °C, or the equivalent if other units are used (e.g., 32 °F). • Drive gain is reported as measured. • Totalizers stop incrementing.
Not-a-Number (NAN)	Not a Number	Not-a-Number	• Process variables are reported as IEEE NAN. • Drive gain is reported as measured. • Modbus scaled integers are reported as Max Int. • Totalizers stop incrementing.
Flow to Zero	Flow to Zero	IntZero-Flow 0	• Flow rates are reported as 0. • Other process variables are reported as measured. • Totalizers stop incrementing.
None (default)	None	None (default)	• All process variables are reported as measured. • Totalizers increment if they are running.

⚠ **CAUTION!**

If you set mA Output Fault Action **or** Frequency Output Fault Action **to** None**, be sure to set** Digital Communications Fault Action **to** None**. If you do not, the output will not report actual process data, and this may result in measurement errors or unintended consequences for your process.**

Restriction

If you set Digital Communications Fault Action to NAN, you cannot set mA Output Fault Action or Frequency Output Fault Action to None. If you try to do this, the transmitter will not accept the configuration.

6.8 Set up polling for temperature

Display	*Not available*
ProLink II	ProLink > Configuration > Polled Variables > External Temperature
Field Communicator	Configure > Manual Setup > Measurements > External Compensation > External Polling

Overview

The transmitter can poll an external temperature device for current temperature data. The external temperature value is used only by the petroleum measurement application or the concentration measurement application. If you do not have one of these applications, do not set up polling for temperature.

Tip

To obtain value from using an external temperature value, the external measurement device must be reliable and must provide more accurate data than is available from the sensor.

Prerequisites

Polling requires HART protocol over the Bell 202 physical layer. Ensure that the primary mA output on your transmitter has been wired for HART protocol, and that the external measurement device is accessible over the HART network.

Procedure

1. Select Polled Variable 1 or Polled Variable 2.
2. Set Polling Control.

   Polling Control determines how the transmitter will access the external measurement device.

Option	Description
Primary	The transmitter is the only device that will access the external measurement device as a primary master.
Secondary	Another device on the network will access the external measurement device as a primary master.

   Tip

   If you set up polling for both temperature and pressure, use the same Polling Control option for both. If you do not, Primary will be used for both devices.

   ---

3. (ProLink II only) Click Apply to enable the polling controls.
4. Enter the device tag of the external measurement device.
5. Set Process Variable to Temperature.

Postrequisites

Verify that the transmitter is receiving the external data. To do this:

- Using ProLink II, click ProLink > Process Variables and check the External Temperature value.
- Using the Field Communicator, select Overview > Primary Purpose Variables.

Need help? If the value is not correct:

1. Verify the HART tag of the external device.
2. Verify that the external device is powered up and online.
3. Verify the HART/mA connection between the transmitter and the external measurement device.

6.9 Set up polling for pressure

Display	*Not available*
ProLink II	ProLink > Configuration > Polled Variables > External Pressure
Field Communicator	Configure > Manual Setup > Measurements > External Compensation > External Polling

Overview

The transmitter can poll an external pressure device for current pressure data. The pressure value is used only for pressure compensation. If you are not implementing pressure compensation, do not set up polling for pressure.

Tip
To obtain value from pressure compensation, the external measurement device must be reliable and accurate.

Prerequisites

Polling requires HART protocol over the Bell 202 physical layer. Ensure that the primary mA output on your transmitter has been wired for HART protocol, and that the external measurement device is accessible over the HART network.

Procedure

1. Select Polled Variable 1 or Polled Variable 2.
2. Set Polling Control.

   Polling Control determines how the transmitter will access the external measurement device.

Option	Description
Primary	The transmitter is the only device that will access the external measurement device as a primary master.
Secondary	Another device on the network will access the external measurement device as a primary master.

Tip
If you set up polling for both temperature and pressure, use the same Polling Control option for both. If you do not, Primary will be used for both devices.

3. (ProLink II only) Click Apply to enable the polling controls.
4. Enter the device tag of the external measurement device.
5. Set Process Variable to Pressure.

Postrequisites

Verify that the transmitter is receiving the external data. To do this:

- Using ProLink II, click ProLink > Process Variables and check the External Pressure value.
- Using the Field Communicator, select Overview > Primary Purpose Variables

Need help? If the value is not correct:

1. Verify the HART tag of the external device.
2. Verify that the external device is powered up and online.
3. Verify the HART/mA connection between the transmitter and the external measurement device.

7 Completing the configuration

Topics covered in this chapter:

- *Back up transmitter configuration*
- *Enable/disable HART security*
- *Enable write-protection on the transmitter configuration*

7.1 Back up transmitter configuration

ProLink II and ProLink III provide a configuration upload/download function which allows you to save configuration sets to your PC. This allows you to back up and restore your transmitter configuration. It is also a convenient way to replicate a configuration across multiple devices.

Prerequisites

One of the following:

- An active connection from ProLink II

Restriction
This function is not available with any other communications tools.

Procedure

To back up the transmitter configuration using ProLink II:

1. Choose File > Load from Xmtr to File.
2. Specify a name and location for the backup file, and click Save.
3. Select the options that you want to include in the backup file, and click Download Configuration.

The backup file is saved to the specified name and location. It is saved as a text file and can be read using any text editor.

7.2 Enable/disable HART security

You use the HART security switch located on the transmitter display to disable configuration of the transmitter using HART protocol. When the HART security switch is set to ON, HART protocol cannot be used to perform any action that requires writing to the transmitter. For example, you cannot change the configuration, reset totalizers, perform calibration, etc., using the Field Communicator or ProLink II with a HART/Bell 202 or HART/RS-485 connection. When the HART security switch is set to OFF, no functions are disabled.

Important

The HART security switch does not affect Modbus communications.

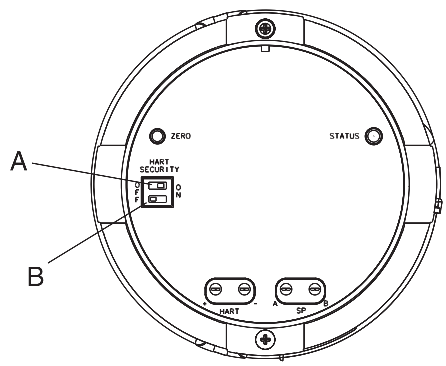
⚠ CAUTION!

If the transmitter is in a hazardous area, do not remove the housing cover while power is being supplied to the unit. Removing the housing cover while power is supplied to the unit could cause an explosion. To access the HART security switch in a hazardous environment, be sure to remove power from the transmitter before removing the housing cover and setting the HART security switch.

Procedure

1. Remove power from the transmitter.
2. Remove the transmitter housing cover.
3. Move the HART security switch to the desired position.

Figure 7-1: HART security switch (on blank display)



A. HART security switch
B. Unused

4. Replace the transmitter housing cover.
5. Restore power to the transmitter.

7.3 Enable write-protection on the transmitter configuration

Display	OFF-LINE MAINT > CONFIG > LOCK
ProLink II	ProLink > Configuration > Device > Enable Write Protection
Field Communicator	Configure > Manual Setup > Info Parameters > Transmitter Info > Write Protect

Overview

If the transmitter is write-protected, the configuration is locked and nobody can change it until it is unlocked. This prevents accidental or unauthorized changes to the transmitter configuration parameters.

Part III

Operations, maintenance, and troubleshooting

Chapters covered in this part:

- *Transmitter operation*
- *Measurement support*
- *Troubleshooting*

8 Transmitter operation

Topics covered in this chapter:

- *Record the process variables*
- *View transmitter status using the status LED*
- *View and acknowledge status alarms*
- *Read totalizer and inventory values*
- *Start and stop totalizers and inventories*
- *Reset totalizers*
- *Reset inventories*

8.1 Record the process variables

Micro Motion suggests that you make a record of specific process variable measurements, including the acceptable range of measurements, under normal operating conditions. This data will help you recognize when the process variables are unusually high or low, and may help you better diagnose and troubleshoot application issues.

Procedure

Record the following process variables, under normal operating conditions:

Process variable	Measurement		
	Typical average	**Typical high**	**Typical low**
Flow rate			
Density			
Temperature			
Tube frequency			
Pickoff voltage			
Drive gain			

8.2 View transmitter status using the status LED

The status LED shows the current alarm condition of the transmitter. The status LED is located on the face of the transmitter.

Observe the status LED.

- If your transmitter has a display, you can view the status LED with the transmitter housing cover in place.
- If your transmitter does not have a display, you must remove the transmitter housing cover to view the status LED.

⚠ **CAUTION!**

If the transmitter is in a hazardous area, do not remove the housing cover while power is supplied to the unit. Removing the housing cover while power is supplied to the unit could cause an explosion. To view transmitter status in a hazardous environment, use a communications method that does not require removing the transmitter housing cover.

To interpret the status LED, see the following table.

Table 8-1: Status LED states

LED behavior	Alarm condition	Description
Solid green	No alarm	Normal operation
Flashing yellow	No alarm	Zero in progress
Solid yellow	Active low-severity alarm	Alarm condition that will not cause measurement error (outputs continue to report process data)
Solid red	Active high-severity alarm	Alarm condition that will cause measurement error (outputs in fault)

8.3 View and acknowledge status alarms

The transmitter posts status alarms whenever a process variable exceeds its defined limits or the transmitter detects a fault condition. You can view active alarms, and you can acknowledge alarms.

8.3.1 View and acknowledge alarms using the display

You can view a list containing all alarms that are active, or inactive but unacknowledged.

Note

Only Fault and Informational alarms are listed. The transmitter automatically filters out alarms with Status Alarm Severity set to Ignore.

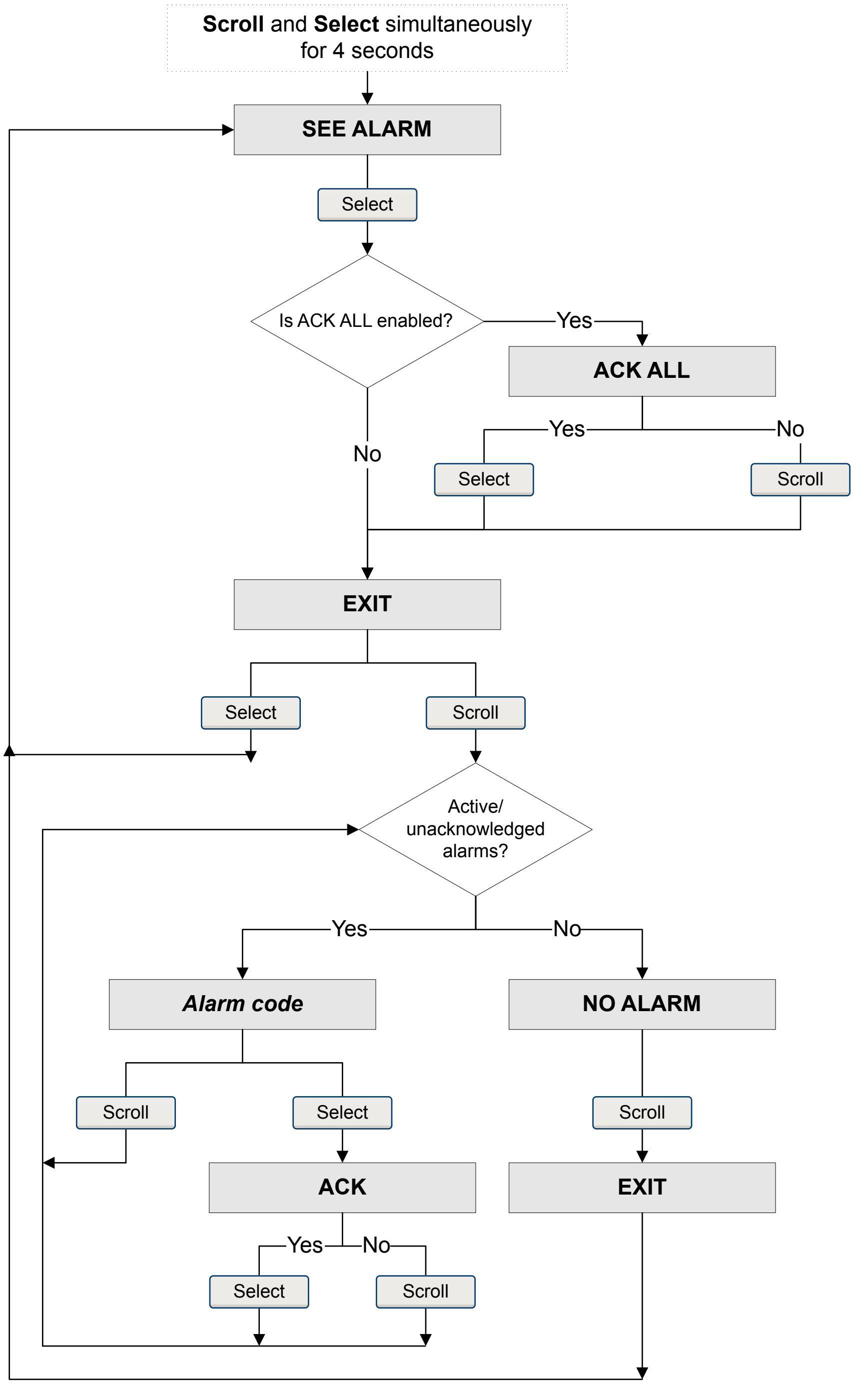
Prerequisites

Operator access to the alarm menu must be enabled (default setting). If operator access to the alarm menu is disabled, you must use another method to view or acknowledge status alarms.

Procedure

See *Figure 8-1*.

Figure 8-1: Using the display to view and acknowledge the status alarms



Postrequisites

- To clear the following alarms, you must correct the problem, acknowledge the alarm, then power-cycle the transmitter: A001, A002, A010, A011, A012, A013, A018, A019, A022, A023, A024, A025, A028, A029, A031.
- For all other alarms:
  - If the alarm is inactive when it is acknowledged, it will be removed from the list.
  - If the alarm is active when it is acknowledged, it will be removed from the list when the alarm condition clears.

8.3.2 View and acknowledge alarms using ProLink II

You can view a list containing all alarms that are active, or inactive but unacknowledged.

1. Choose ProLink > Alarm Log.
2. Choose the High Priority or Low Priority panel.

   Note
   The grouping of alarms into these two categories is hard-coded and is not affected by Status Alarm Severity.

   All active or unacknowledged alarms are listed:
   - Red indicator: Alarm is currently active.
   - Green indicator: Alarm is inactive but unacknowledged.

   Note
   Only Fault and Informational alarms are listed. The transmitter automatically filters out alarms with Status Alarm Severity set to Ignore.

3. To acknowledge an alarm, check the Ack checkbox.

Postrequisites

- To clear the following alarms, you must correct the problem, acknowledge the alarm, then power-cycle the transmitter: A001, A002, A010, A011, A012, A013, A018, A019, A022, A023, A024, A025, A028, A029, A031.
- For all other alarms:
  - If the alarm is inactive when it is acknowledged, it will be removed from the list.
  - If the alarm is active when it is acknowledged, it will be removed from the list when the alarm condition clears.

8.3.3 View alarms using the Field Communicator

You can view a list containing all alarms that are active, or inactive but unacknowledged.

- To view active or unacknowledged alarms, press Service Tools > Alerts.

All active alarms or unacknowledged alarms are listed.

Note

Only Fault and Informational alarms are listed. The transmitter automatically filters out alarms with Status Alarm Severity set to Ignore.

- To refresh the list of active or unacknowledged alarms, press Service Tools > Alerts > Refresh Alerts.

8.3.4 Alarm data in transmitter memory

The transmitter maintains three sets of data for every alarm that is posted.

For each alarm occurrence, the following three sets of data are maintained in transmitter memory:

- Alert List
- Alert Statistics
- Recent Alerts

Table 8-2: Alarm data in transmitter memory

Alarm data structure	Transmitter action if condition occurs	
	Contents	**Clearing**
Alert List	As determined by the alarm status bits, a list of: • All currently active alarms • All previously active alarms that have not been acknowledged	Cleared and regenerated with every transmitter power cycle
Alert Statistics	One record for each alarm (by alarm number) that has occurred since the last master reset. Each record contains: • A count of the number of occurrences • Timestamps for the most recent posting and clearing	Not cleared; maintained across transmitter power cycles
Recent Alerts	50 most recent alarm postings or alarm clearings	Not cleared; maintained across transmitter power cycles

8.4 Read totalizer and inventory values

Display	To read a totalizer or inventory value from the display, it must be configured as a display variable.
ProLink II	ProLink > Totalizer Control
Field Communicator	Service Tools > Variables > Totalizer Control

Overview

Totalizers keep track of the total amount of mass or volume measured by the transmitter since the last totalizer reset. Inventories keep track of the total amount of mass or volume measured by the transmitter since the last inventory reset.

Tip

You can use the inventories to keep a running total of mass or volume across multiple totalizer resets.

8.5 Start and stop totalizers and inventories

Display	See *Section 8.5.1*.
ProLink II	ProLink > Totalizer Control > Start ProLink > Totalizer Control > Stop
Field Communicator	Service Tools > Variables > Totalizer Control > All Totalizers > Start Totalizers Service Tools > Variables > Totalizer Control > All Totalizers > Stop Totalizers

Overview

When you start a totalizer, it tracks process measurement. In a typical application, its value increases with flow. When you stop a totalizer, it stops tracking process measurement and its value does not change with flow. Inventories are started and stopped automatically, when totalizers are started and stopped.

Important

Totalizers and inventories are started or stopped as a group. When you start any totalizer, all other totalizers and all inventories are started simultaneously.When you stop any totalizer, all other totalizers and all inventories are stopped simultaneously. You cannot start or stop inventories directly.

8.5.1 Start and stop totalizers and inventories using the display

Prerequisites

The Totalizer Start/Stop display function must be enabled.

At least one totalizer must be configured as a display variable.

Procedure

- To start all totalizers and inventories using the display:
  1. Scroll until the word TOTAL appears in the lower left corner of the display.

     Important
     Because all totalizers are started or stopped together, it does not matter which total you use.

  2. Select.
  3. Scroll until START appears beneath the current totalizer value.
  4. Select.
  5. Select again to confirm.
  6. Scroll to EXIT.
- To stop all totalizers and inventories using the display:
  1. Scroll until the word TOTAL appears in the lower left corner of the display.

     Important
     Because all totalizers are started or stopped together, it does not matter which total you use.

  2. Select.
  3. Scroll until STOP appears beneath the current totalizer value.
  4. Select.
  5. Select again to confirm.
  6. Scroll to EXIT.

8.6 Reset totalizers

Display	See *Section 8.6.1*.
ProLink II	ProLink > Totalizer Control > Reset Mass Total ProLink > Totalizer Control > Reset Volume Total ProLink > Totalizer Control > Reset Gas Volume Total ProLink > Totalizer Control > Reset
Field Communicator	Service Tools > Variables > Totalizer Control > Mass > Mass Total Service Tools > Variables > Totalizer Control > Gas Standard Volume > Volume Total Service Tools > Variables > Totalizer Control > Gas Standard Volume > GSV Total Service Tools > Variables > Totalizer Control > All Totalizers > Reset All Totals

Overview

When you reset a totalizer, the transmitter sets its value to 0. It does not matter whether the totalizer is started or stopped. If the totalizer is started, it continues to track process measurement.

Tip

When you reset a single totalizer, the values of other totalizers are not reset. Inventory values are not reset.

8.6.1 Reset totalizers using the display

Prerequisites

The Totalizer Reset display function must be enabled.

The totalizer that you want to reset must be configured as a display variable. For example:

- If you want to reset the mass totalizer, Mass Total must be configured as a display variable.
- If you want to reset the volume totalizer, Volume Total must be configured as a display variable.

Procedure

- To reset the mass totalizer:
  1. Scroll until the mass totalizer value appears.
  2. Select.
  3. Scroll until RESET appears beneath the current totalizer value.
  4. Select.
  5. Select again to confirm.

6. Scroll to EXIT.
7. Select.

- To reset the volume totalizer:
    1. Scroll until the volume totalizer value appears.
    2. Select.
    3. Scroll until RESET appears beneath the current totalizer value.
    4. Select.
    5. Select again to confirm.
    6. Scroll to EXIT.
    7. Select.
- To reset the gas standard volume totalizer:
    1. Scroll until the gas standard volume totalizer value appears.
    2. Select.
    3. Scroll until RESET appears beneath the current totalizer value.
    4. Select.
    5. Select again to confirm.
    6. Scroll to EXIT.
    7. Select.

8.7 Reset inventories

ProLink II	ProLink > Totalizer Control > Reset Inventories ProLink > Totalizer Control > Reset Mass Inventory ProLink > Totalizer Control > Reset Volume Inventory ProLink > Totalizer Control > Reset Gas Volume Inventory

Overview

When you reset an inventory, the transmitter sets its value to 0. It does not matter whether the inventory is started or stopped. If the inventory is started, it continues to track process measurement.

Tip

When you reset a single inventory, the values of other inventories are not reset. Totalizer values are not reset.

Prerequisites

To use ProLink II or ProLink III to reset the inventories, the feature must be enabled.

- To enable inventory reset in ProLink II:
  1. Click View > Preferences.
  2. Check the Enable Inventory Totals Reset checkbox.
  3. Click Apply.
- To enable inventory reset in ProLink III:
  1. Choose Tools > Options.
  2. Select Reset Inventories from ProLink III.

9 Measurement support

Topics covered in this chapter:

- *Options for measurement support*
- *Zero the flowmeter*
- *Validate the meter*
- *Perform a (standard) D1 and D2 density calibration*
- *Perform a D3 and D4 density calibration (T-Series sensors only)*
- *Perform temperature calibration*

9.1 Options for measurement support

Micro Motion provides several measurement support procedures to help you evaluate and maintain your flowmeter's accuracy.

The following methods are available:

- Meter validation compares flowmeter measurements reported by the transmitter to an external measurement standard. Meter validation requires one data point.
- Calibration establishes the relationship between a process variable and the signal produced at the sensor. You can calibrate the flowmeter for zero, density, and temperature. Density and temperature calibration require two data points (low and high) and an external measurement for each.

Tips

- To prove the meter against a regulatory standard, or to correct measurement error, use meter validation and meter factors.
- Before performing a field calibration, contact Micro Motion to see if there is an alternative. In many cases, field calibrations have a negative effect on measurement accuracy.

9.2 Zero the flowmeter

Zeroing the flowmeter establishes a baseline for process measurement by analyzing the sensor's output when there is no flow through the sensor tubes.

Important

In most cases, the factory zero is more accurate than the field zero. Do not zero the flowmeter unless one of the following is true:

- The zero is required by site procedures.
- The stored zero value fails the Zero Verification procedure.

Prerequisites

Before performing a field zero, execute the Zero Verification procedure to see whether or not a field zero can improve measurement accuracy. See *Section 2.6*.

Important
Do not verify the zero or zero the flowmeter if a high-severity alarm is active. Correct the problem, then verify the zero or zero the flowmeter. You may verify the zero or zero the flowmeter if a low-severity alarm is active.

9.2.1 Zero the flowmeter using the display

Zeroing the flowmeter establishes a baseline for process measurement by analyzing the sensor's output when there is no flow through the sensor tubes.

Restriction
You cannot change the Zero Time setting from the display. The current setting of Zero Time will be applied to the zero procedure. The default value is 20 seconds. If you need to change Zero Time, you must make a connection to the transmitter from a communications tool such as ProLink II.

Prerequisites

Assign the following as display variables:

- Live Zero or Field Verification Zero
- Drive Gain
- Temperature
- Density

See *Section 5.1.2* for assistance.

Procedure

1. Prepare the flowmeter:

   a. Allow the flowmeter to warm up for at least 20 minutes after applying power.
   b. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
   c. Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.
   d. Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.
   e. Observe the drive gain, temperature, and density readings. If they are stable, check the Live Zero or Field Verification Zero value. If the average value is close to 0, you should not need to zero the flowmeter.
2. Navigate to OFFLINE MAINT > ZERO > CAL ZERO and select CAL/YES?.

   Dots traverse the display while flowmeter zero is in progress.
3. Read the zero result on the display.

The display reports CAL PASS if the zero was successful, or CAL FAIL if it was not.

Postrequisites

Restore normal flow through the sensor by opening the valves.

Need help? If the zero fails:

- Ensure that there is no flow through the sensor, then retry.
- Remove or reduce sources of electromechanical noise, then retry.
- Set Zero Time to a lower value, then retry.
- If the zero continues to fail, contact Micro Motion.
- If you want to return the flowmeter to operation using a previous zero value:
  - To restore the zero value set at the factory: OFFLINE MAINT > ZERO > RESTORE ZERO > RESTORE/YES? .

Restriction
Restore the factory zero only if your flowmeter was purchased as a unit, it was zeroed at the factory, and you are using the original components.

9.2.2 Zero the flowmeter using ProLink II

Zeroing the flowmeter establishes a baseline for process measurement by analyzing the sensor's output when there is no flow through the sensor tubes.

Prerequisites

ProLink II must be running and must be connected to the transmitter.

Procedure

1. Prepare the flowmeter:
   a. Allow the flowmeter to warm up for at least 20 minutes after applying power.
   b. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
   c. Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.
   d. Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.
   e. Observe the drive gain, temperature, and density readings. If they are stable, check the Live Zero or Field Verification Zero value. If the average value is close to 0, you should not need to zero the flowmeter.
2. Choose ProLink > Calibration > Zero Verification and Calibration.
3. Click Calibrate Zero.
4. Modify Zero Time, if desired.

Zero Time controls the amount of time the transmitter takes to determine its zero-flow reference point. The default Zero Time is 20 seconds. For most applications, the default Zero Time is appropriate.

5. Click Perform Auto Zero.

   The Calibration in Progress light will turn red during the zero procedure. At the end of the procedure:

   - If the zero procedure was successful, the Calibration in Progress light returns to green and a new zero value is displayed.
   - If the zero procedure failed, the Calibration Failure light turns red.

Postrequisites

Restore normal flow through the sensor by opening the valves.

Need help? If the zero fails:

- Ensure that there is no flow through the sensor, then retry.
- Remove or reduce sources of electromechanical noise, then retry.
- Set Zero Time to a lower value, then retry.
- If the zero continues to fail, contact Micro Motion.
- If you want to return the flowmeter to operation using a previous zero value:
  - To restore the zero value set at the factory: ProLink > Zero Verification and Calibration > Calibrate Zero > Restore Factory Zero .
  - To restore the most recent valid value from transmitter memory: ProLink > Zero Verification and Calibration > Calibrate Zero > Restore Prior Zero . Restore Prior Zero is available only while the Flow Calibration window is open. If you close the Flow Calibration window, you will no longer be able to restore the prior zero.

Restriction

Restore the factory zero only if your flowmeter was purchased as a unit, it was zeroed at the factory, and you are using the original components.

9.2.3 Zero the flowmeter using the Field Communicator

Zeroing the flowmeter establishes a baseline for process measurement by analyzing the sensor's output when there is no flow through the sensor tubes.

1. Prepare the flowmeter:

   a. Allow the flowmeter to warm up for at least 20 minutes after applying power.
   b. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
   c. Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.
   d. Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.

e. Observe the drive gain, temperature, and density readings. If they are stable, check the Live Zero or Field Verification Zero value. If the average value is close to 0, you should not need to zero the flowmeter.

2. Press Service Tools > Maintenance > Zero Calibration > Perform Auto Zero.
3. Modify Zero Time, if desired.

   Zero Time controls the amount of time the transmitter takes to determine its zero-flow reference point. The default Zero Time is 20 seconds. For most applications, the default Zero Time is appropriate.
4. Press OK to start the zero, and wait while the zero calibration is performed.
5. When the zero is complete, data from the zero calibration is displayed.
   - Press OK to accept the data and store the values.
   - Press ABORT to discard the data and return to the previous zero values.

Postrequisites

Restore normal flow through the sensor by opening the valves.

Need help? If the zero fails:

- Ensure that there is no flow through the sensor, then retry.
- Remove or reduce sources of electromechanical noise, then retry.
- Set Zero Time to a lower value, then retry.
- If the zero continues to fail, contact Micro Motion.
- If you want to return the flowmeter to operation using a previous zero value:
  - To restore the zero value set at the factory: Service Tools > Maintenance > Zero Calibration > Restore Factory Zero .

Restriction

Restore the factory zero only if your flowmeter was purchased as a unit, it was zeroed at the factory, and you are using the original components.

9.3 Validate the meter

Display	OFF-LINE MAINT > CONFG > UNITS > MTR F
ProLink II	ProLink > Configuration > Flow
Field Communicator	Configure > Manual Setup > Measurements > Flow Configure > Manual Setup > Measurements > Density

Overview

Meter validation compares flowmeter measurements reported by the transmitter to an external measurement standard. If the transmitter value for mass flow, volume flow, or density measurement is significantly different from the external measurement standard, you may want to adjust the corresponding meter factor. The flowmeter's actual measurement is multiplied by the meter factor, and the resulting value is reported and used in further processing.

Prerequisites

Identify the meter factor(s) that you will calculate and set. You may set any combination of the three meter factors: mass flow, volume flow, and density. Note that all three meter factors are independent:

- The meter factor for mass flow affects only the value reported for mass flow.
- The meter factor for density affects only the value reported for density.
- The meter factor for volume flow affects only the value reported for volume flow or gas standard volume flow.

Important
To adjust volume flow, you must set the meter factor for volume flow. Setting a meter factor for mass flow and a meter factor for density will not produce the desired result. The volume flow calculations are based on original mass flow and density values, before the corresponding meter factors have been applied.

If you plan to calculate the meter factor for volume flow, be aware that validating volume in the field may be expensive, and the procedure may be hazardous for some process fluids. Therefore, because volume is inversely proportional to density, an alternative to direct measurement is to calculate the meter factor for volume flow from the meter factor for density. See *Section 9.3.1* for instructions on this method.

Obtain a reference device (external measurement device) for the appropriate process variable.

Important
For good results, the reference device must be highly accurate.

Procedure

1. Determine the meter factor as follows:
   a. Use the flowmeter to take a sample measurement.
   b. Measure the same sample using the reference device.
   c. Calculate the meter factor using the following formula:

$$\text{NewMeterFactor} = \text{ConfiguredMeterFactor} \times \frac{\text{ReferenceMeasurement}}{\text{FlowmeterMeasurement}}$$

2. Ensure that the calculated meter factor is between 0.8 and 1.2, inclusive. If the meter factor is outside these limits, contact Micro Motion customer service.

3. Configure the meter factor in the transmitter.

Example: Calculating the meter factor for mass flow

The flowmeter is installed and validated for the first time. The mass flow measurement from the transmitter is 250.27 lb. The mass flow measurement from the reference device is 250 lb. The mass flow meter factor is calculated as follows:

$$MeterFactor_{MassFlow} = 1 \times \frac{250}{250.27} = 0.9989$$

The first meter factor for mass flow is 0.9989.

One year later, the flowmeter is validated again. The mass flow measurement from the transmitter is 250.07 lb. The mass flow measurement from the reference device is 250.25 lb. The new mass flow meter factor is calculated as follows:

$$MeterFactor_{MassFlow} = 0.9989 \times \frac{250.25}{250.07} = 0.9996$$

The new meter factor for mass flow is 0.9996.

9.3.1 Alternate method for calculating the meter factor for volume flow

The alternate method for calculating the meter factor for volume flow is used to avoid the difficulties that may be associated with the standard method.

This alternate method is based on the fact that volume is inversely proportional to density. It provides partial correction of the volume flow measurement by adjusting for the portion of the total offset that is caused by the density measurement offset. Use this method only when a volume flow reference is not available, but a density reference is available.

Procedure

1. Calculate the meter factor for density, using the standard method (see *Section 9.3*).
2. Calculate the meter factor for volume flow from the meter factor for density:

$$MeterFactor_{Volume} = \frac{1}{MeterFactor_{Density}}$$

Note

The following equation is mathematically equivalent to the first equation. You may use whichever version you prefer.

$$MeterFactor_{Volume} = ConfiguredMeterFactor_{Density} \times \frac{Density_{Flowmeter}}{Density_{ReferenceDevice}}$$

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3. Ensure that the calculated meter factor is between 0.8 and 1.2, inclusive. If the meter factor is outside these limits, contact Micro Motion customer service.
4. Configure the meter factor for volume flow in the transmitter.

9.4 Perform a (standard) D1 and D2 density calibration

Density calibration establishes the relationship between the density of the calibration fluids and the signal produced at the sensor. Density calibration includes the calibration of the D1 (low-density) and D2 (high-density) calibration points.

Important

Micro Motion flowmeters are calibrated at the factory, and normally do not need to be calibrated in the field. Calibrate the flowmeter only if you must do so to meet regulatory requirements. Contact Micro Motion before calibrating the flowmeter.

Tip

Micro Motion recommends using meter validation and meter factors, rather than calibration, to prove the meter against a regulatory standard or to correct measurement error.

9.4.1 Perform a D1 and D2 density calibration using ProLink II

Prerequisites

- During density calibration, the sensor must be completely filled with the calibration fluid, and flow through the sensor must be at the lowest rate allowed by your application. This is usually accomplished by closing the shutoff valve downstream from the sensor, then filling the sensor with the appropriate fluid.
- D1 and D2 density calibration require a D1 (low-density) fluid and a D2 (high-density) fluid. You may use air and water.
- If LD Optimization is enabled on your meter, disable it. To do this, choose ProLink > Configuration > Sensor and ensure that the checkbox is not checked. LD Optimization is used only with large sensors in hydrocarbon applications. In some installations, only Micro Motion customer service has access to this parameter. If this is the case, contact Micro Motion before continuing.
- The calibrations must be performed without interruption, in the order shown. Make sure that you are prepared to complete the process without interruption.
- Before performing the calibration, record your current calibration parameters. You can do this by saving the current configuration to a file on the PC. If the calibration fails, restore the known values.

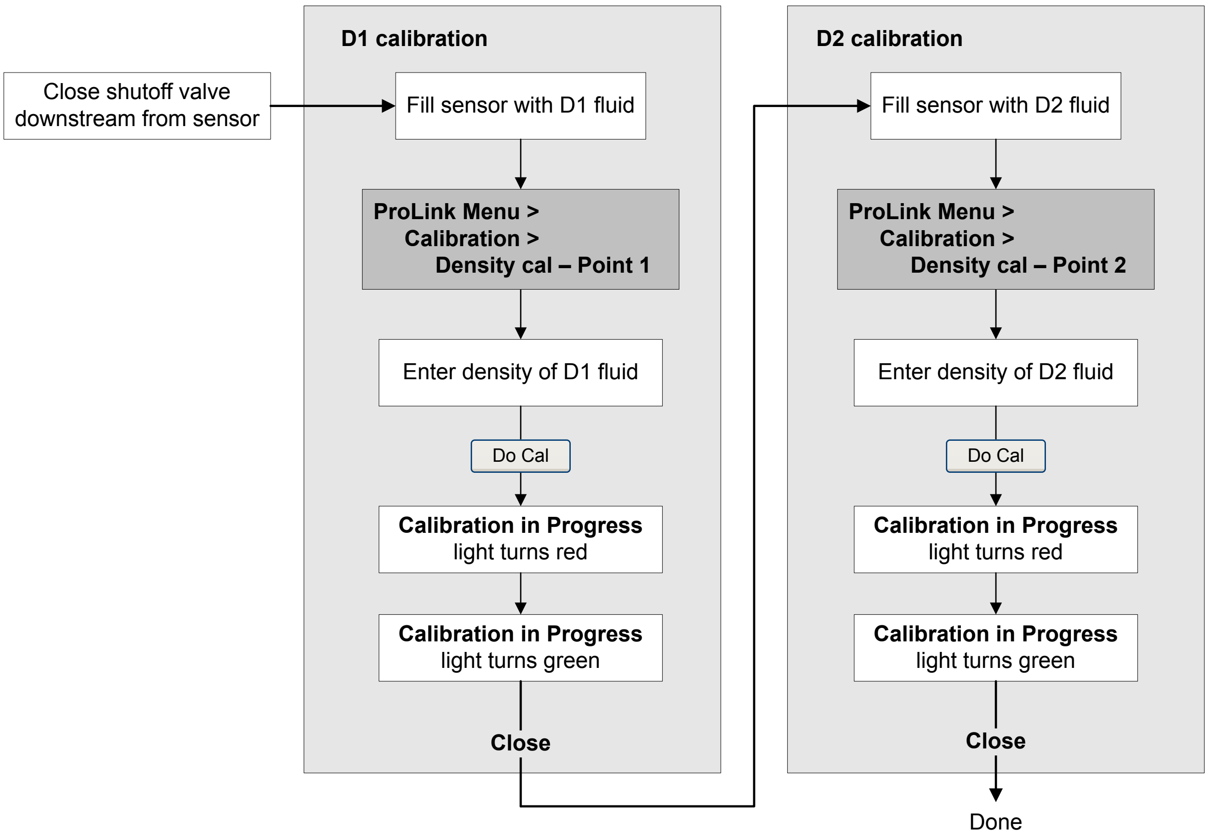
Restriction

For T-Series sensors, the D1 calibration must be performed on air and the D2 calibration must be performed on water.

Procedure

See *Figure 9-1*.

Figure 9-1: D1 and D2 density calibration using ProLink II



Postrequisites

If you disabled LD Optimization before the calibration procedure, re-enable it.

9.4.2 Perform a D1 and D2 density calibration using the Field Communicator

Prerequisites

- During density calibration, the sensor must be completely filled with the calibration fluid, and flow through the sensor must be at the lowest rate allowed by your application. This is usually accomplished by closing the shutoff valve downstream from the sensor, then filling the sensor with the appropriate fluid.
- D1 and D2 density calibration require a D1 (low-density) fluid and a D2 (high-density) fluid. You may use air and water.

- If LD Optimization is enabled on your meter, disable it. To do this, choose Configure > Manual Setup > Measurements > LD Optimization. LD Optimization is used only with large sensors in hydrocarbon applications. In some installations, only Micro Motion customer service has access to this parameter. If this is the case, contact Micro Motion before continuing.
- The calibrations must be performed without interruption, in the order shown. Make sure that you are prepared to complete the process without interruption.
- Before performing the calibration, record your current calibration parameters. If the calibration fails, restore the known values.

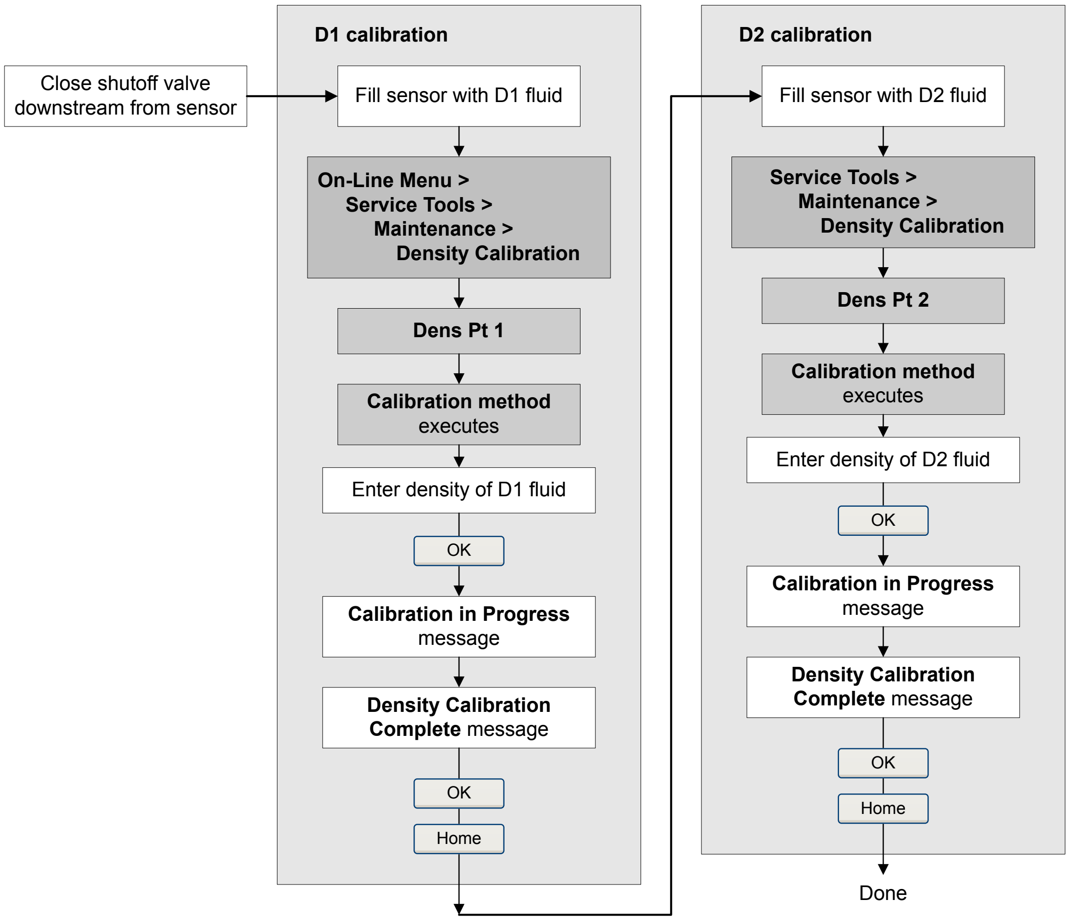
Restriction

For T-Series sensors, the D1 calibration must be performed on air and the D2 calibration must be performed on water.

Procedure

See *Figure 9-2*.

Figure 9-2: D1 and D2 density calibration using the Field Communicator



Postrequisites

If you disabled LD Optimization before the calibration procedure, re-enable it.

9.5 Perform a D3 and D4 density calibration (T-Series sensors only)

For T-Series sensors, the optional D3 and D4 calibration could improve the accuracy of the density measurement if the density of your process fluid is less than 0.8 g/cm^3 or greater than 1.2 g/cm^3.

If you perform the D3 and D4 calibration, note the following:

- Do not perform the D1 and D2 calibration.

- Perform the D3 calibration if you have one calibrated fluid.
- Perform both the D3 and D4 calibrations if you have two calibrated fluids (other than air and water). The calibrations must be performed without interruption, in the order shown. Make sure that you are prepared to complete the process without interruption.

9.5.1 Perform a D3 or D3 and D4 density calibration using ProLink II

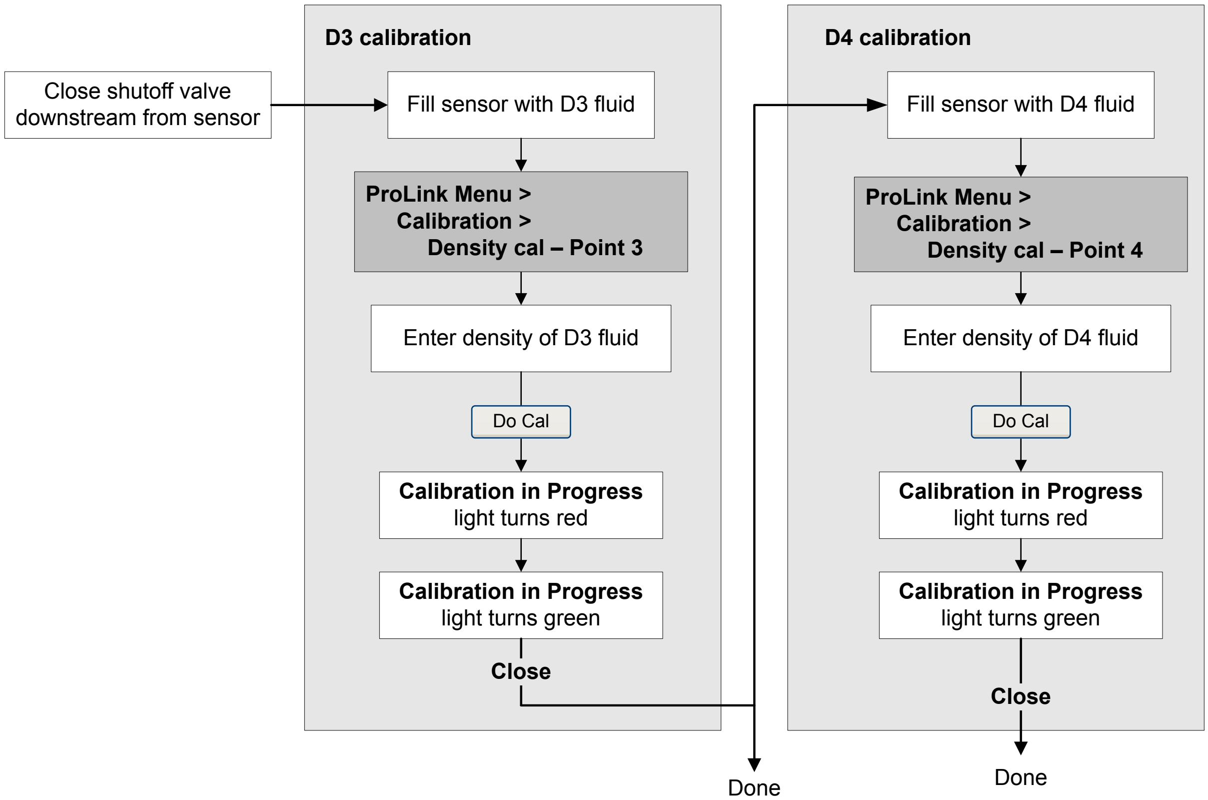
Prerequisites

- During density calibration, the sensor must be completely filled with the calibration fluid, and flow through the sensor must be at the lowest rate allowed by your application. This is usually accomplished by closing the shutoff valve downstream from the sensor, then filling the sensor with the appropriate fluid.
- For D3 density calibration, the D3 fluid must meet the following requirements:
  - Minimum density of 0.6 g/cm^3
  - Minimum difference of 0.1 g/cm^3 between the density of the D3 fluid and the density of water. The density of the D3 fluid may be either greater or less than the density of water.
- For D4 density calibration, the D4 fluid must meet the following requirements:
  - Minimum density of 0.6 g/cm^3
  - Minimum difference of 0.1 g/cm^3 between the density of the D4 fluid and the density of the D3 fluid. The density of the D4 fluid must be greater than the density of the D3 fluid.
  - Minimum difference of 0.1 g/cm^3 between the density of the D4 fluid and the density of water. The density of the D4 fluid may be either greater or less than the density of water.
- Before performing the calibration, record your current calibration parameters. You can do this by saving the current configuration to a file on the PC. If the calibration fails, restore the known values.

Procedure

See *Figure 9-3*.

Figure 9-3: D3 or D3 and D4 density calibration using ProLink II



9.5.2 Perform a D3 or D3 and D4 density calibration using the Field Communicator

Prerequisites

- During density calibration, the sensor must be completely filled with the calibration fluid, and flow through the sensor must be at the lowest rate allowed by your application. This is usually accomplished by closing the shutoff valve downstream from the sensor, then filling the sensor with the appropriate fluid.
- For D3 density calibration, the D3 fluid must meet the following requirements:
  - Minimum density of 0.6 g/cm^3
  - Minimum difference of 0.1 g/cm^3 between the density of the D3 fluid and the density of water. The density of the D3 fluid may be either greater or less than the density of water.
- For D4 density calibration, the D4 fluid must meet the following requirements:
  - Minimum density of 0.6 g/cm^3

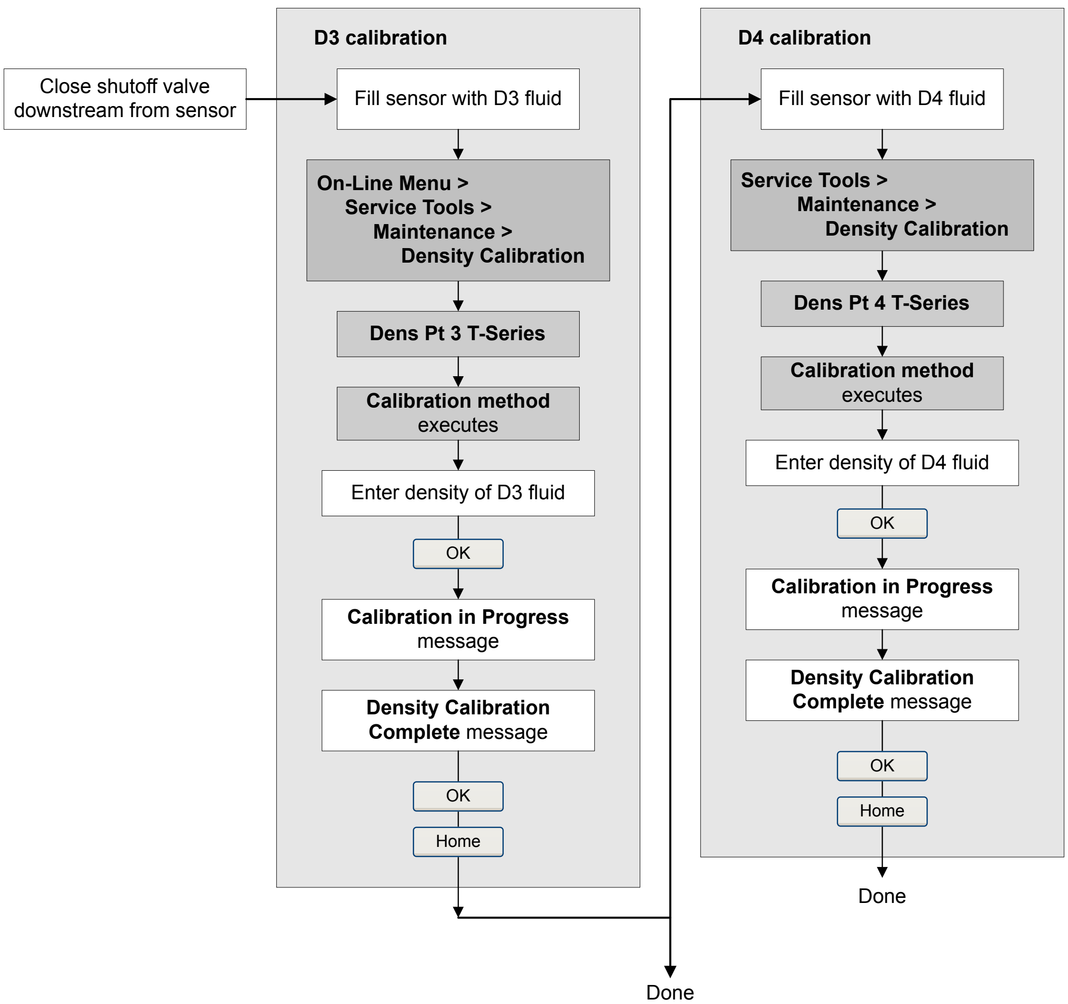
- Minimum difference of 0.1 g/cm^3 between the density of the D4 fluid and the density of the D3 fluid. The density of the D4 fluid must be greater than the density of the D3 fluid.
- Minimum difference of 0.1 g/cm^3 between the density of the D4 fluid and the density of water. The density of the D4 fluid may be either greater or less than the density of water.

- Before performing the calibration, record your current calibration parameters. If the calibration fails, restore the known values.

Procedure

See *Figure 9-4*.

Figure 9-4: D3 or D3 and D4 density calibration using the Field Communicator



9.6 Perform temperature calibration

Temperature calibration establishes the relationship between the temperature of the calibration fluids and the signal produced by the sensor.

9.6.1 Perform temperature calibration using ProLink II

Temperature calibration establishes the relationship between the temperature of the calibration fluids and the signal produced by the sensor.

Prerequisites

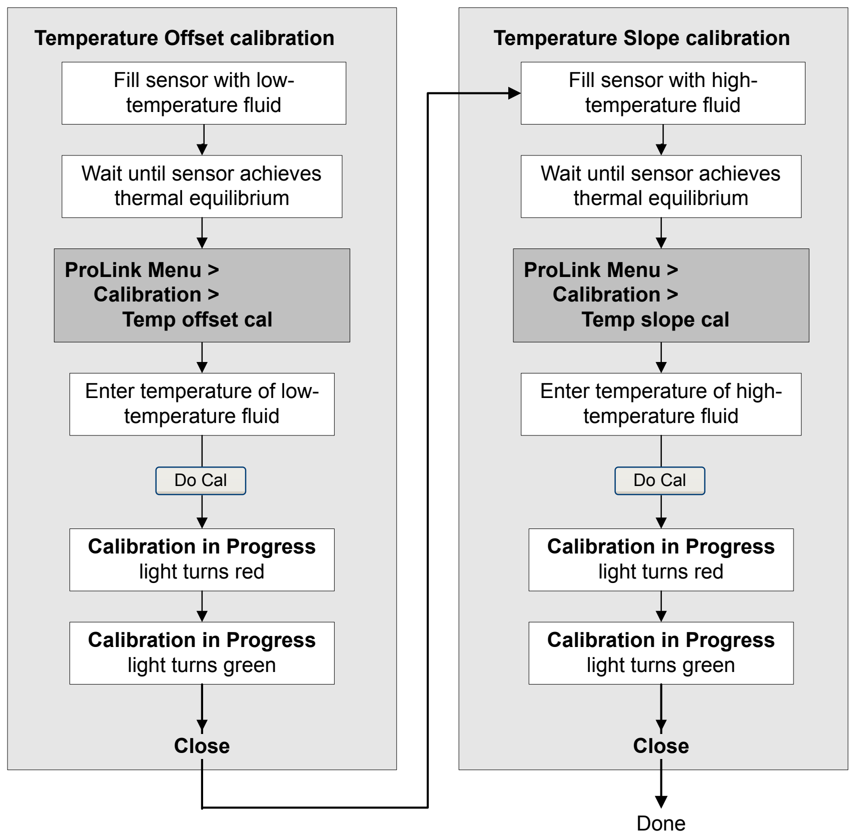
The temperature calibration is a two-part procedure: temperature offset calibration and temperature slope calibration. The two parts must be performed without interruption, in the order shown. Ensure that you are prepared to complete the process without interruption.

Important
Consult Micro Motion before performing a temperature calibration. Under normal circumstances, the temperature circuit is stable and should not need an adjustment.

Procedure

See *Figure 9-5*.

Figure 9-5: Temperature calibration using ProLink II



10 Troubleshooting

Topics covered in this chapter:

- *Status LED states*
- *Status alarms*
- *Flow measurement problems*
- *Density measurement problems*
- *Temperature measurement problems*
- *Milliamp output problems*
- *Frequency output problems*
- *Use sensor simulation for troubleshooting*
- *Check power supply wiring*
- *Check sensor-to-transmitter wiring*
- *Check grounding*
- *Perform loop tests*
- *Trim mA outputs*
- *Check the HART communication loop*
- *Check HART Address and Loop Current Mode*
- *Check HART burst mode*
- *Check Lower Range Value and Upper Range Value*
- *Check mA Output Fault Action*
- *Check for radio frequency interference (RFI)*
- *Check Frequency Output Maximum Pulse Width*
- *Check Frequency Output Scaling Method*
- *Check Frequency Output Fault Action*
- *Check Flow Direction*
- *Check the cutoffs*
- *Check for slug flow (two-phase flow)*
- *Check the drive gain*
- *Check the pickoff voltage*
- *Check for electrical shorts*

10.1 Status LED states

The status LED on the transmitter indicates whether or not alarms are active. If alarms are active, view the alarm list to identify the alarms, then take appropriate action to correct the alarm condition.

Table 10-1: Status LED states

LED behavior	Alarm condition	Description
Solid green	No alarm	Normal operation
Flashing yellow	No alarm	Zero calibration procedure is in progress
Solid yellow	Low-severity alarm	Alarm condition that will not cause measurement error (outputs continue to report process data)
Solid red	High-severity alarm	Alarm condition that will cause measurement error (outputs in fault)

10.2 Status alarms

Table 10-2: Status alarms and recommended actions

Alarm code	Description	Cause	Recommended actions
A001	EEPROM Error (Core Processor)	An uncorrectable checksum mismatch has been detected.	• Cycle power to the meter. • Contact Micro Motion.
A002	RAM Error (Core Processor)	ROM checksum error or a RAM location cannot be written to.	• Cycle power to the meter. • Contact Micro Motion.
A003	No Sensor Response	Continuity failure of drive circuit, LPO, or RPO, or LPO-RPO mismatch when driving.	• Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • Check for electrical shorts. See *Section 10.28*. • Check the integrity of the sensor tubes.
A004	Temperature Overrange	Combination of A016 and A017.	• Check the sensor wiring. See *Section 10.28.1*. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • Verify temperature characterization parameters (Temp Cal Factor). • Check your process conditions against the values reported by the flowmeter. • Contact Micro Motion.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A005	Mass Flow Rate Overrange	The measured flow has exceeded the maximum flow rate of the sensor (ΔT greater than 200 µs).	• If other alarms are present, resolve those alarm conditions first. If the current alarm persists, continue with the recommended actions. • Check your process conditions against the values reported by the flowmeter. • Check for slug flow. See *Section 10.25*. • Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • Check for electrical shorts. See *Section 10.28*. • Check the integrity of the sensor tubes. • Contact Micro Motion.
A006	Characterization Required	Calibration factors have not been entered and the sensor type is incorrect.	• Verify that all of the characterization parameters match the data on the sensor tag. • Contact Micro Motion.
A008	Density Overrange	The measured density has exceeded 10 g/cm^3.	• If other alarms are present, resolve those alarm conditions first. If the current alarm persists, continue with the recommended actions. • Verify process conditions, checking especially for air in the flow tubes, tubes not filled, foreign material in the tubes, or coating in the tubes. • Check for slug flow. See *Section 10.25*. • If accompanied by an A003 alarm, check for electrical shorts. See *Section 10.28*. • Verify that all of the characterization parameters match the data on the sensor tag. • Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • Perform a density calibration. • Contact Micro Motion.
A009	Transmitter Initializing/ Warming Up	Transmitter is in power-up mode.	• Allow the meter to warm up. • Verify that the tubes are full of process fluid. • Check the wiring between the sensor and transmitter. See *Section 10.10*.
A010	Calibration Failure	Many possible causes, such as too much flow through the sensor during a calibration procedure.	• If this alarm appears during zeroing, verify that there is no flow through the sensor, then retry the procedure. • Cycle power to the meter, then retry the procedure.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A011	Zero Calibration Failed: Low	Many possible causes, such as too much flow – especially reverse flow – through the sensor during a calibration procedure.	• Verify that there is no flow through the sensor, then retry the procedure. • Cycle power to the meter, then retry the procedure.
A012	Zero Calibration Failed: High	Many possible causes, such as too much flow – especially forward flow – through the sensor during a calibration procedure.	• Verify that there is no flow through the sensor, then retry the procedure. • Cycle power to the meter, then retry the procedure.
A013	Zero Calibration Failed: Unstable	There was too much instability during the calibration procedure.	• Remove or reduce sources of electromechanical noise (e.g., pumps, vibration, pipe stress), then retry the procedure. • Cycle power to the meter, then retry the procedure.
A014	Transmitter Failure	Many possible causes.	• Cycle power to the meter. • Contact Micro Motion.
A016	Sensor RTD Failure	The value computed for the resistance of the Line RTD is outside limits.	• Check the sensor wiring. See *Section 10.28.1*. • Check your process conditions against the values reported by the flowmeter. • Contact Micro Motion.
A017	T-Series RTD Failure	The value computed for the resistance of the Meter/Case RTD is outside limits.	• Check the sensor wiring. See *Section 10.28.1*. • Check your process conditions against the values reported by the flowmeter. Temperature should be between −200 °F and +400 °F. • Verify that all of the characterization parameters match the data on the sensor tag. • Contact Micro Motion.
A018	EEPROM Error (Transmitter)		• Cycle power to the meter. • Contact Micro Motion.
A019	RAM Error (Transmitter)		• Cycle power to the meter. • Contact Micro Motion.
A020	No Flow Cal Value	The flow calibration factor and/or K1 has not been entered since the last master reset.	• Verify that all of the characterization parameters match the data on the sensor tag.
A021	Incorrect Sensor Type (K1)	The sensor is recognized as a straight tube but the K1 value indicates a curved tube, or vice versa.	• Verify that all of the characterization parameters match the data on the sensor tag.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A022	Configuration Database Corrupt (Core Processor)		• Cycle power to the meter. • Contact Micro Motion.
A026	Sensor/Transmitter Communications Failure		• The core processor may have been disconnected or replaced. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • Check for noise in the wiring or in the transmitter environment.
A027	Security Breach		• Check the HART device ID. • The transmitter has a weights and measures security feature that is currently set to "unsecure." Set the transmitter to "secure" to clear the alarm. An authorized procedure may be required to resecure the transmitter.
A028	Core Processor Write Failure		• Cycle power to the meter. • Contact Micro Motion.
A029	PIC/Daughterboard Communications Failure	Transmitter electronics failure.	• Cycle power to the meter. • Contact Micro Motion.
A030	Incorrect Board Type	The loaded software is not compatible with the programmed board type.	• Cycle power to the meter. • Contact Micro Motion.
A032	Meter Verification in Progress: Outputs to Fault	Meter verification in progress, with outputs set to Fault or Last Measured Value.	• Allow the procedure to complete.
A035	Meter Verification Aborted	The test did not complete, possibly because of a manual abort.	• Verify that process conditions are stable, then retry the test. • Contact Micro Motion.
A100	mA Output 1 Saturated	The calculated amount of current output is outside of the linear range.	• Check the settings of Upper Range Value and Lower Range Value. See *Section 10.17*. • Check process conditions. Actual conditions may be outside of the normal conditions for which the output is configured. • Verify process conditions, checking especially for air in the flow tubes, tubes not filled, foreign material in the tubes, or coating in the tubes. • Verify that the measurement units are configured correctly for your application. • Purge the flow tubes.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A101	mA Output 1 Fixed	Non-zero HART address configured, or the mA output is configured to send a constant value.	• Check whether the output is in loop test mode. If it is, unfix the output. • Exit mA output trim, if applicable. • Check the HART polling address. • Check whether the output has been set to a constant value via digital communication.
A102	Drive Overrange	The drive power (current/voltage) is at its maximum.	• Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • Check for electrical shorts. See *Section 10.28*.
A104	Calibration in Progress	A calibration procedure is in process.	• Allow the procedure to complete. • For zero calibration, you may abort the calibration, set the zero time parameter to a lower value, and restart the calibration.
A105	Slug Flow	The density has exceeded the user-defined slug (density) limits.	• Check for slug flow. See *Section 10.25*.
A106	Burst Mode Enabled	HART burst mode is enabled.	• No action required. • If desired, you can reconfigure the alarm severity level to Ignore.
A107	Power Reset Occurred	The transmitter has been restarted.	• No action required. • If desired, you can reconfigure the alarm severity level to Ignore.
A108	Basic Event 1 On		• No action required. • Review event configuration if you believe the event was triggered erroneously.
A109	Basic Event 2 On		• No action required. • Review event configuration if you believe the event was triggered erroneously.
A110	Frequency Output Saturated	The calculated frequency output is outside of the linear range.	• Check the frequency output scaling. See *Section 10.21*. • Check process conditions. Actual conditions may be outside of the normal conditions for which the output is configured. • Verify process conditions, checking especially for air in the flow tubes, tubes not filled, foreign material in the tubes, or coating in the tubes. • Verify that the measurement units are configured correctly for your application. • Purge the flow tubes.
A111	Frequency Output Fixed	The frequency output has been configured to send a constant value.	• Check whether the output is in loop test mode. If it is, unfix the output. • Check whether the output has been set to a constant value via digital communication.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A113	mA Output 2 Saturated		• Check process conditions. Actual conditions may be outside of the normal conditions for which the output is configured. • Verify process conditions, checking especially for air in the flow tubes, tubes not filled, foreign material in the tubes, or coating in the tubes. • Verify that the measurement units are configured correctly for your application. • Purge the flow tubes. • Check the settings of Upper Range Value and Lower Range Value. See *Section 10.17*.
A114	mA Output 2 Fixed		• Check whether the output is in loop test mode. If it is, unfix the output. • Exit mA output trim, if applicable. • Check whether the output has been set to a constant value via digital communication.
A115	No External Input or Polled Data	The HART polling connection to an external device has failed. No response received from polled device. The mA input connection to an external device has failed. No response received from the external device.	• Verify the external device operation. • Verify the wiring between the transmitter and the external device. • Verify the HART polling configuration. • Verify the mA input configuration.
A116	Temperature Overrange (Petroleum)		• Check your process conditions against the values reported by the flowmeter. • Verify the configuration of the petroleum measurement table type and temperature.
A117	Density Overrange (Petroleum)		• Check your process conditions against the values reported by the flowmeter. • Verify the configuration of the petroleum measurement table type and density.
A118	Discrete Output 1 Fixed	The discrete output has been configured to send a constant value.	• Check whether the output is in loop test mode. If it is, unfix the output.
A120	Curve Fit Failure (Concentration)		• Verify the configuration of the concentration measurement application.
A121	Extrapolation Alarm (Concentration)		• Check your process conditions against the values reported by the flowmeter. • Verify the configuration of the concentration measurement application.

Table 10-2: Status alarms and recommended actions *(continued)*

Alarm code	Description	Cause	Recommended actions
A131	Meter Verification in Progress: Outputs to Last Measured Value	Meter verification in progress, with outputs set to Last Measured Value.	• Allow the procedure to complete.
A132	Sensor Simulation Active	Simulation mode is enabled.	• No action required. • Disable sensor simulation.
A133	EEPROM Error (Display)	The transmitter display is not functional.	• Contact Micro Motion.
A141	DDC trigger(s) have completed		
N/A	Density FD Calibration in Progress		• Allow the procedure to complete.
N/A	Density D1 Calibration in Progress		• Allow the procedure to complete.
N/A	Density D2 Calibration in Progress		• Allow the procedure to complete.
N/A	Density D3 Calibration in Progress		• Allow the procedure to complete.
N/A	Density D4 Calibration in Progress		• Allow the procedure to complete.
N/A	Zero Calibration in Progress		• Allow the procedure to complete.
N/A	Reverse Flow		• No action required.

10.3 Flow measurement problems

Table 10-3: Flow measurement problems and recommended actions

Problem	Possible causes	Recommended actions
Flow indication at no flow conditions or zero offset	• Misaligned piping (especially in new installations) • Open or leaking valve • Incorrect sensor zero	• Verify that all of the characterization parameters match the data on the sensor tag. • If the flow reading is not excessively high, review the live zero. You may need to restore the factory zero. • Check for open or leaking valves or seals. • Check for mounting stress on the sensor (e.g., sensor being used to support piping, misaligned piping). • Contact Micro Motion.

Table 10-3: Flow measurement problems and recommended actions *(continued)*

Problem	Possible causes	Recommended actions
Erratic non-zero flow rate under no-flow conditions	• Leaking valve or seal • Slug flow • Plugged or coated flow tube • Incorrect sensor orientation • Wiring problem • Vibration in pipeline at rate close to sensor tube frequency • Damping value too low • Mounting stress on sensor	• Verify that the sensor orientation is appropriate for your application (refer to the sensor installation manual). • Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • If the wiring between the sensor and the transmitter includes a 9-wire segment, verify that the 9-wire cable shields are correctly grounded. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • For sensors with a junction box, check for moisture in the junction box. • Purge the flow tubes. • Check for open or leaking valves or seals. • Check for sources of vibration. • Verify damping configuration. • Verify that the measurement units are configured correctly for your application. • Check for slug flow. See *Section 10.25*. • Check for radio frequency interference. See *Section 10.19*. • Contact Micro Motion.
Erratic non-zero flow rate when flow is steady	• Slug flow • Damping value too low • Plugged or coated flow tube • Output wiring problem • Problem with receiving device • Wiring problem	• Verify that the sensor orientation is appropriate for your application (refer to the sensor installation manual). • Check the drive gain and the pickoff voltage. See *Section 10.26* and *Section 10.27*. • If the wiring between the sensor and the transmitter includes a 9-wire segment, verify that the 9-wire cable shields are correctly grounded. • Check for air entrainment, tube fouling, flashing, or tube damage. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • For sensors with a junction box, check for moisture in the junction box. • Purge the flow tubes. • Check for open or leaking valves or seals. • Check for sources of vibration. • Verify damping configuration. • Verify that the measurement units are configured correctly for your application. • Check for slug flow. See *Section 10.25*. • Check for radio frequency interference. See *Section 10.19*. • Contact Micro Motion.

Table 10-3: Flow measurement problems and recommended actions *(continued)*

Problem	Possible causes	Recommended actions
Inaccurate flow rate or batch total	• Wiring problem • Inappropriate measurement unit • Incorrect flow calibration factor • Incorrect meter factor • Incorrect density calibration factors • Incorrect flowmeter grounding • Slug flow • Problem with receiving device	• Check the wiring between the sensor and transmitter. See *Section 10.10*. • Verify that the measurement units are configured correctly for your application. • Verify that all of the characterization parameters match the data on the sensor tag. • Zero the meter. • Check grounding. See *Section 10.11*. • Check for slug flow. See *Section 10.25*. • Verify that the receiving device, and the wiring between the transmitter and the receiving device. • Check sensor coil resistance and for shorts to case. See *Section 10.28.1*. • Replace the core processor or transmitter.

10.4 Density measurement problems

Table 10-4: Density measurement problems and recommended actions

Problem	Possible causes	Recommended actions
Inaccurate density reading	• Problem with process fluid • Incorrect density calibration factors • Wiring problem • Incorrect flowmeter grounding • Slug flow • Plugged or coated flow tube • Incorrect sensor orientation • RTD failure • Physical characteristics of sensor have changed	• Check the wiring between the sensor and transmitter. See *Section 10.10*. • Check grounding. See *Section 10.11*. • Check your process conditions against the values reported by the flowmeter. • Verify that all of the characterization parameters match the data on the sensor tag. • Check for slug flow. See *Section 10.25*. • If two sensors with similar frequency are too near each other, separate them. • Purge the flow tubes.
Unusually high density reading	• Plugged or coated flow tube • Incorrect K2 value • Incorrect temperature measurement • RTD problem • In high frequency meters, this can be an indication of erosion or corrosion • In low frequency meters this can indicate tube fouling	• Verify that all of the characterization parameters match the data on the sensor tag. • Purge the flow tubes. • Check for coating in the flow tubes.

Table 10-4: Density measurement problems and recommended actions *(continued)*

Problem	Possible causes	Recommended actions
Unusually low density reading	• Slug flow • Incorrect K2 value • In low frequency meters this can indicate erosion or corrosion	• Check your process conditions against the values reported by the flowmeter. • Verify that all of the characterization parameters match the data on the sensor tag. • Check the wiring between the sensor and transmitter. See *Section 10.10*. • Check for tube erosion, especially if the process fluid is abrasive.

10.5 Temperature measurement problems

Table 10-5: Temperature measurement problems and recommended actions

Problem	Possible causes	Recommended actions
Temperature reading significantly different from process temperature	• RTD failure • Wiring problem	• Check junction box for moisture or verdigris. • Perform RTD resistance checks and check for shorts to case (see *Section 10.28.1*). • Confirm the temperature calibration factor matches the value on the sensor tag. • Refer to status alarms (especially RTD failure alarms). • Disable external temperature compensation. • Verify temperature calibration. • Check the wiring between the sensor and transmitter. See *Section 10.10*.
Temperature reading slightly different from process temperature	• Sensor temperature not yet equalized • Sensor leaking heat	• The RTD has a specification of ±1 °C. If the error is within this range there is no problem. If the temperature measurement is outside the specification for the sensor, contact Micro Motion. • The temperature of the fluid may be changing rapidly. Allow sufficient time for the sensor to equalize with the process fluid. • Insulate the sensor if necessary. • Perform RTD resistance checks and check for shorts to case (see *Section 10.28.1*). • The RTD may not be making good contact with the sensor. The sensor may need to be replaced.

10.6 Milliamp output problems

Table 10-6: Milliamp output problems and recommended actions

Problem	Possible causes	Recommended actions
No mA output	• Wiring problem • Circuit failure	• Check the power supply and power supply wiring. See Section 10.9. • Check the mA output wiring. • Check the Fault Action settings. See Section 10.18. • Measure DC voltage across output terminals to verify that the output is active. • Contact Micro Motion.
Loop test failed	• Power supply problem • Wiring problem • Circuit failure • Incorrect internal/external power configuration	• Check the power supply and power supply wiring. See Section 10.9. • Check the mA output wiring. • Check the Fault Action settings. See Section 10.18. • Contact Micro Motion.
mA output below 4 mA	• Open in wiring • Bad output circuit • Process condition below LRV • LRV and URV are not set correctly • Fault condition if fault action is set to internal zero or downscale • Bad mA receiving device	• Check your process conditions against the values reported by the flowmeter. • Verify that the receiving device, and the wiring between the transmitter and the receiving device. • Check the settings of Upper Range Value and Lower Range Value. See Section 10.17. • Check the Fault Action settings. See Section 10.18.
Constant mA output	• Incorrect process variable assigned to the output • Fault condition exists • Non-zero HART address (mA output 1) • Output is configured for loop test mode • Zero calibration failure	• Verify the output variable assignments. • View and resolve any existing alarm conditions. • Check the HART address and Loop Current Mode. See Section 10.15. • Check to see if a loop test is in process (the output is fixed). • Check HART burst mode configuration. See Section 10.16. • If related to a zero calibration failure, cycle power to the meter and retry the zeroing procedure.

Table 10-6: Milliamp output problems and recommended actions *(continued)*

Problem	Possible causes	Recommended actions
mA output consistently out of range	• Incorrect process variable or units assigned to output • Fault condition if fault action is set to upscale or downscale • LRV and URV are not set correctly	• Verify the output variable assignments. • Verify the measurement units configured for the output. • Check the Fault Action settings. See *Section 10.18*. • Check the settings of Upper Range Value and Lower Range Value. See *Section 10.17*. • Check the mA output trim. See *Section 10.13*.
Consistently incorrect mA measurement	• Loop problem • Output not trimmed correctly • Incorrect flow measurement unit configured • Incorrect process variable configured • LRV and URV are not set correctly	• Check the mA output trim. See *Section 10.13*. • Verify that the measurement units are configured correctly for your application. • Verify the process variable assigned to the mA output. • Check the settings of Upper Range Value and Lower Range Value. See *Section 10.17*.
mA output correct at lower current, but incorrect at higher current	• mA loop resistance may be set too high	• Verify that the mA output load resistance is below maximum supported load (see the installation manual for your transmitter).

10.7 Frequency output problems

Table 10-7: Frequency output problems and recommended actions

Problem	Possible causes	Recommended actions
No frequency output	• Stopped totalizer • Process condition below cutoff • Fault condition if fault action is set to internal zero or downscale • Slug flow • Flow in reverse direction from configured flow direction parameter • Bad frequency receiving device • Output level not compatible with receiving device • Bad output circuit • Incorrect internal/external power configuration • Incorrect pulse width configuration • Output not powered • Wiring problem	• Verify that the process conditions are below the low-flow cutoff. Reconfigure the low-flow cutoff if necessary. • Check the Fault Action settings. See *Section 10.18*. • Verify that the totalizers are not stopped. A stopped totalizer will cause the frequency output to be locked. • Check for slug flow. See *Section 10.25*. • Check flow direction. See *Section 10.23*. • Verify that the receiving device, and the wiring between the transmitter and the receiving device. • Verify that the channel is wired and configured as a frequency output. • Verify the power configuration for the frequency output (internal vs. external). • Check the pulse width. See *Section 10.20*. • Perform a loop test. See *Section 10.12*.
Consistently incorrect frequency measurement	• Output not scaled correctly • Incorrect flow measurement unit configured	• Check the frequency output scaling. See *Section 10.21*. • Verify that the measurement units are configured correctly for your application.
Erratic frequency output	• Radio frequency interference (RFI) from environment	• Check for radio frequency interference. See *Section 10.19*.

10.8 Use sensor simulation for troubleshooting

When sensor simulation is enabled, the transmitter reports user-specified values for mass flow, temperature, and density. This allows you to reproduce various process conditions or to test the system.

You can use sensor simulation to help distinguish between legitimate process noise and externally caused variation. For example, consider a receiving device that reports an unexpectedly erratic flow value. If sensor simulation is enabled and the observed flow rate does not match the simulated value, the source of the problem is likely to be somewhere between the transmitter and the receiving device.

Important

When sensor simulation is active, the simulated value is used in all transmitter outputs and calculations, including totals and inventories, volume flow calculations, and concentration calculations. Disable all automatic functions related to the transmitter outputs and place the loop in manual operation. Do not enable simulation mode unless your application can tolerate these effects, and be sure to disable simulation mode when you have finished testing.

For more information on using sensor simulation, see #unique_253.

10.9 Check power supply wiring

If the power supply wiring is damaged or improperly connected, the transmitter may not receive enough power to operate properly.

Prerequisites

You will need the installation manual for your transmitter.

The electronics module must be removed from the transmitter housing base.

Procedure

1. Before inspecting the power supply wiring, disconnect the power source.

   ⚠ **CAUTION!**

   If the transmitter is in a hazardous area, wait five minutes after disconnecting the power.

2. Verify that the correct external fuse is used.

   An incorrect fuse can limit current to the transmitter and keep it from initializing.
3. Ensure that the power supply wires are connected to the correct terminals.
4. Verify that the power supply wires are making good contact, and are not clamped to the wire insulation.
5. Inspect the voltage label on the inside of the field-wiring compartment.

   The voltage supplied to the transmitter should match the voltage specified on the label.

6. Reapply power to the transmitter.

   ⚠ **CAUTION!**

   If the transmitter is in a hazardous area, do not reapply power to the transmitter with the housing cover removed. Reapplying power to the transmitter while the housing cover is removed could cause an explosion.

7. Use a voltmeter to test the voltage at the transmitter's power supply terminals.

   The voltage should be within specified limits. For DC power, you may need to size the cable.

10.10 Check sensor-to-transmitter wiring

A number of power-supply and output problems may occur if the wiring between the sensor and the transmitter is improperly connected, or if the wiring becomes damaged.

Prerequisites

You will need the installation manual for your transmitter.

Procedure

1. Before opening the wiring compartments, disconnect the power source.

   ⚠ **CAUTION!**

   If the transmitter is in a hazardous area, wait five minutes after disconnecting the power.

2. Verify that the transmitter is connected to the sensor according to the information provided in your transmitter installation manual.
3. Verify that the wires are making good contact with the terminals.
4. Check the continuity of all wires from the transmitter to the sensor.

10.11 Check grounding

The sensor and the transmitter must be grounded.

Prerequisites

You will need:

- Installation manual for your sensor
- Installation manual for your transmitter

Procedure

Refer to the sensor and transmitter installation manuals for grounding requirements and instructions.

10.12 Perform loop tests

A loop test is a way to verify that the transmitter and the remote device are communicating properly. A loop test also helps you know whether you need to trim mA outputs.

10.12.1 Perform loop tests using the display

A loop test is a way to verify that the transmitter and the remote device are communicating properly. A loop test also helps you know whether you need to trim mA outputs.

Prerequisites

Follow appropriate procedures to ensure that loop testing will not interfere with existing measurement and control loops.

Procedure

1. Test the mA output(s).
   a. Read the mA current at the receiving device and compare it to the transmitter output.

      The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

   b. At the transmitter, activate Select.
   c. Scroll to and select a high value, e.g., 20 mA.

      Dots traverse the display while the output is fixed.

   d. Read the mA current at the receiving device and compare it to the transmitter output.

      The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

   e. At the transmitter, activate Select.
2. Test the frequency output(s).
   a. Choose OFFLINE MAINT > SIM > FO SIM, and select the frequency output value.

      The frequency output can be set to 1, 10, or 15 kHz.

      Note
      If the Weights & Measures application is enabled on the transmitter, it is not possible to perform a loop test of the frequency output, even when the transmitter is unsecured.

      Dots traverse the display while the output is fixed.

   b. Read the frequency signal at the receiving device and compare it to the transmitter output.
   c. At the transmitter, activate Select.
3. Test the discrete output(s).

a. Choose OFFLINE MAINT > SIM > DO SIM, and select SET ON.

   Dots traverse the display while the output is fixed.

b. Verify the signal at the receiving device.
c. At the transmitter, activate Select.
d. Scroll to and select SET OFF.
e. Verify the signal at the receiving device.
f. At the transmitter, activate Select.

4. Test the discrete input.

   a. Set the remote input device to generate a known fixed current.
   b. At the transmitter, choose OFFLINE MAINT > SIM, and select READ DI.
   c. At the transmitter, activate Select.
   d. Verify the signal at the transmitter.
   e. Repeat the procedure for the other signal state.

5. Test the mA input.

   a. Set the remote input device to generate a known fixed current.
   b. At the transmitter, choose OFFLINE MAINT > SIM, and select READ MAI.
   c. Verify the current value.

Postrequisites

- If the mA output reading at the receiving device was slightly inaccurate, you can correct this discrepancy by trimming the output.
- If the mA output reading at the receiving device was significantly inaccurate, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the mA input reading was slightly off at the transmitter, calibrate the mA signal at the remote input device.
- If the discrete output reading is reversed, check the setting of Discrete Output Polarity.
- If the discrete input reading is reversed, check the setting of Discrete Input Polarity.

10.12.2 Perform loop tests using ProLink II

A loop test is a way to verify that the transmitter and the remote device are communicating properly. A loop test also helps you know whether you need to trim mA outputs.

Prerequisites

Follow appropriate procedures to ensure that loop testing will not interfere with existing measurement and control loops.

ProLink II must be running and must be connected to the transmitter.

Procedure

1. Test the mA output(s).
    a. Choose ProLink > Test > Fix Milliamp.
    b. Enter 0 mA or 4 mA in Set Output To.
    c. Click Fix mA.
    d. Read the mA current at the receiving device and compare it to the transmitter output.

       The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.
    e. Click UnFix mA.
    f. Enter 20 mA in Set Output To.
    g. Click Fix mA.
    h. Read the mA current at the receiving device and compare it to the transmitter output.

       The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.
    i. Click UnFix mA.
2. Test the frequency output(s).
    a. Choose ProLink > Test > Fix Freq Out.
    b. Enter the frequency output value in Set Output To.
    c. Click Fix Frequency.
    d. Read the frequency signal at the receiving device and compare it to the transmitter output.
    e. Click UnFix Freq.
3. Test the discrete output(s).
    a. Choose ProLink > Test > Fix Discrete Output.
    b. Select On.
    c. Verify the signal at the receiving device.
    d. Select Off.
    e. Verify the signal at the receiving device.
    f. Click UnFix.
4. Test the discrete input.
    a. Set the remote input device to ON.
    b. Choose ProLink > Test > Read Discrete Input.
    c. Verify the signal at the transmitter.

d. Set the remote input device to OFF.

e. Choose ProLink > Test > Read Discrete Input.

f. Verify the signal at the transmitter.

5. Test the mA input.

a. Set the remote input device to generate a known fixed current.

b. Choose ProLink > Test > Read MA Input.

c. Return the remote input device to normal operation.

Postrequisites

- If the mA output reading at the receiving device was slightly inaccurate, you can correct this discrepancy by trimming the output.
- If the mA output reading at the receiving device was significantly inaccurate, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the mA input reading was slightly off at the transmitter, calibrate the mA signal at the remote input device.
- If the discrete output reading is reversed, check the setting of Discrete Output Polarity.
- If the discrete input reading is reversed, check the setting of Discrete Input Polarity.

10.12.3 Perform loop tests using the Field Communicator

A loop test is a way to verify that the transmitter and the remote device are communicating properly. A loop test also helps you know whether you need to trim mA outputs.

Prerequisites

Follow appropriate procedures to ensure that loop testing will not interfere with existing measurement and control loops.

Procedure

1. Test the mA output(s).

a. Choose Service Tools > Simulate > Simulate Outputs > mA Output 1 Loop Test or Service Tools > Maintenance > Simulate Outputs > mA Output 2 Loop Test, and select 4 mA.

b. Choose Service Tools > Simulate > Simulate Outputs > mA Output Loop Test and select 4 mA.

c. Read the mA current at the receiving device and compare it to the transmitter output.

The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

d. Press OK.

e. Select 20 mA.

f. Read the mA current at the receiving device and compare it to the transmitter output.

   The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

g. Press OK.

h. Choose End.

2. Test the frequency output(s).

Note

If the Weights & Measures application is enabled on the transmitter, it is not possible to perform a loop test of the frequency output, even when the transmitter is unsecured.

a. Press Service Tools > Simulate > Simulate Outputs > Frequency Output Test, and choose the frequency output level.

b. Read the frequency signal at the receiving device and compare it to the transmitter output.

c. Choose End.

3. Test the discrete output(s).

a. Choose Off.

b. Verify the signal at the receiving device.

c. Press OK.

d. Choose On.

e. Verify the signal at the receiving device.

f. Press OK.

g. Choose End.

Postrequisites

- If the mA output reading at the receiving device was slightly inaccurate, you can correct this discrepancy by trimming the output.
- If the mA output reading at the receiving device was significantly inaccurate, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the discrete output reading is reversed, check the setting of Discrete Output Polarity.

10.13 Trim mA outputs

Trimming an mA output calibrates the transmitter's mA output to the receiving device. If the current trim values are inaccurate, the transmitter will under-compensate or over-compensate the output.

10.13.1 Trim mA outputs using ProLink II

Trimming the mA output establishes a common measurement range between the transmitter and the device that receives the mA output.

Important
You must trim the output at both ends (0 mA or 4 mA, and 20 mA) to ensure that it is compensated accurately across the entire output range.

Prerequisites

Ensure that the mA output is wired to the receiving device that will be used in production.

Procedure

1. Choose ProLink > Calibration > Milliamp 1 Trim or ProLink > Calibration > Milliamp 2 Trim.
2. Follow the instructions in the guided method.

   Important
   If you are using a HART/Bell 202 connection, the HART signal over the primary mA output affects the mA reading. Disconnect the wiring between ProLink II and the transmitter terminals when reading the primary mA output at the receiving device. Reconnect to continue the trim.

3. Check the trim values, and contact Micro Motion customer service if any value is less than −200 microamps or greater than +200 microamps.

10.13.2 Trim mA outputs using the Field Communicator

Trimming the mA output establishes a common measurement range between the transmitter and the device that receives the mA output.

Important
You must trim the output at both ends (0 mA or 4 mA, and 20 mA) to ensure that it is compensated accurately across the entire output range.

Prerequisites

Ensure that the mA output is wired to the receiving device that will be used in production.

Procedure

1. Choose Service Tools > Maintenance > Routine Maintenance > Trim mA output 1.
2. Follow the instructions in the guided method.

Important

The HART signal over the primary mA output affects the mA reading. Disconnect the wiring between the Field Communicator and the transmitter terminals when reading the primary mA output at the receiving device. Reconnect to continue the trim.

3. Choose Service Tools > Maintenance > Routine Maintenance > Trim mA output 2.
4. Follow the instructions in the guided method.
5. Check the trim values, and contact Micro Motion customer service if any value is less than −200 microamps or greater than +200 microamps.

10.14 Check the HART communication loop

If you cannot establish or maintain HART communications, the HART loop may be wired incorrectly.

Prerequisites

You will need:

- A copy of your transmitter installation manual
- A Field Communicator
- Optional: the *HART Application Guide*, available at www.hartcomm.org

Procedure

1. Verify that the loop wires are connected as shown in the wiring diagrams in the transmitter installation manual.

   If your HART network is more complex than the wiring diagrams in the transmitter installation manual, contact either Micro Motion or the HART Communication Foundation.
2. Disconnect the primary mA output wiring from the transmitter.
3. Install a 250–1000 Ω resistor across the transmitter's primary mA output terminals.
4. Check the voltage drop across the resistor (4–20 mA = 1–5 VDC).

   If voltage drop is less than 1 VDC, add resistance to achieve a voltage drop of greater than 1 VDC.
5. Connect a Field Communicator directly across the resistor and attempt to communicate (poll).

   If communication with the transmitter cannot be established, the transmitter may need service. Contact Micro Motion.

10.15 Check HART Address and Loop Current Mode

If the transmitter is producing a fixed current from the mA output, the Loop Current Mode parameter may be disabled.

When Loop Current Mode is disabled, the mA output produces a fixed value, and does not report process data or implement its fault action.

When HART Address is changed, some configuration tools will automatically change Loop Current Mode.

Tip
Always verify Loop Current Mode after setting or changing HART Address.

Procedure

1. Set HART Address as appropriate for your HART network.

   The default address is 0. This is the recommended value unless the transmitter is in a multidrop network.
2. Set Loop Current Mode to Enabled.

10.16 Check HART burst mode

HART burst mode can cause the transmitter to output unexpected values. Burst mode is normally disabled, and should only be enabled if another device on the HART network requires burst mode communication.

1. Check to see if burst mode is enabled or disabled.
2. If burst mode is enabled, disable it.

10.17 Check Lower Range Value and Upper Range Value

If the process conditions fall below the configured Lower Range Value (LRV) or rise above the configured Upper Range Value (URV), the transmitter outputs may send unexpected values.

1. Make a note of your current process conditions.
2. Check the configuration of the LRV and URV.

10.18 Check mA Output Fault Action

mA Output Fault Action controls the behavior of the mA output if the transmitter encounters an internal fault condition. If the mA output is reporting a constant value below 4 mA or above 20 mA, the transmitter may be in a fault condition.

1. Check the status alarms for active fault conditons.
2. If there are active fault conditions, the transmitter is performing correctly. If you want to change its behavior, consider the following options:
   - Change the setting of mA Output Fault Action.
   - For the relevant status alarms, change the setting of Alarm Severity to Ignore.
3. If there are no active fault conditions, continue troubleshooting.

10.19 Check for radio frequency interference (RFI)

The transmitter's frequency output or discrete output can be affected by radio frequency interference (RFI). Possible sources of RFI include a source of radio emissions, or a large transformer, pump, or motor that can generate a strong electromagnetic field. Several methods to reduce RFI are available. Use one or more of the following suggestions, as appropriate to your installation.

Procedure

- Eliminate the RFI source.
- Move the transmitter.
- Use shielded cable for the frequency output or discrete output.
  - Terminate the shielding at the output device. If this is impossible, terminate the shielding at the cable gland or conduit fitting.
  - Do not terminate the shielding inside the wiring compartment.
  - 360-degree termination of shielding is unnecessary.

10.20 Check Frequency Output Maximum Pulse Width

If Frequency Output Maximum Pulse Width is set incorrectly, the frequency output may report an incorrect value.

Verify the configuration of Frequency Output Maximum Pulse Width.

For most applications, the default value for Frequency Output Maximum Pulse Width is appropriate. This corresponds to a 50% duty cycle.

10.21 Check Frequency Output Scaling Method

If Frequency Output Scaling Method is set incorrectly, the frequency output may report an incorrect value.

1. Verify the configuration of Frequency Output Scaling Method.

2. If you changed the setting of Frequency Output Scaling Method, check the settings of all other frequency output parameters.

10.22 Check Frequency Output Fault Action

The Frequency Output Fault Action controls the behavior of the frequency output if the transmitter encounters an internal fault condition. If the frequency output is reporting a constant value, the transmitter may be in a fault condition.

1. Check the status alarms for active fault conditons.
2. If there are active fault conditions, the transmitter is performing correctly. If you want to change its behavior, consider the following options:
   - Change the setting of Frequency Output Fault Action.
   - For the relevant status alarms, change the setting of Alarm Severity to Ignore.
3. If there are no active fault conditions, continue troubleshooting.

10.23 Check Flow Direction

If Flow Direction is set inappropriately for your process, the transmitter may report unexpected flow values or totals.
The Flow Direction parameter interacts with actual flow direction to affect flow values, flow totals and inventories, and output behavior. For the simplest operation, actual process flow should match the flow arrow that is on the side of the sensor case.

Procedure

1. Verify the actual direction of process flow through the sensor.
2. Verify the configuration of Flow Direction.

10.24 Check the cutoffs

If the transmitter cutoffs are configured incorrectly, the transmitter may report zero flow when flow is present, or very small amounts of flow under no-flow conditions.

There are separate cutoff parameters for mass flow rate, volume flow rate, gas standard volume flow rate (if applicable), and density. There is an independent cutoff for each mA output on your transmitter. The interaction between cutoffs sometimes produces unexpected results.

Procedure

Verify the configuration of the cutoffs.

Tip
For typical applications, Micro Motion recommends setting Mass Flow Cutoff to the zero stability value for your sensor, multiplied by 10. Zero stabiliy values can be found in the Product Data Sheet for your sensor.

10.25 Check for slug flow (two-phase flow)

Slug flow (two-phase flow, entrained gas) can cause spikes in the drive gain. This may cause the transmitter to report zero flow, or to post several different alarms.

1. Check for slug flow alarms.

   If the transmitter is not generating slug flow alarms, slug flow is not the source of your problem.

2. Check the process for cavitation, flashing, or leaks.
3. Monitor the density of your process fluid output under normal process conditions.
4. Check the settings of Slug Low Limit, Slug High Limit, and Slug Duration.

Tip
You can reduce the occurrence of slug flow alarms by setting Slug Low Limit to a lower value, Slug High Limit to a higher value, or Slug Duration to a higher value.

10.26 Check the drive gain

Excessive or erratic drive gain may indicate any of a variety of process conditions, sensor problems, or configuration problems.

To know whether your drive gain is excessive or erratic, you must collect drive gain data during the problem condition and compare it to drive gain data from a period of normal operation.

Excessive (saturated) drive gain

Table 10-8: Possible causes and recommended actions for excessive (saturated) drive gain

Possible cause	Recommended actions
Slug flow	Check for slug flow. See *Section 10.25*.
Partially filled flow tube	Correct process conditions so that the flow tubes are full.
Plugged flow tube	Check the pickoff voltages (see *Section 10.27*). If either of them are close to zero (but neither is zero), plugged tubes may be the source of your problem. Purge the tubes. In extreme cases, you may need to replace the sensor.

Table 10-8: Possible causes and recommended actions for excessive (saturated) drive gain *(continued)*

Possible cause	Recommended actions
Cavitation, flashing, or air entrainment; settling of two- or three-phase fluids	• Increase the inlet or back pressure at the sensor. • If a pump is located upstream from the sensor, increase the distance between the pump and sensor. • The sensor may need to be reorientated. Consult the installation manual for your sensor for recommended orientations.
Drive board or module failure	Contact Micro Motion.
Bent flow tube	Check the pickoff voltages (see *Section 10.27*). If either of them are close to zero (but neither is zero), the flow tubes may be bent. The sensor will need to be replaced.
Cracked flow tube	Replace the sensor.
Sensor imbalance	Contact Micro Motion.
Mechanical binding at sensor	Ensure sensor is free to vibrate.
Open drive or left pickoff sensor coil	Contact Micro Motion.
Flow rate out of range	Ensure that flow rate is within sensor limits.
Incorrect sensor characterization	Verify the characterization parameters.

Erratic drive gain

Table 10-9: Possible causes and recommended actions for erratic drive gain

Possible cause	Recommended actions
Wrong K1 characterization constant for sensor	Verify the K1 characterization parameter.
Polarity of pick-off reversed or polarity of drive reversed	Contact Micro Motion.
Slug flow	Check for slug flow. See *Section 10.25*.
Foreign material caught in flow tubes	• Purge the flow tubes. • Replace the sensor.

10.26.1 Collect drive gain data

ProLink II	ProLink > Diagnostic Information
Field Communicator	Service Tools > Maintenance > Diagnostic Variables

Overview

Drive gain data can be used to diagnose a variety of process and equipment conditions. Collect drive gain data from a period of normal operation, and use this data as a baseline for troubleshooting.

Procedure

1. Navigate to the drive gain data.
2. Observe and record drive gain data over an appropriate period of time, under a variety of process conditions.

10.27 Check the pickoff voltage

If the pickoff voltage readings are unusually low, you may have any of a variety of process or equipment problems.

To know whether your pickoff voltage is unusually low, you must collect pickoff voltage data during the problem condition and compare it to pickoff voltage data from a period of normal operation.

Table 10-10: Possible causes and recommended actions for low pickoff voltage

Possible cause	Recommended actions
Air entrainment	• Increase the inlet or back pressure at the sensor. • If a pump is located upstream from the sensor, increase the distance between the pump and sensor. • The sensor may need to be reoriented. Consult the installation manual for your sensor for recommended orientations.
Faulty wiring runs between the sensor and transmitter	Verify wiring between sensor and transmitter.
Process flow rate beyond the limits of the sensor	Verify that the process flow rate is not out of range of the sensor.
Slug flow	Check for slug flow. See *Section 10.25*.
No tube vibration in sensor	• Check for plugging. • Ensure sensor is free to vibrate (no mechanical binding). • Verify wiring. • Test coils at sensor. See *Section 10.28.1*.
Moisture in the sensor electronics	Eliminate the moisture in the sensor electronics.
The sensor is damaged, or sensor magnets may have become demagnetized	Replace the sensor.

10.27.1 Collect pickoff voltage data

ProLink II	ProLink > Diagnostic Information
Field Communicator	Service Tools > Maintenance > Diagnostic Variables

Overview

Pickoff voltage data can be used to diagnose a variety of process and equipment conditions. Collect pickoff voltage data from a period of normal operation, and use this data as a baseline for troubleshooting.

Procedure

1. Navigate to the pickoff voltage data.
2. Observe and record data for both the left pickoff and the right pickoff, over an appropriate period of time, under a variety of process conditions.

10.28 Check for electrical shorts

Shorts between sensor terminals or between the sensor terminals and the sensor case can cause the sensor to stop working.

Table 10-11: Possible causes and recommended actions for electrical shorts

Possible cause	Recommended action
Moisture inside the junction box	Ensure that the junction box is dry and no corrosion is present.
Liquid or moisture inside the sensor case	Contact Micro Motion.
Internally shorted feedthrough	Contact Micro Motion.
Faulty cable	Replace the cable.
Improper wire termination	Verify wire terminations inside sensor junction box. The Micro Motion document titled *9-Wire Flowmeter Cable Preparation and Installation Guide* may offer some assistance.

10.28.1 Check the sensor coils

Checking the sensor coils can identify electrical shorts.

Restriction

This procedure applies only to 9-wire remote-mount transmitters and remote transmitters with remote core processors.

Procedure

1. Disconnect power to the transmitter.

   ⚠ **CAUTION!**

   If the transmitter is in a hazardous area, wait 5 minutes before continuing.

2. Remove the transmitter housing cover.
3. Unplug the terminal blocks from the terminal board on the core processor.
4. Using a digital multimeter (DMM), check the pickoff coils by placing the DMM leads on the unplugged terminal blocks for each terminal pair. See *Table 10-12* for a list of the coils. Record the values.

   Table 10-12: Coils and test terminal pairs

Coil	Sensor model	Terminal colors
Drive coil	All	Brown to red
Left pickoff coil (LPO)	All	Green to white
Right pickoff coil (RPO)	All	Blue to gray
Resistance temperature detector (RTD)	All	Yellow to violet
Lead length compensator (LLC)	All except T-Series and CMF400 (see note)	Yellow to orange
Composite RTD	T-Series	Yellow to orange
Fixed resistor (see note)	CMF400	Yellow to orange

   Note
   The CMF400 fixed resistor applies only to certain specific CMF400 releases. Contact Micro Motion for more information.

   There should be no open circuits, that is, no infinite resistance readings. The left pickoff and right pickoff readings should be the same or very close (±5 Ω). If there are any unusual readings, repeat the coil resistance tests at the sensor junction box to eliminate the possibility of faulty cable. The readings for each coil pair should match at both ends.

5. Test the terminals in the sensor junction box for shorts to case.

   a. Leave the terminal blocks disconnected.
   b. Remove the lid of the junction box.
   c. Testing one terminal at a time, place a DMM lead on the terminal and the other lead on the sensor case.

      With the DMM set to its highest range, there should be infinite resistance on each lead. If there is any resistance at all, there is a short to case.

6. Test the resistance of junction box terminal pairs.
    a. Test the brown terminal against all other terminals except the red one.
    b. Test the red terminal against all other terminals except the brown one.
    c. Test the green terminal against all other terminals except the white one.
    d. Test the white terminal against all other terminals except the green one.
    e. Test the blue terminal against all other terminals except the gray one.
    f. Test the gray terminal against all other terminals except the blue one.
    g. Test the orange terminal against all other terminals except the yellow and violet ones.
    h. Test the yellow terminal against all other terminals except the orange and violet ones.
    i. Test the violet terminal against all other terminals except the yellow and orange ones.

    There should be infinite resistance for each pair. If there is any resistance at all, there is a short between terminals.

Postrequisites

To return to normal operation:

1. Plug the terminal blocks into the terminal board.
2. Replace the transmitter housing cover.
3. Replace the lid on the sensor junction box.

Important
When reassembling the meter components, be sure to grease all O-rings.

Appendix A
Using the transmitter display

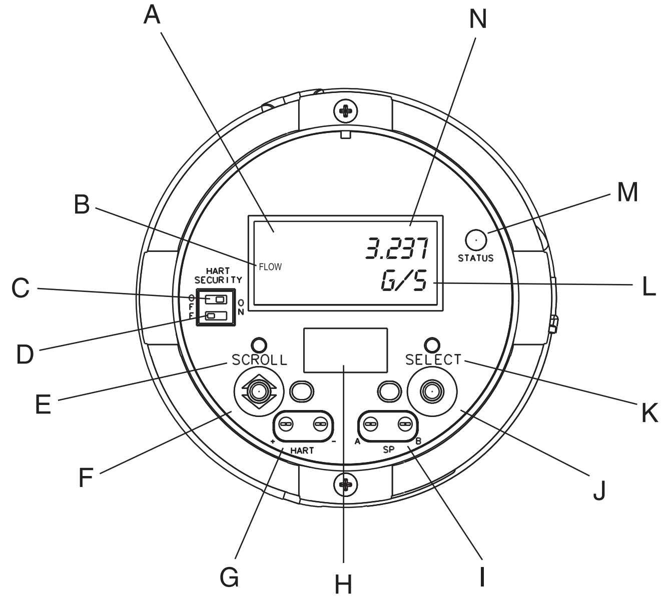
Topics covered in this appendix:

- *Components of the transmitter interface*
- *Use the optical switches*
- *Access and use the display menu system*
- *Display codes for process variables*
- *Codes and abbreviations used in display menus*
- *Menu maps for the transmitter display*

A.1 Components of the transmitter interface

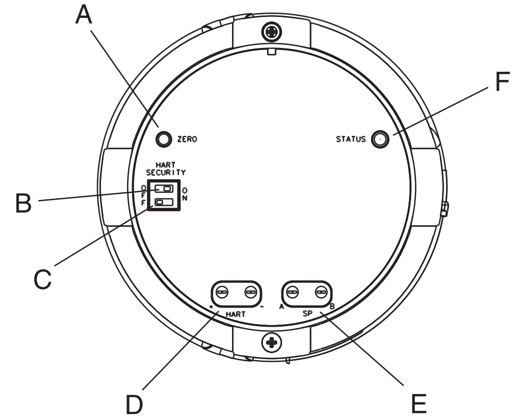
The transmitter interface is available with a display and without a display. If you have a transmitter with a display, you can use the display to view process data and operate the display menus. If you have a transmitter without a display, you must use a communications tool to view process data and configure the transmitter. The transmitter interface includes the status LED, the display (LCD panel), and two optical switches.

Figure A-1: Transmitter interface with display



A. *Display (LCD panel)*
B. *Process variable*
C. *HART security switch*
D. *Unused*
E. *Optical switch indicator for Scroll*
F. *Scroll optical switch*
G. *HART clips*
H. *Unused*
I. *Service port clips*
J. *Select optical switch*
K. *Optical switch indicator for Select*
L. *Unit of measure*
M. *Status LED*
N. *Current value*

Figure A-2: Transmitter interface without display



- *A. Zero button*
- *B. HART security switch*
- *C. Unused*
- *D. HART clips*
- *E. Service port clips*
- *F. Status LED*

A.2 Use the optical switches

Use the optical switches on the transmitter interface to control the transmitter display. The transmitter has two optical switches: Scroll and Select.

To activate an optical switch, block the light by holding your thumb or finger in front of the opening.

Tip

You can activate the optical switch through the lens. Do not remove the transmitter housing cover.

The optical switch indicator lights up when the transmitter senses that an optical switch has been activated.

Table A-1: Optical switch indicator and optical switch states

Optical switch indicator	State of optical switches
Solid red	One optical switch is activated.
Flashing red	Both optical switches are activated.

A.3 Access and use the display menu system

The display menu system is used to perform various configuration, administrative, and maintenance tasks.

Tip

The display menu system does not provide complete configuration, administrative, or maintenance functions. For complete transmitter management, you must use another communications tool.

Prerequisites

To access the display menu system, operator access to either the Off-Line menu or the Alarm menu must be enabled. To access the complete menu system, operator access must be enabled for both the Off-Line menu and the Alarm menu.

Procedure

1. At the transmitter display, activate the Scroll and Select optical switches simultaneously until the display changes.

   You will enter the Off-Line menu at any of several locations, depending on several factors.

   - If an alarm is active and access to the Alarm menu is enabled, you will see SEE ALARM.
   - If no alarm is active and Smart Meter Verification is enabled on the transmitter, you will see ENTER METER VERFY.
   - If no alarm is active and Smart Meter Verification is not enabled on the transmitter, you will see OFF_LINE MAINT.

2. Use the Scroll and Select optical switches to navigate to your destination in the display menu system.

   - Use Scroll to move through a list of options.
   - Use Select to choose the current option.

3. If CODE? appears on the display when you make a choice, enter the value that is configured for Off-Line Password.

   a. With the cursor flashing on the first digit, activate Scroll until the correct digit is displayed, then activate Select.

   b. Repeat this process for the second, third, and fourth digits.

   Tip

   If you do not know the correct value for Off-Line Password, wait 30 seconds. The password screen will time out automatically and you will be returned to the previous screen.

4. If Scroll flashes on the display, activate the Scroll optical switch, then the Select optical switch, and then the Scroll optical switch again.

The display will prompt you through this sequence. The Scroll-Select-Scroll sequence is designed to guard against accidental activation of the off-line menu. It is not designed as a security measure.

5. To exit a display menu and return to a higher-level menu:
   - Activate Scroll until the EXIT option is displayed, then activate Select.
   - If the EXIT option is not available, activate Scroll and Select simultaneously and hold until the screen returns to the previous display.
6. To exit the display menu system, you can use either of the following methods:
   - Exit each menu separately, working your way back to the top of the menu system.
   - Wait until the display times out and returns to displaying process variable data.

A.3.1 Enter a floating-point value using the display

Certain configuration values (for example, Lower Range Value and Upper Range Value) are entered as floating-point values. The display supports both decimal notation and exponential notation for floating-point values.
The display allows you to enter a maximum of 8 characters, including the sign. The decimal point is not counted as a character. Exponential notation is used to enter values that require more than 8 characters.

Enter a floating-point value using decimal notation

Decimal notation allows you to enter values between –9999999 and 99999999. You can use the decimal point to enter values with a precision of 0 through 4 (4 characters to the right of the decimal point).

Decimal values entered via the display must meet the following requirements:

- They can contain a maximum of 8 digits, or 7 digits plus a minus sign (−) to indicate a negative number.
- They can contain a decimal point. The decimal point does not count as a digit. The decimal point must be positioned so that the precision of the value does not exceed 4.

When you first enter the configuration screen, the current configuration value is displayed in decimal notation, and the active character is flashing. If the value is positive, no sign is displayed. If the value is negative, a minus sign is displayed.

Procedure

- To change the value:
  1. Activate Select until the digit you want to change is active (flashing).

     Select moves the cursor one position to the left. From the leftmost position, Select moves the cursor to the rightmost digit.
  2. Activate Scroll to change the value of the active digit.

3. Repeat until all digits are set as desired.

- To change the sign of the value:
  - If the current value is negative, activate Select until the minus sign is flashing, then activate Scroll until the space is blank.
  - If the current value is positive and there is a blank space at the left of the value, activate Select until the cursor is flashing under the blank space, then activate Scroll until the minus sign appears.
  - If the current value is positive and there is no blank space at the left of the value, activate Select until the cursor is flashing under the leftmost digit, then activate Scroll until the minus sign appears.
- To move the decimal point:
  1. Activate Select until the decimal point is flashing.
  2. Activate Scroll.

     The decimal point is removed from its current position.
  3. Activate Select and watch the position of the decimal point.

     As the cursor moves to the left, the decimal point will flash between each pair of digits, up to a maximum precision of four (four digits to the right of the decimal point).

     Tip
     If the position is not valid, the decimal point is not displayed. Continue to activate Select until the decimal point appears at the right of the displayed value.
  4. When the decimal point is in the desired position, activate Scroll.

     The decimal point is inserted at its current position.
- To save the displayed value to transmitter memory, activate Scroll and Select simultaneously and hold until the display changes.
  - If the displayed value is the same as the value in transmitter memory, you will be returned to the previous screen.
  - If the displayed value is not the same as the value in transmitter memory, SAVE/YES? flashes on the display. Activate Select.
- To exit the menu without saving the displayed value to transmitter memory, activate Scroll and Select simultaneously and hold until the display changes.
  - If the displayed value is the same as the value in transmitter memory, you will be returned to the previous screen.
  - If the displayed value is not the same as the value in transmitter memory, SAVE/YES? flashes on the display. Activate Scroll.

Enter a floating-point value using exponential notation

Exponential notation is used to enter values that are larger than 99999999 or smaller than −9999999.

Exponential values entered via the display must be in the following form: SX.XXXEYY. In this string:

- S = Sign. A minus sign (−) indicates a negative number. A blank indicates a positive number.
- X.XXX = The 4-digit mantissa.
- E = The exponent indicator.
- YY = The 2-digit exponent.

Procedure

1. Switch from decimal notation to exponential notation.
   a. Activate Select as required until the rightmost digit is flashing.
   b. Activate Scroll until E is displayed.
   c. Activate Select.

   Tip
   If you have modified the value in decimal notation without saving the changes to transmitter memory, the changes will be lost when you switch to exponential notation. Save the decimal value before switching to exponential notation.

   ---
2. Enter the exponent.

   The first character may be a minus sign or any digit between 0 and 3. The second character may be any digit between 0 and 9.
   a. Activate Select to move the cursor to the rightmost character on the display.
   b. Activate Scroll until the desired character is displayed.
   c. Activate Select to move the cursor one position to the left.
   d. Activate Scroll until the desired character is displayed.
3. Enter the mantissa.

   The mantissa must be a 4-digit value with a precision of 3 (that is, all values between 0.000 and 9.999).
   a. Activate Select to move the cursor to the rightmost digit in the mantissa.
   b. Activate Scroll until the desired character is displayed.
   c. Activate Select to move the cursor one digit to the left.
   d. Activate Scroll until the desired character is displayed.
   e. Activate Select to move the cursor one digit to the left.
   f. Activate Scroll until the desired character is displayed.
   g. Activate Select to move the cursor one digit to the left.

h. Activate Scroll until the desired character is displayed.

4. Enter the sign.

    a. Activate Select to move the cursor one digit to the left.

    b. Activate Scroll until the desired character is displayed.

       For positive numbers, select a blank space.

5. To save the displayed value to transmitter memory, activate Scroll and Select simultaneously and hold until the display changes.

    - If the displayed value is the same as the value in transmitter memory, you will be returned to the previous screen.
    - If the displayed value is not the same as the value in transmitter memory, SAVE/ YES? flashes on the display. Activate Select.

6. (Optional) Switch back from exponential notation to decimal notation.

    a. Activate Select until the E is flashing.

    b. Activate Select until d is displayed.

    c. Activate Select.

A.4 Display codes for process variables

Table A-2: Display codes for process variables

Code	Definition	Comment or reference
AVE_D	Average density	
AVE_T	Average temperature	
BRD_T	Board temperature	
CONC	Concentration	
DRIVE%	Drive gain	
EXT_P	External pressure	
EXT_T	External temperature	
FVZ	Field verification zero	Weights & Measures application only
GSV F	Gas standard volume flow	
GSV I	Gas standard volume inventory	
GSV T	Gas standard volume total	
LPO_A	Left pickoff amplitude	
LVOLI	Volume inventory	
LZERO	Live zero flow	
MASSI	Mass inventory	
MTR_T	Case temperature (T-Series sensors only)	

Table A-2: Display codes for process variables *(continued)*

Code	Definition	Comment or reference
NET M	Net mass flow rate	Concentration measurement application only
NET V	Net volume flow rate	Concentration measurement application only
NETMI	Net mass inventory	Concentration measurement application only
NETVI	Net volume inventory	Concentration measurement application only
PWRIN	Input voltage	Refers to power input to the core processor
RDENS	Density at reference temperature	Concentration measurement application only
RPO_A	Right pickoff amplitude	
SGU	Specific gravity units	
STD V	Standard volume flow rate	Concentration measurement application only
STDVI	Standard volume inventory	Concentration measurement application only
TCDENS	Temperature-corrected density	Petroleum measurement application only
TCORI	Temperature-corrected inventory	Petroleum measurement application only
TCORR	Temperature-corrected total	Petroleum measurement application only
TCVOL	Temperature-corrected volume	Petroleum measurement application only
TUBEF	Raw tube frequency	
WTAVE	Weighted average	

A.5 Codes and abbreviations used in display menus

Table A-3: Codes and abbreviations used in display menus

Code or abbreviation	Definition	Comment or reference
ACK ALARM	Acknowledge alarm	
ACK ALL	Acknowledge all alarms	
ACT	Action	

Table A-3: Codes and abbreviations used in display menus *(continued)*

Code or abbreviation	Definition	Comment or reference
ADDR	Address	
AO 1 SRC	Fixed to the process variable assigned to the primary output	
AO1	Analog output 1 (primary mA output)	
AO2	Analog output 2 (secondary mA output)	
AUTO SCRLL	Auto Scroll	
BKLT B LIGHT	Backlight	
CAL	Calibrate	
CH A	Channel A	
CH B	Channel B	
CH C	Channel C	
CHANGE PASSW CHANGE CODE	Change password or passcode	Change the password or passcode required for access to display functions
CONFG	Configuration	
CORE	Core processor	
CUR Z	Current zero	
CUSTODY XFER	Custody transfer	
D EV	Discrete event	Events configured using the enhanced event model
DENS	Density	
DGAIN, DRIVE %	Drive gain	
DI	Discrete input	
DISBL	Disable	Select to disable
DO1	Discrete output 1	
DO2	Discrete output 2	
DSPLY	Display	
E1OR2	Event 1 or Event 2	Events configured using the basic event model
ENABL	Enable	Select to enable
ENABLE ACK	Enable acknowledge all	Enable or disable the ACK ALL function
ENABLE ALARM	Enable alarm menu	Access to alarm menu from display
ENABLE AUTO	Enable Auto Scroll	Enable or disable the Auto Scroll function
ENABLE OFFLN	Enable off-line	Access to off-line menu from display

Table A-3: Codes and abbreviations used in display menus *(continued)*

Code or abbreviation	Definition	Comment or reference
ENABLE PASSW	Enable password	Enable or disable password protection for display functions
ENABLE RESET	Enable totalizer reset	Enable or disable totalizer reset from display
ENABLE START	Enable totalizer start	Enable or disable totalizer start/stop from display
EVNT1	Event 1	Event configured using the basic event model only
EVNT2	Event 2	Event configured using the basic event model only
EXTRN	External	
FAC Z	Factory zero	
FCF	Flow calibration factor	
FL SW FLSWT	Flow switch	
FLDIR	Flow direction	
FO	Frequency output	
FO FREQ	Frequency factor	
FO RATE	Rate factor	
FR FL	Frequency=Flow	
FREQ	Frequency	
GSV	Gas standard volume	
HYSTRSIS	Hysteresis	
INTERN	Internal	
IO	Input/output	
LANG	Language	
LOCK	Write-protect	
LOOP CUR	Loop current	
MTR F	Meter factor	
M_ASC	Modbus ASCII	
M_RTU	Modbus RTU	
MAO1	mA output 1 (primary mA output)	
MAO2	mA output 2 (secondary mA output)	
MASS	Mass flow	
MBUS	Modbus	
MFLOW	Mass flow	

Table A-3: Codes and abbreviations used in display menus *(continued)*

Code or abbreviation	Definition	Comment or reference
MSMT	Measurement	
OFFLN	Off-line	
OFF-LINE MAINT	Off-line maintenance	
P/UNT	Pulses/unit	
POLAR	Polarity	
PRESS	Pressure	
QUAD	Quadrature	
r.	Revision	
SCALE	Scaling method	
SIM	Simulation	Used for loop testing, not simulation mode. Simulation mode is not accessible via the display.
SPECL	Special	
SRC	Source	Variable assignment
TEMP, TEMPR	Temperature	
UNT/P	Units/pulse	
VAR 1	Display Variable 1	
VER	Version	
VERFY	Verify	
VFLOW	Volume flow	
VOL	Volume, volume flow	
WRPRO	Write protect	
XMTR	Transmitter	

A.6 Menu maps for the transmitter display

Figure A-3: Offline menu – top level

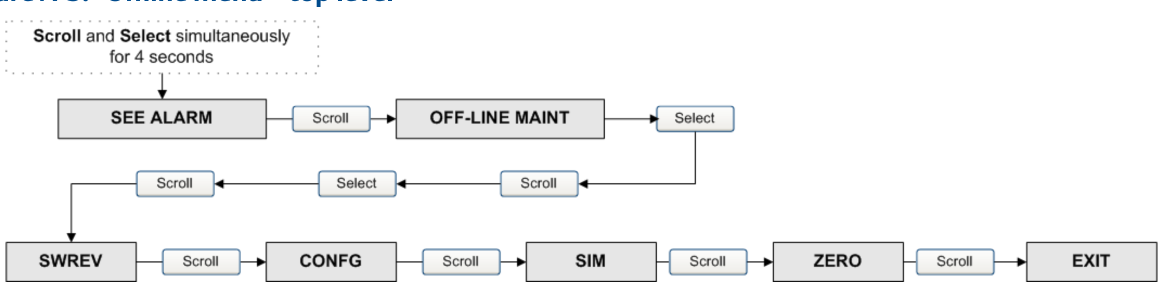


Figure A-4: Offline menu – version information

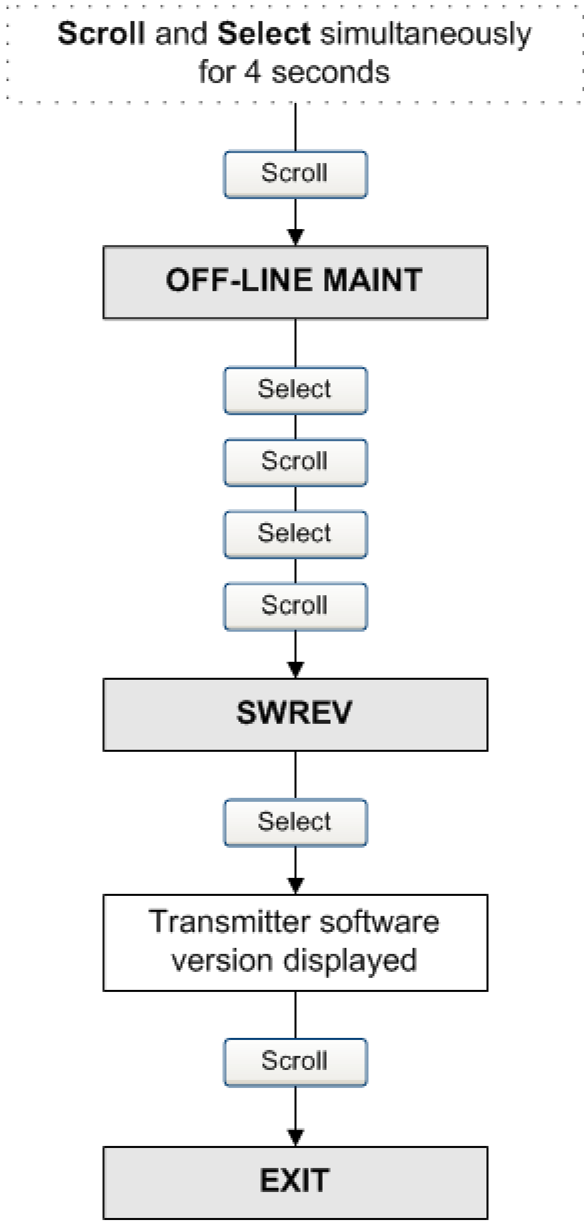


Figure A-5: Offline menu – configuration: units and I/O

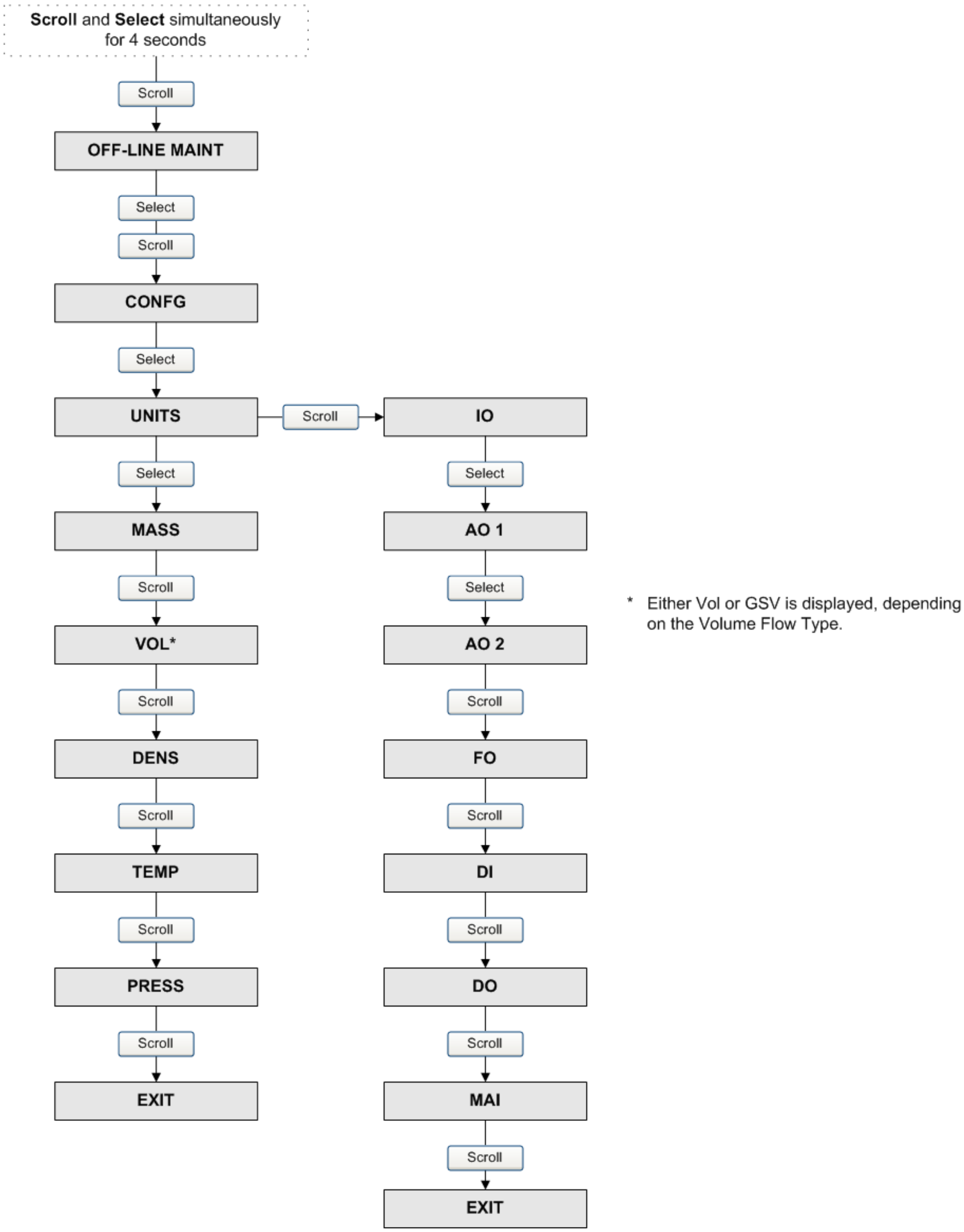


Figure A-6: Offline menu – configuration: meter factors, volume

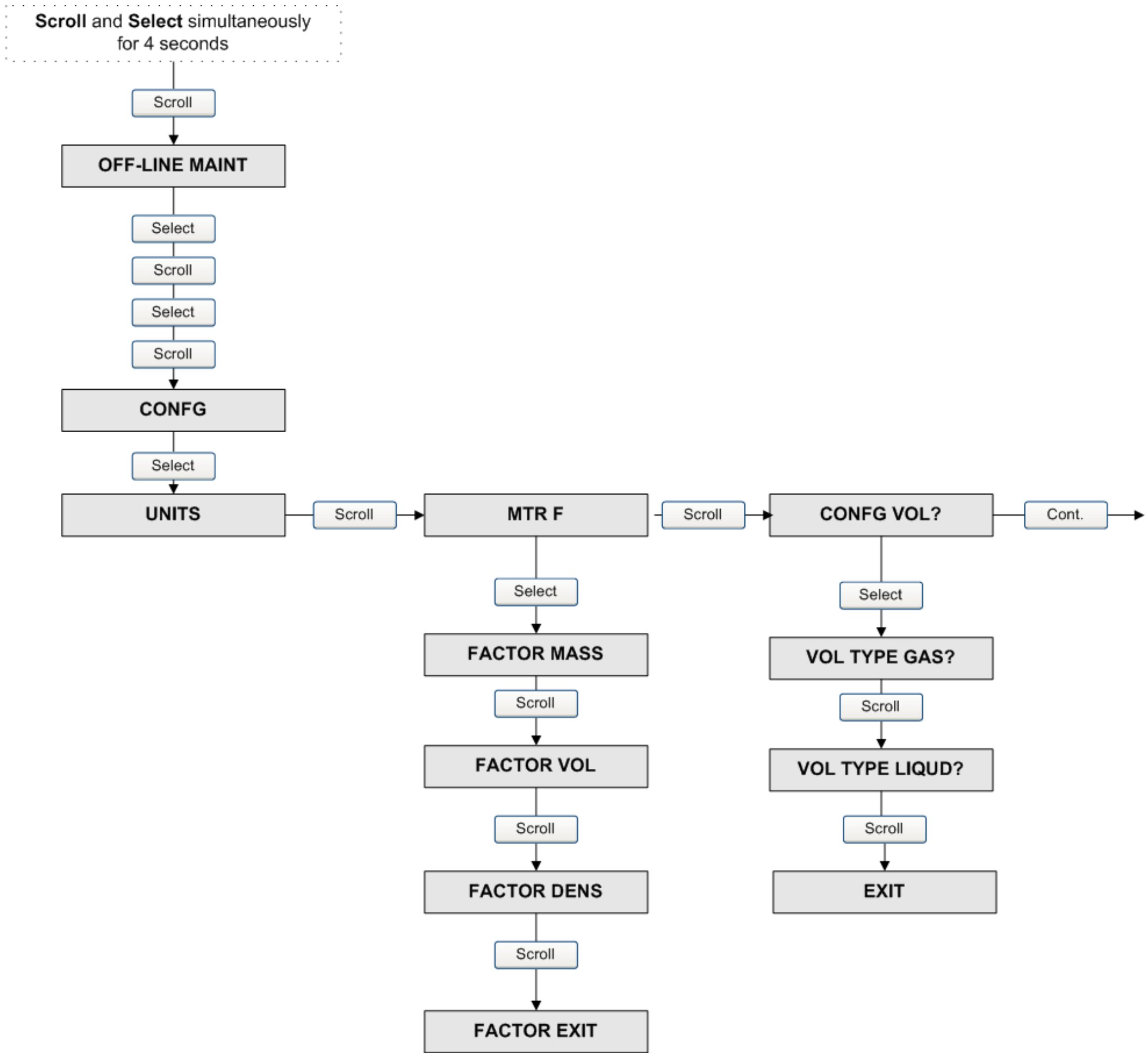
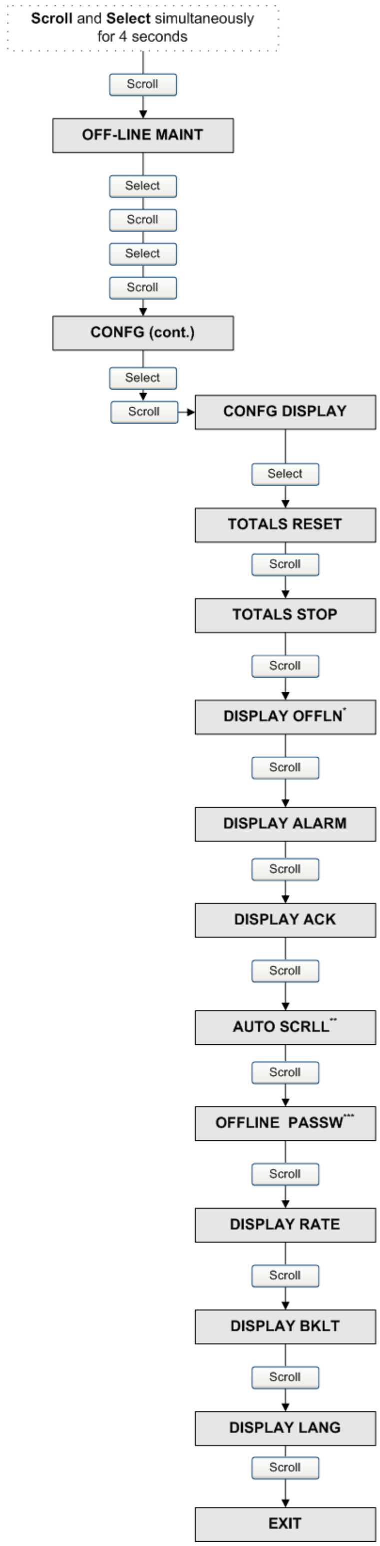


Figure A-7: Offline menu – configuration: display



* If you disable access to the offline menu, the offline menu will disappear as soon as you exit. To re-enable access, you must use ProLink II or the Field Communicator.

** If Auto Scroll is enabled, a Scroll Rate screen is displayed immediately after the Auto Scroll screen.

*** If Offline Password is enabled, a Change Password screen is displayed immediately after the Offline Password screen.

Figure A-8: Offline menu – Simulation (loop testing)

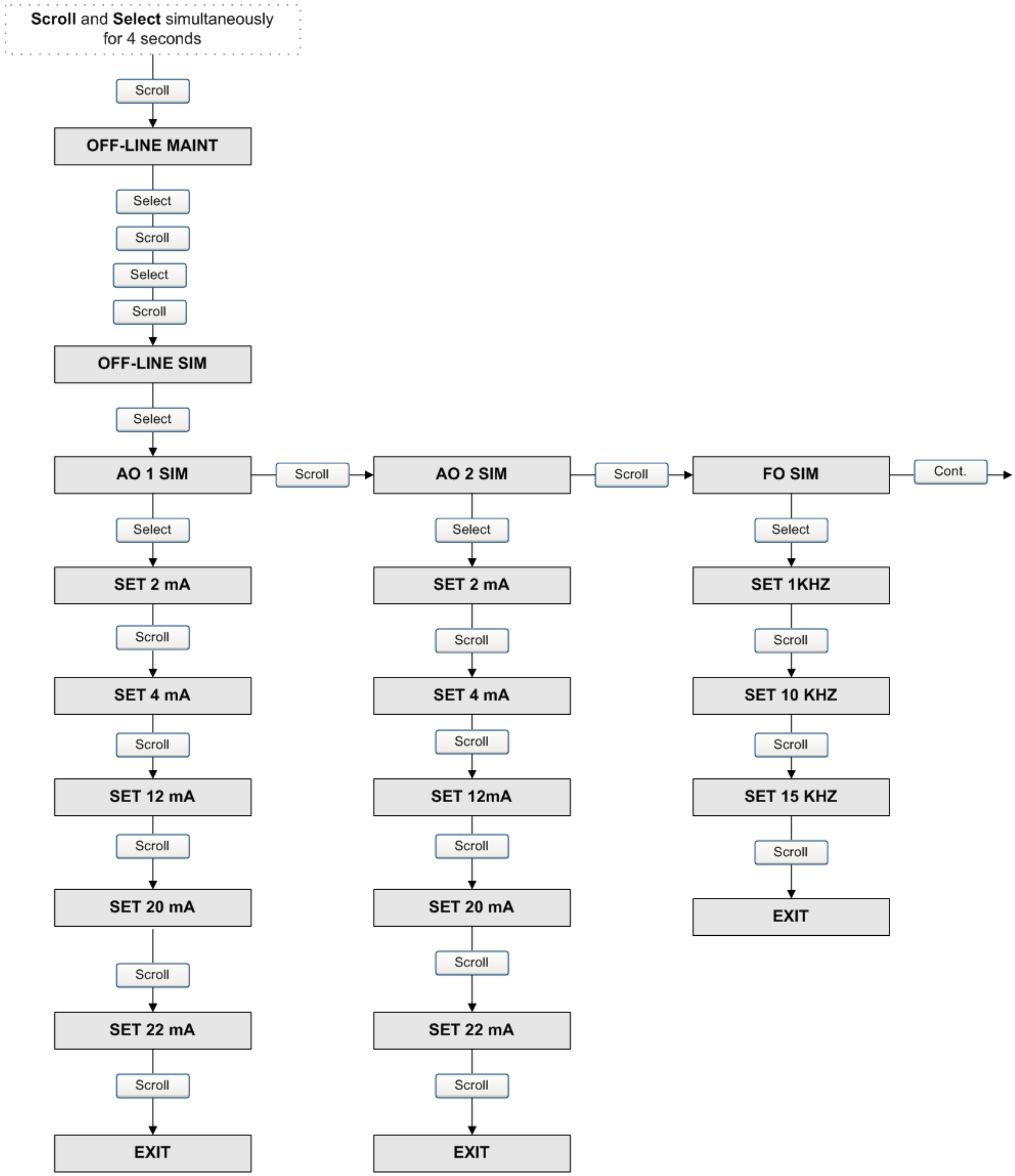


Figure A-9: Offline menu – Simulation: loop testing (continued)

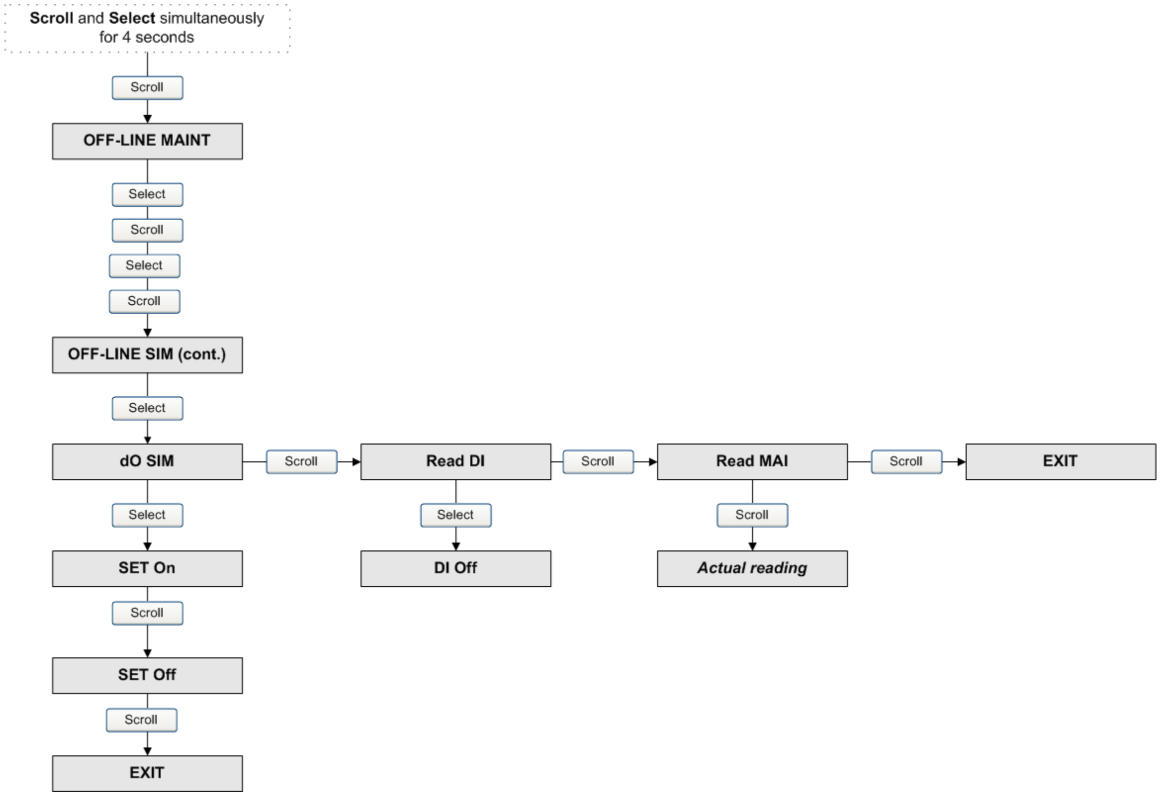
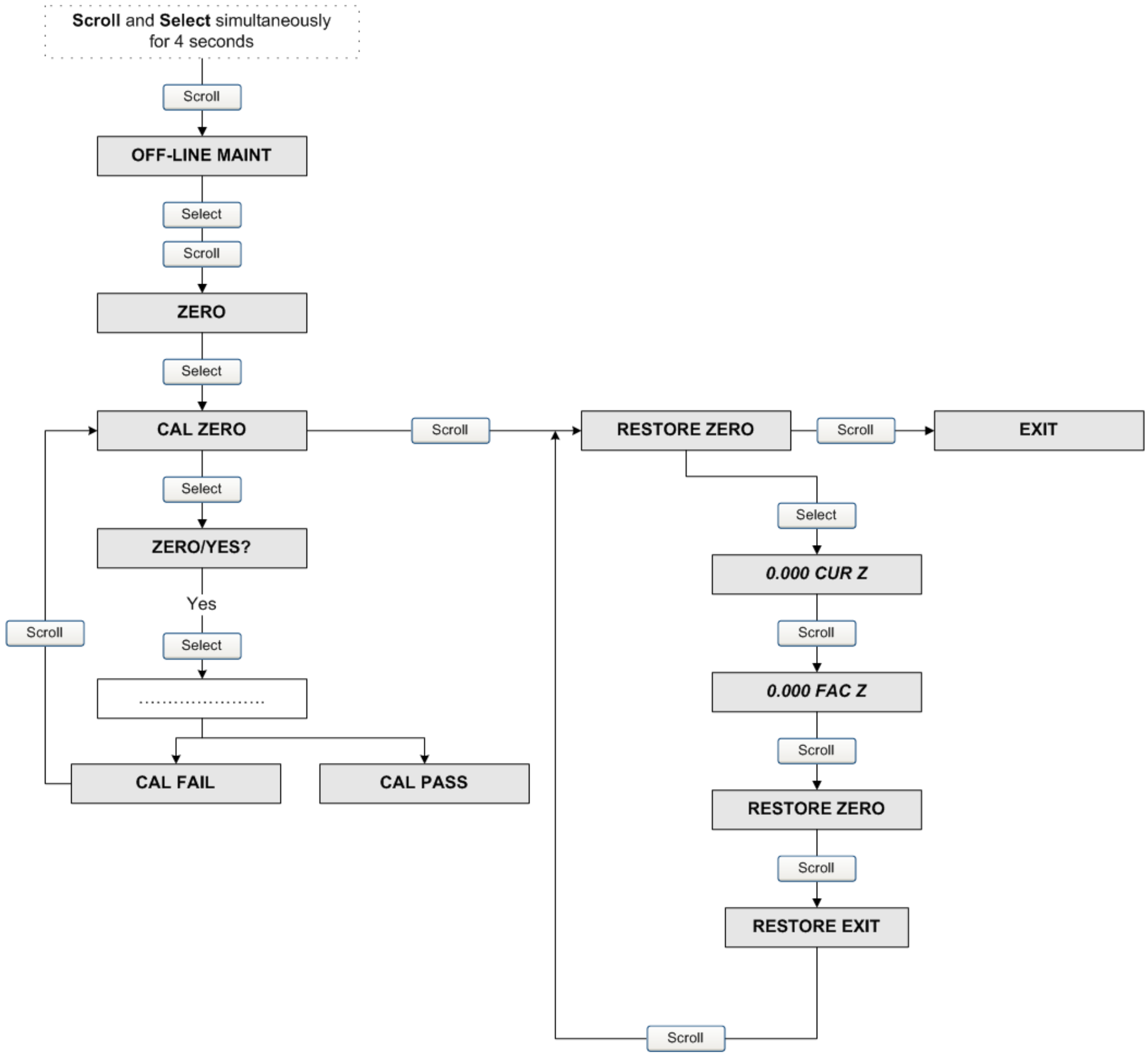


Figure A-10: Offline menu – Zero



Appendix B
Using ProLink II with the transmitter

Topics covered in this appendix:

- *Basic information about ProLink II*
- *Menu maps for ProLink II*

B.1 Basic information about ProLink II

ProLink II is a software tool available from Micro Motion. It runs on a Windows platform and provides complete access to transmitter functions and data.

ProLink II requirements

To install ProLink II, you must have:

- The ProLink II installation media
- The ProLink II installation kit for your connection type

To obtain ProLink II and the appropriate installation kit, contact Micro Motion.

ProLink II documentation

Most of the instructions in this manual assume that you are already familiar with ProLink II or that you have a general familiarity with Windows programs. If you need more information than this manual provides, see the ProLink II manual (*ProLink® II Software for Micro Motion® Transmitters: Installation and Use Manual*).

In most ProLink II installations, the manual is installed with the ProLink II program. Additionally, the ProLink II manual is available on the Micro Motion documentation CD or the Micro Motion web site (www.micromotion.com).

ProLink II features and functions

ProLink II offers complete transmitter configuration and operation functions. ProLink II also offers a number of additional features and functions, including:

- The ability to save the transmitter configuration set to a file on the PC, and reload it or propagate it to other transmitters
- The ability to log specific types of data to a file on the PC
- A commissioning wizard
- A proving wizard
- A gas wizard

These features are documented in the ProLink II manual. They are not documented in the current manual.

ProLink II messages

As you use ProLink II with a Micro Motion transmitter, you will see a number of messages and notes. This manual does not document all of these messages and notes.

Important
The user is responsible for responding to messages and notes and complying with all safety messages.

B.2 Menu maps for ProLink II

Figure B-1: Main menu

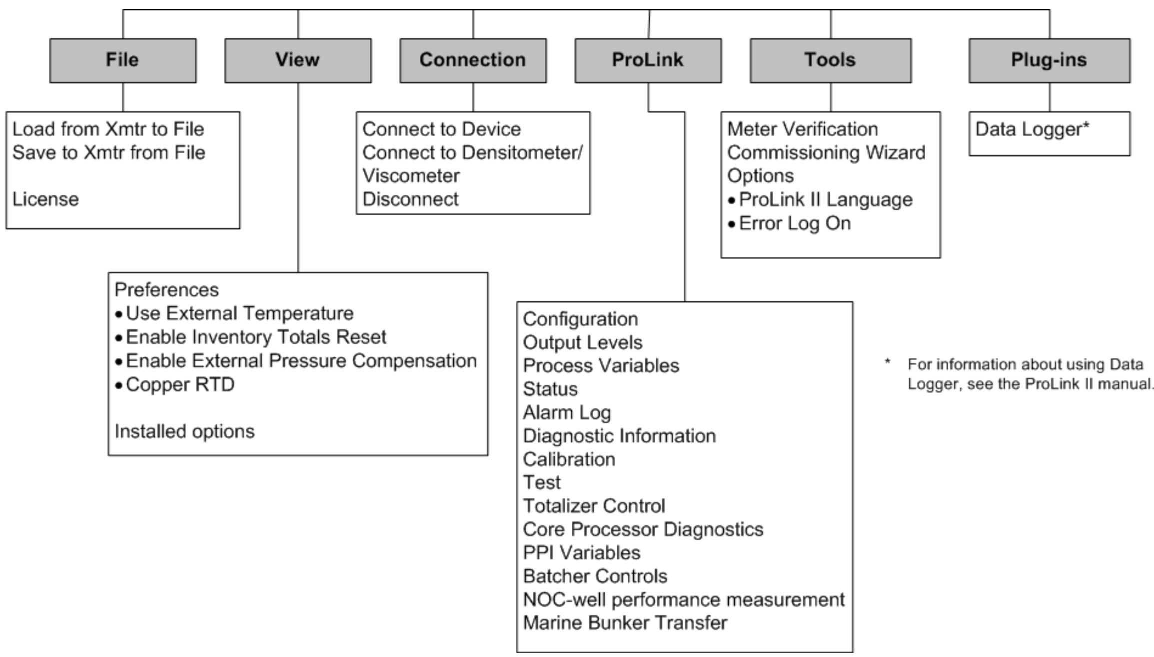


Figure B-2: Configuration menu

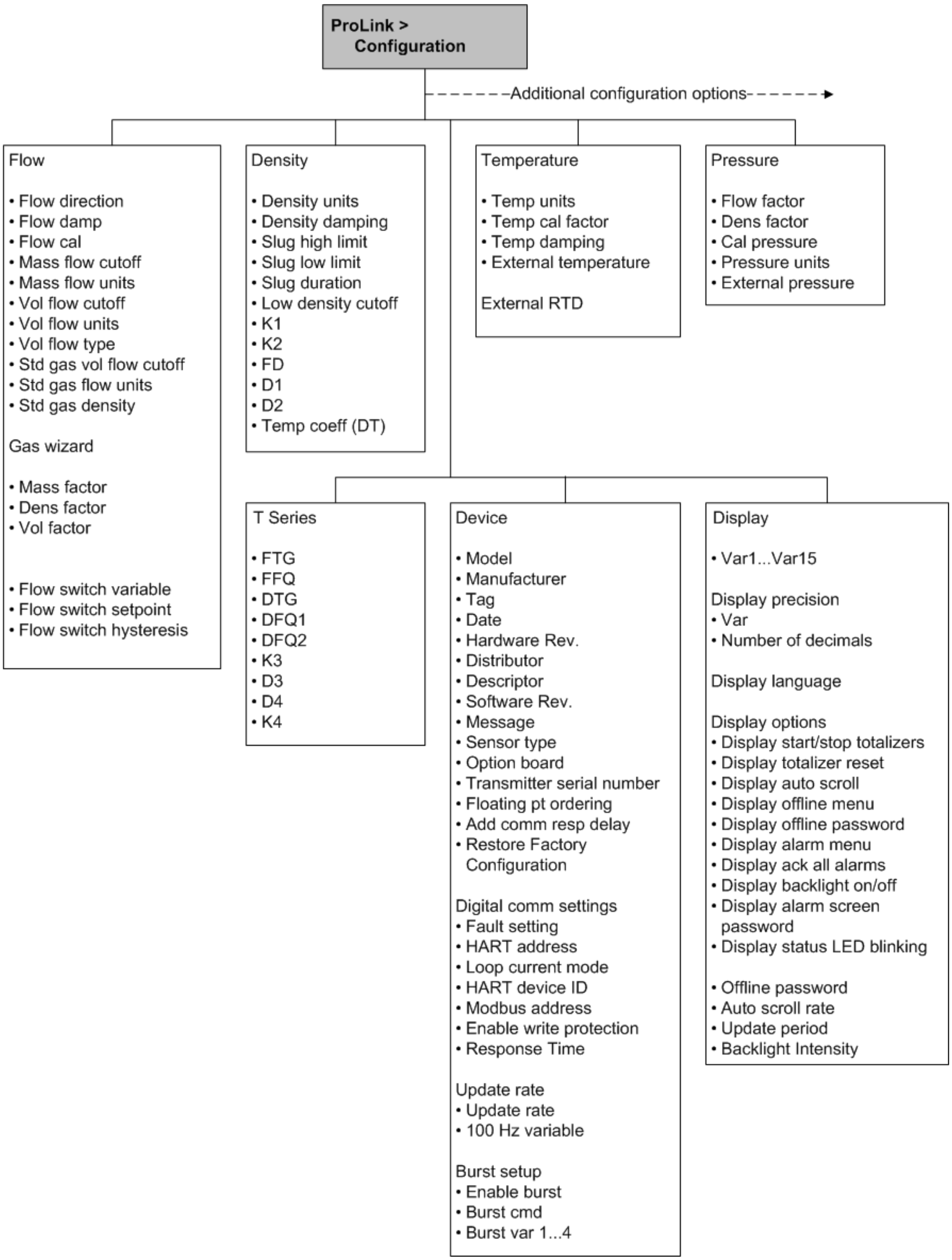


Figure B-3: Configuration menu (continued)

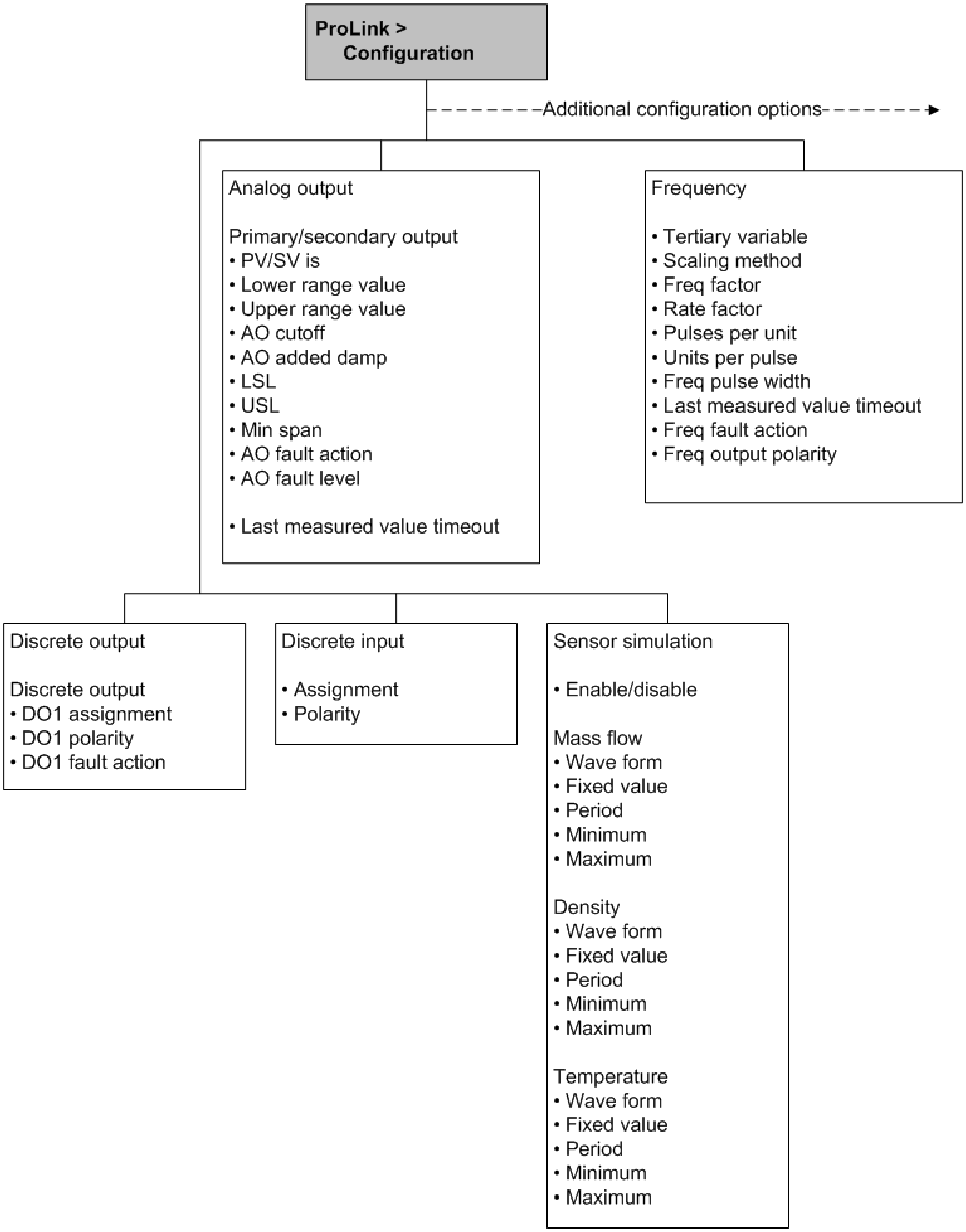
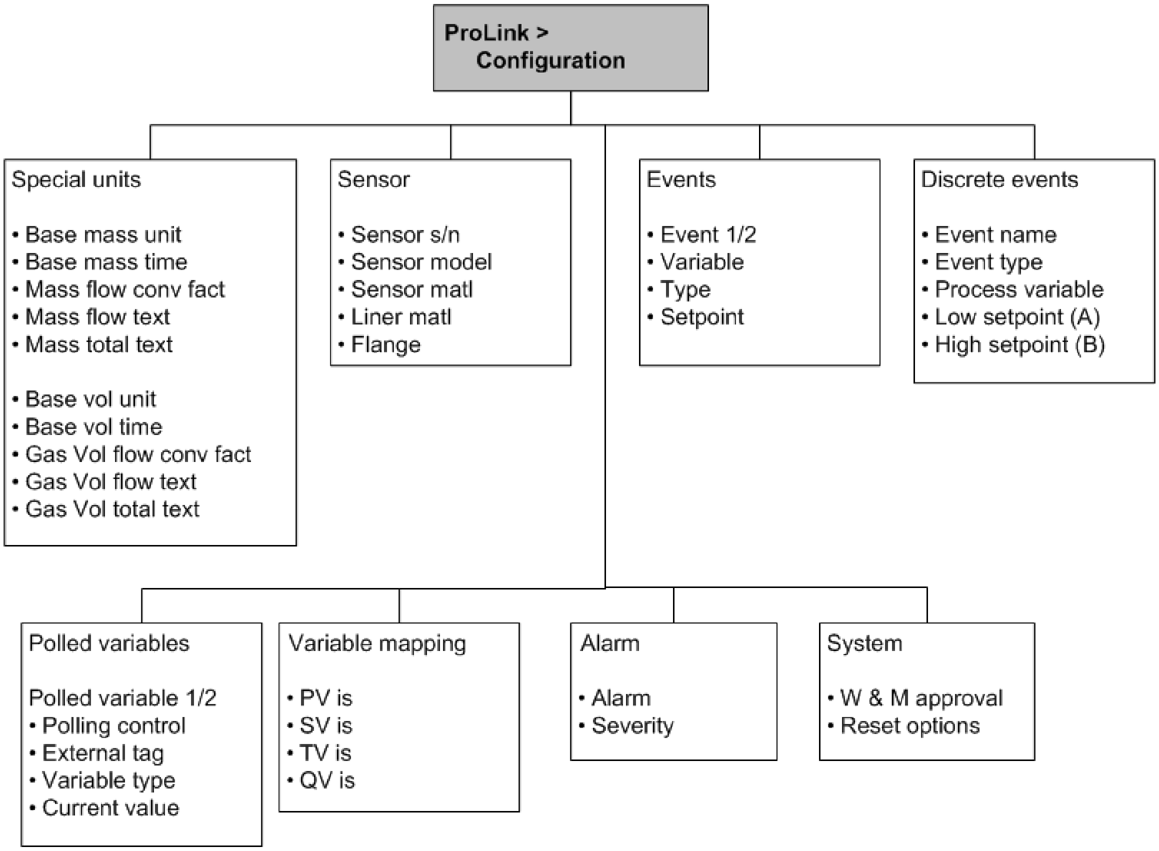


Figure B-4: Configuration menu (continued)



Appendix C
Using the Field Communicator with the transmitter

Topics covered in this appendix:

- *Basic information about the Field Communicator*
- *Menu maps for the Field Communicator*

C.1 Basic information about the Field Communicator

The Field Communicator is a handheld configuration and management tool that can be used with a variety of devices, including Micro Motion transmitters. It provides complete access to transmitter functions and data.

Field Communicator documentation

Most of the instructions in this manual assume that you are already familiar with the Field Communicator and can perform the following tasks:

- Turn on the Field Communicator
- Navigate the Field Communicator menus
- Establish communication with HART-compatible devices
- Send configuration data to the device
- Use the alpha keys to enter information

If you are unable to perform these tasks, consult the Field Communicator manual before attempting to use the Field Communicator. The Field Communicator manual is available on the Micro Motion documentation CD or the Micro Motion web site (www.micromotion.com).

Device descriptions (DDs)

In order for the Field Communicator to work with your device, the appropriate device description (DD) must be installed. The 9739 MVD transmitter requires the following HART device description: 9739MVD, Dev v1, DD v1.

To view the device descriptions that are installed on your Field Communicator:

1. At the HART application menu, press Utility > Available Device Descriptions.
2. Scroll the list of manufacturers and select Micro Motion, then scroll the list of installed device descriptions.

If Micro Motion is not listed, or you do not see the required device description, use the Field Communicator Easy Upgrade Utility to install the device description, or contact Micro Motion.

Field Communicator menus and messages

Many of the menus in this manual start with the On-Line menu. Ensure that you are able to navigate to the On-Line menu.

As you use the Field Communicator with a Micro Motion transmitter, you will see a number of messages and notes. This manual does not document all of these messages and notes.

Important
The user is responsible for responding to messages and notes and complying with all safety messages.

C.2 Menu maps for the Field Communicator

Figure C-1: On-Line menu

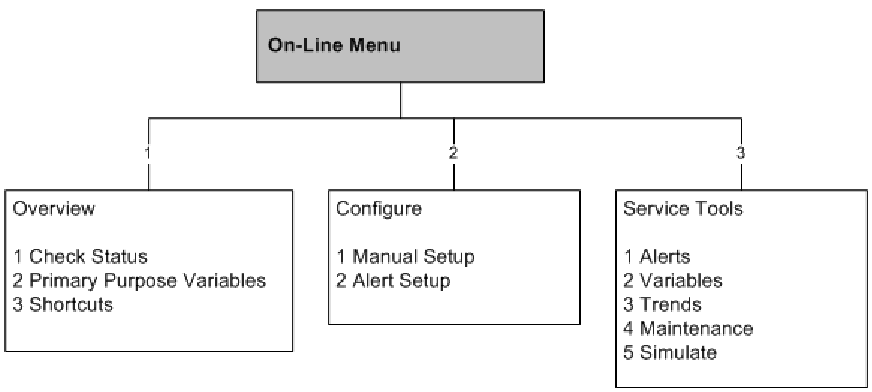


Figure C-2: Overview menu

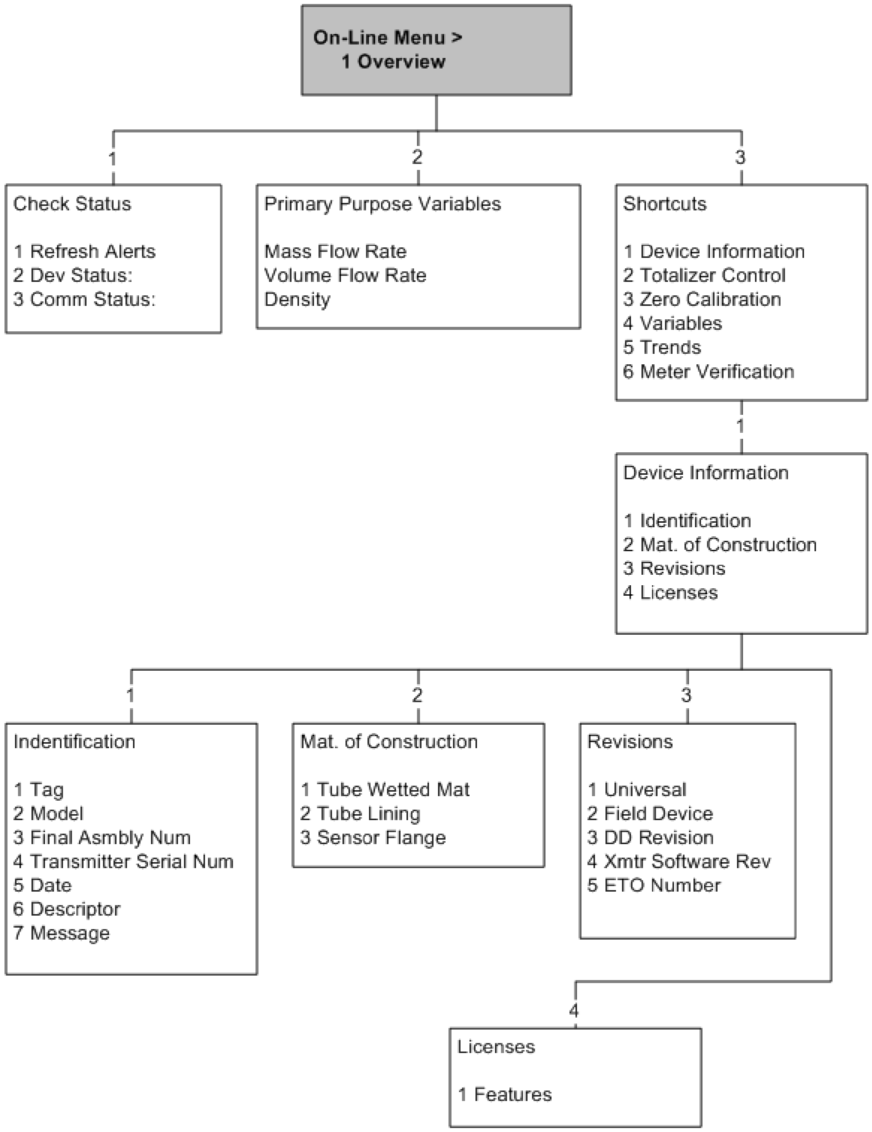


Figure C-3: Configure menu: top level

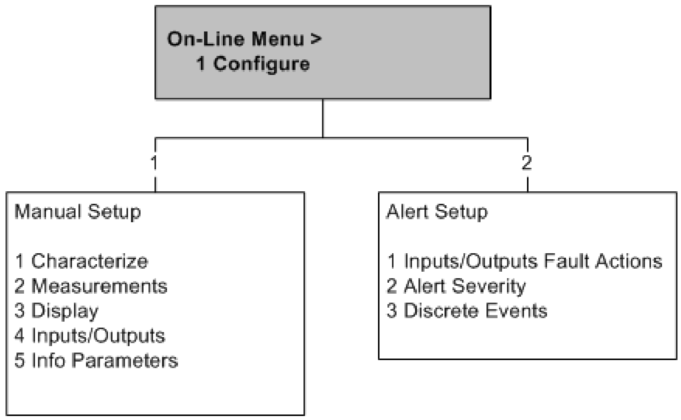


Figure C-4: Configure menu: Manual Setup: Characterize

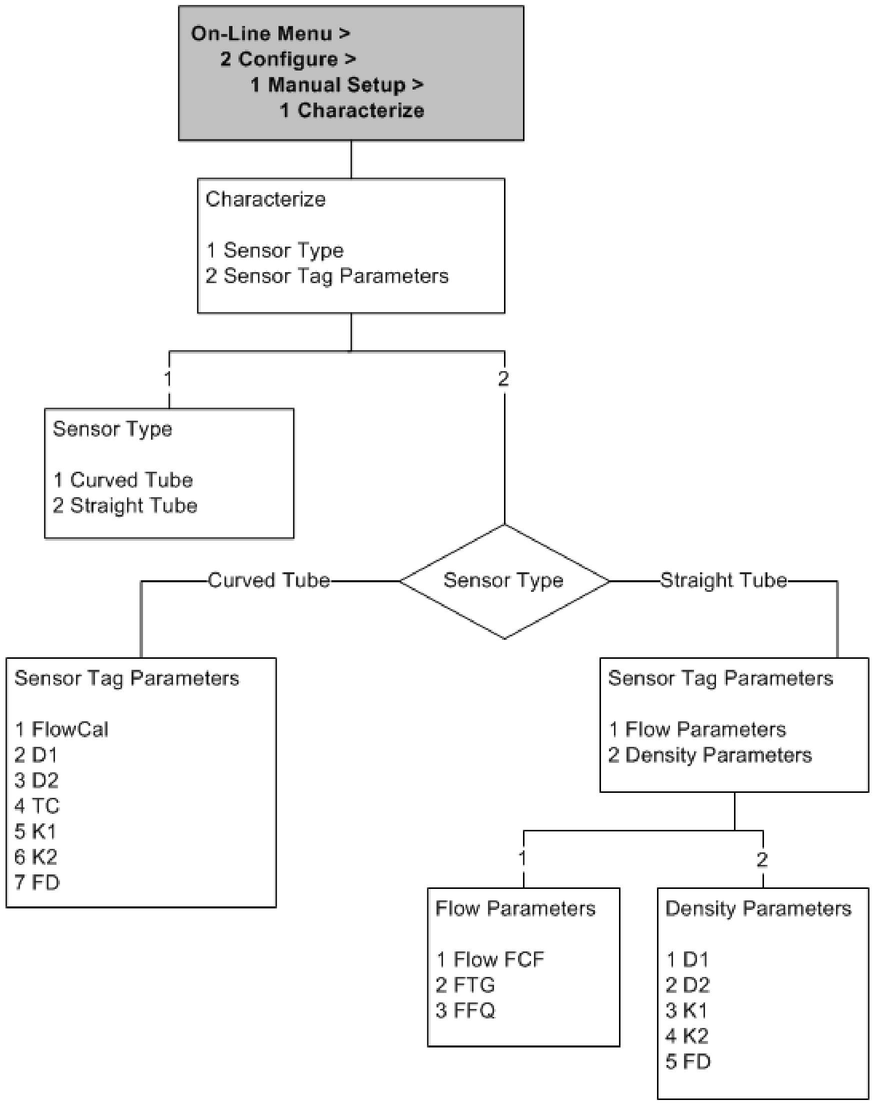


Figure C-5: Configure menu: Manual Setup: Measurements

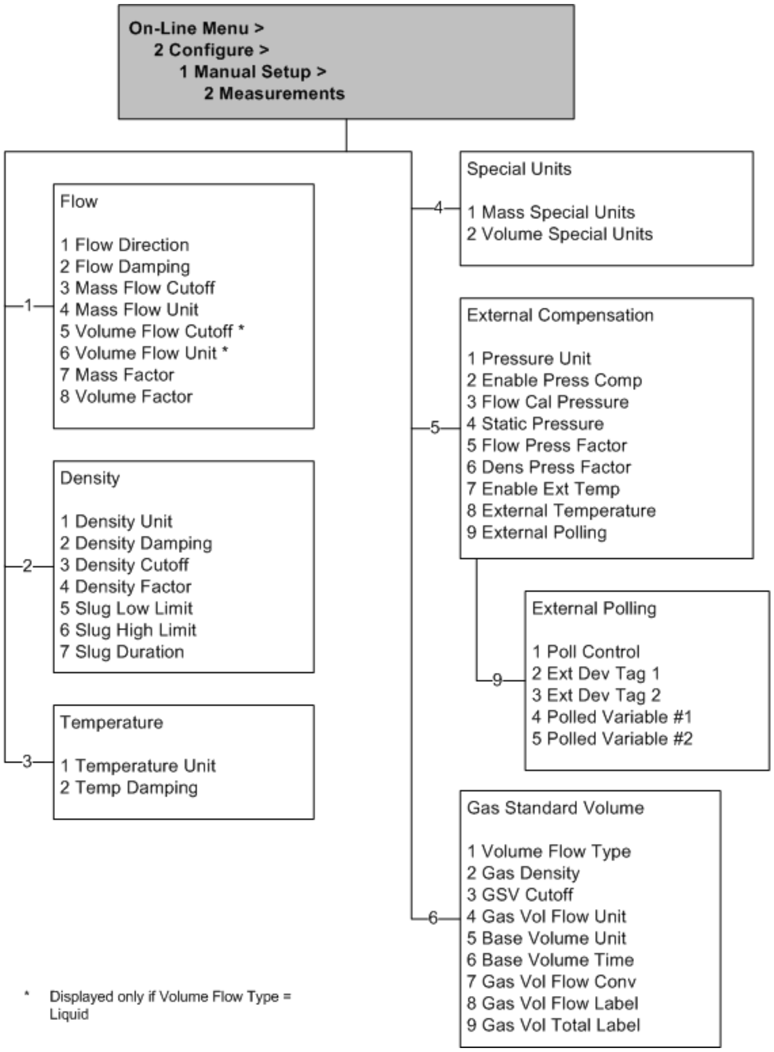


Figure C-6: Configure menu: Manual Setup: Display

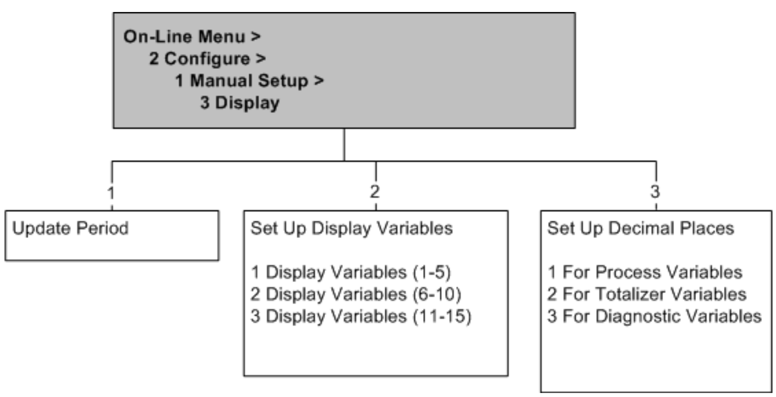


Figure C-7: Configure menu: Manual Setup: Inputs/Outputs

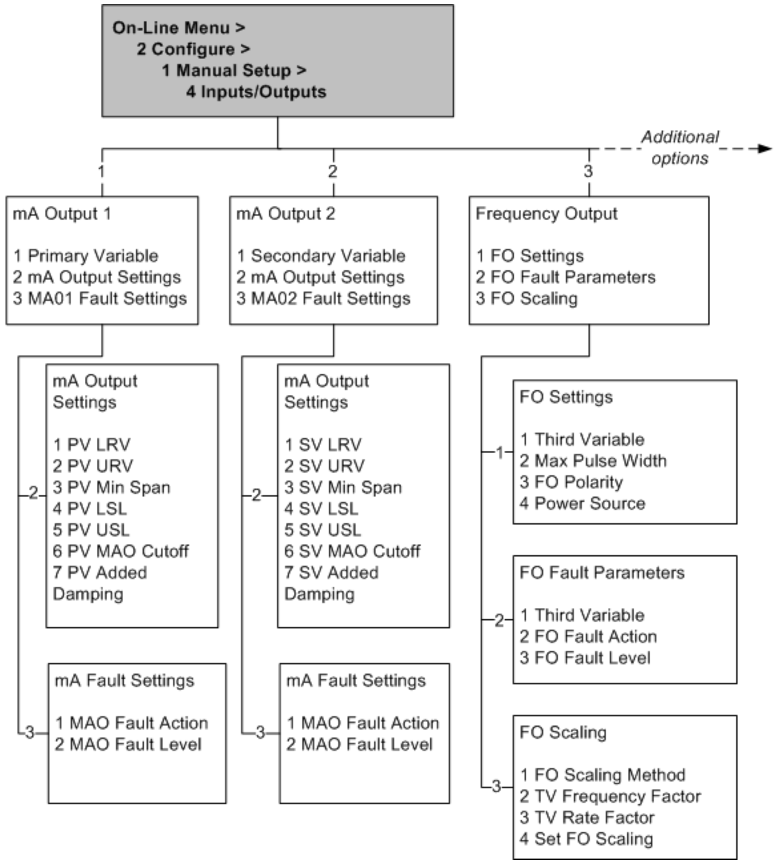


Figure C-8: Configure menu: Manual Setup: Inputs/Outputs (continued)

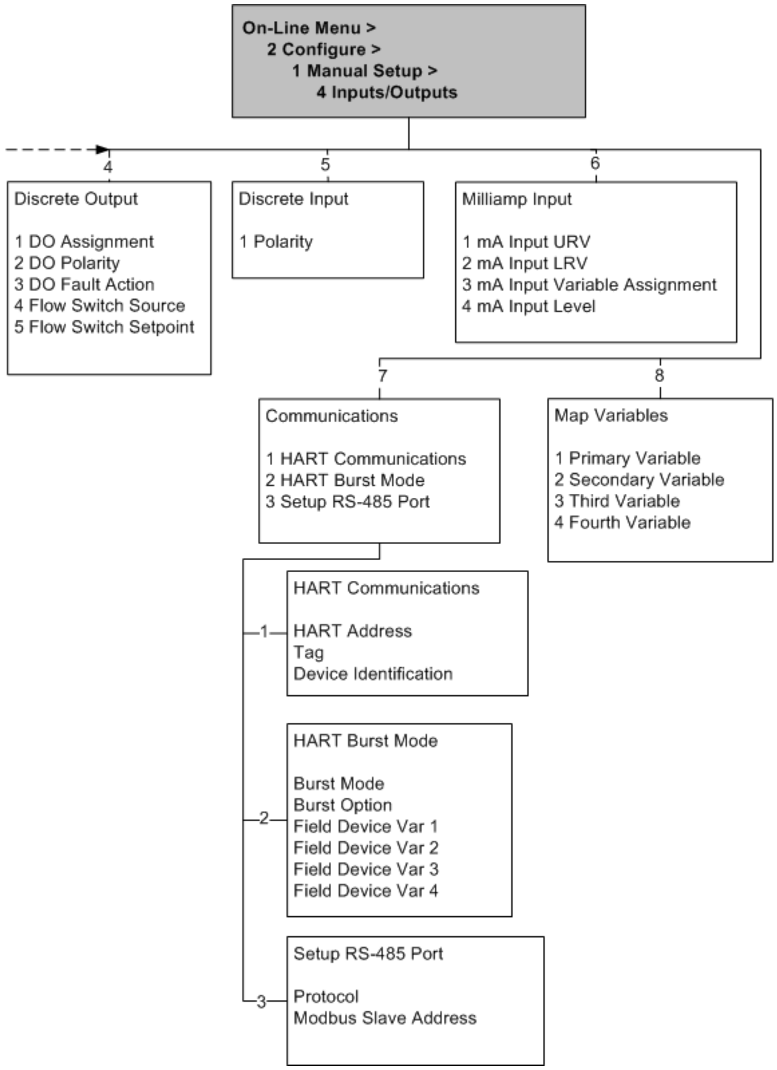


Figure C-9: Configure menu: Alert Setup

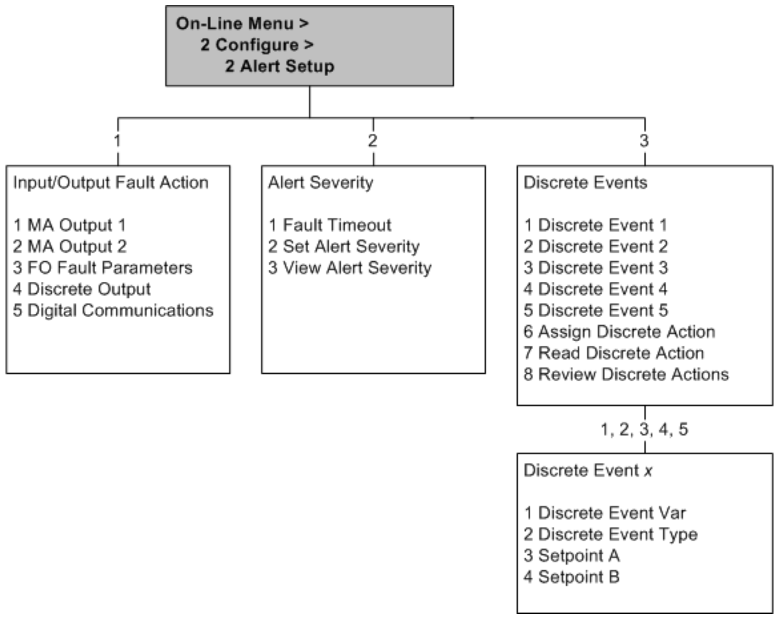


Figure C-10: Service Tools menu: top level

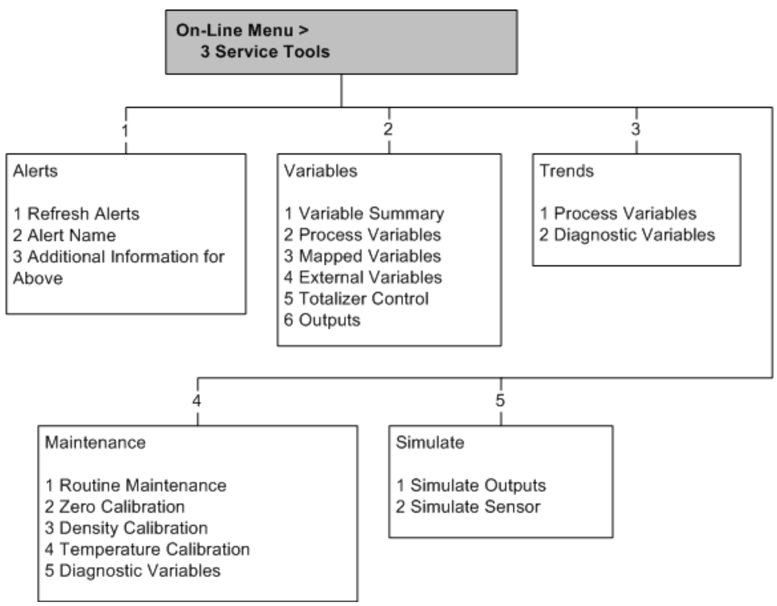


Figure C-11: Service Tools menu: Variables

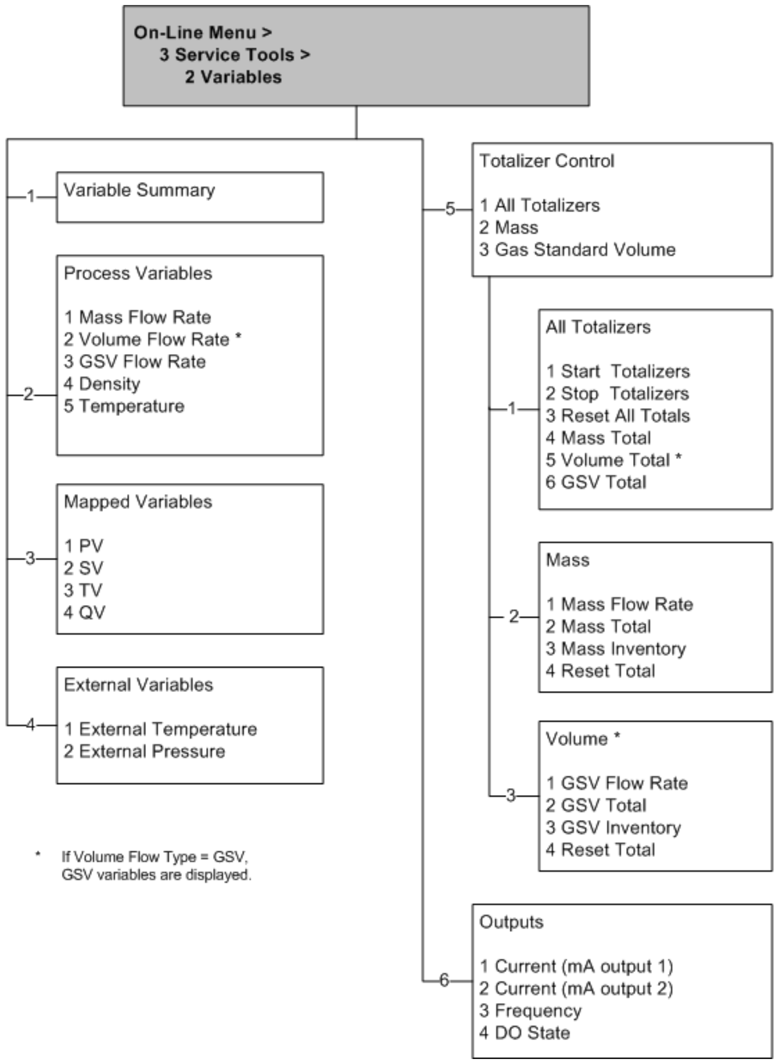


Figure C-12: Service Tools menu: Maintenance

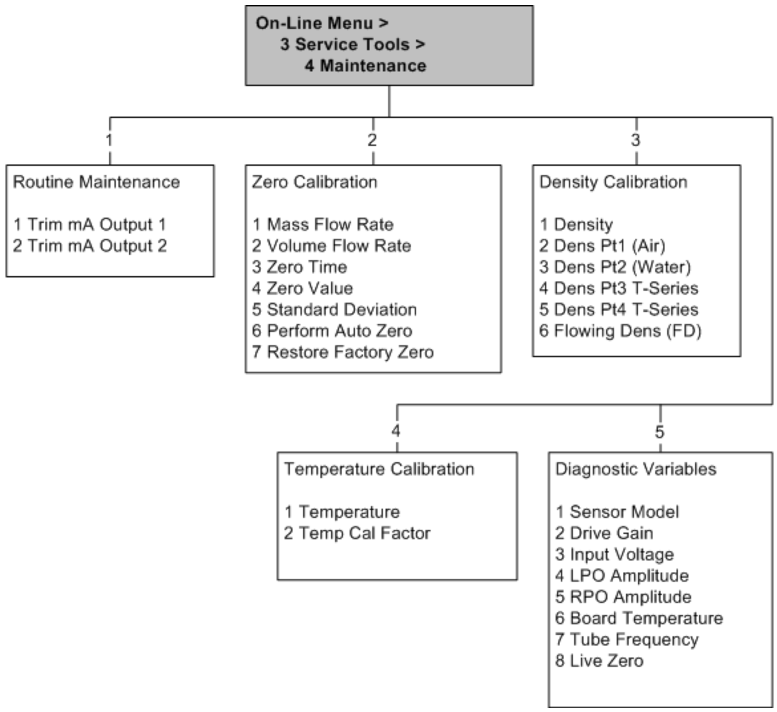
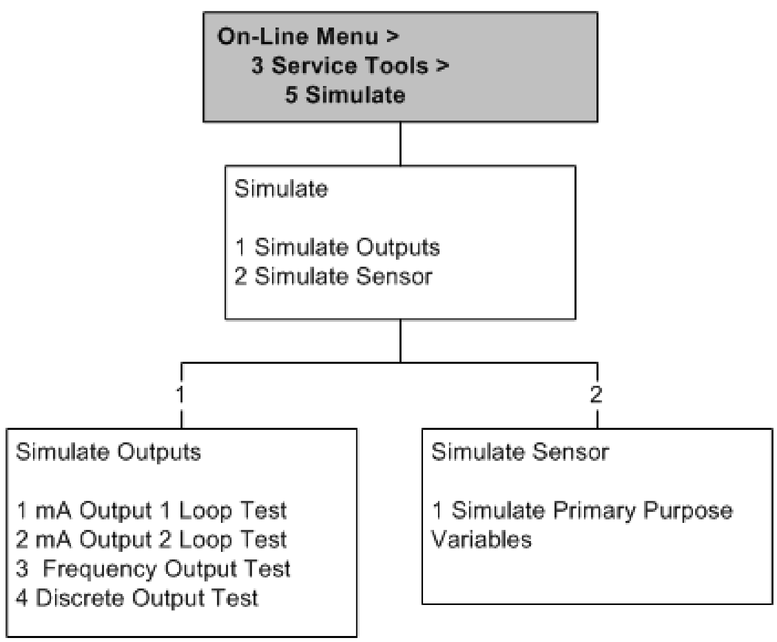


Figure C-13: Service Tools menu: Simulate



Appendix D
Default values and ranges

D.1 Default values and ranges

The default values and ranges represent the typical factory transmitter configuration. Depending on how the transmitter was ordered, certain values may have been configured at the factory and are not represented in the default values and ranges.

Table D-1: Transmitter default values and ranges

Type	Parameter	Default	Range	Comments
Flow	Flow direction	Forward		
	Flow damping	0.8 sec	0.0 – 60.0 sec	User-entered value is corrected to nearest lower value in list of preset values. For gas applications, Micro Motion recommends a minimum value of 2.56.
	Flow calibration factor	1.00005.13		For T-Series sensors, this value represents the FCF and FT factors concatenated.
	Mass flow units	g/s		
	Mass flow cutoff	0.0 g/s		Recommended setting is 5% of the sensor's rated maximum flowrate.
	Volume flow type	Liquid		
	Volume flow units	L/s		
	Volume flow cutoff	0/0 L/s	0.0 – x L/s	x is obtained by multiplying the flow calibration factor by 0.2, using units of L/s.
Meter factors	Mass factor	1		
	Density factor	1		
	Volume factor	1		
Density	Density damping	1.6 sec	0.0 – 60.0 sec	User-entered value is corrected to nearest value in list of preset values.
	Density units	g/cm^3		
	Density cutoff	0.2 g/cm^3	0.0 – 0.5 g/cm^3	
	D1	0 g/cm^3		

Table D-1: Transmitter default values and ranges *(continued)*

Type	Parameter	Default	Range	Comments
	D2	1 g/cm^3		
	K1	1000 µsec	1000 – 50,000 µsec	
	K2	50,000 µsec	1000 – 50,000 µsec	
	FD	0		
	Temp Coefficient	4.44		
Slug flow	Slug flow low limit	0.0 g/cm^3	0.0 – 10.0 g/cm^3	
	Slug flow high limit	5.0 g/cm^3	0. 0 – 10.0 g/cm^3	
	Slug duration	0.0 sec	0.0 – 60.0 sec	
Temperature	Temperature damping	4.8 sec	0.0 – 80 sec	User-entered value is corrected to nearest lower value in list of preset values.
	Temperature units	Deg C		
	Temperature calibration factor	1.00000T0.0000		
Pressure	Pressure units	PSI		
	Flow factor	0		
	Density factor	0		
	Cal pressure	0		
T-Series sensor	D3	0 g/cm^3		
	D4	0 g/cm^3		
	K3	0 µsec		
	K4	0 µsec		
	FTG	0		
	FFQ	0		
	DTG	0		
	DFQ1	0		
	DFQ2	0		
Special units	Base mass unit	g		
	Base mass time	sec		
	Mass flow conversion factor	1		
	Base volume unit	L		
	Base volume time	sec		
	Volume flow conversion factor	1		

Table D-1: Transmitter default values and ranges *(continued)*

Type	Parameter	Default	Range	Comments
Variable mapping	Primary variable	Mass flow		
	Secondary variable	Density		
	Tertiary variable	Mass flow		
	Quaternary variable	Volume flow		
mA output 1	Primary variable	Mass flow		
	LRV	–200.00000 g/s		
	URV	200.00000 g/s		
	AO cutoff	0.00000 g/s		
	AO added damping	0.00000 sec		
	LSL	–200 g/s		Read-only. LSL is calculated based on the sensor size and characterization parameters.
	USL	200 g/s		Read only. USL is calculated based on the sensor size and characterization parameters.
	MinSpan	0.3 g/s		Read-only.
	Fault action	Downscale		
	AO fault level – downscale	2.0 mA	1.0 – 3.6 mA	
	AO fault level – upscale	22 mA	21.0 – 24.0 mA	
	Last measured value timeout	0.00 sec		
mA output 2	Secondary variable	Density		
	LRV	0.00 g/cm3		
	URV	10.00 g/cm3		
	AO cutoff	Not-A-Number		
	AO added damping	0.00000 sec		
	LSL	0.00 g/cm^3		Read-only. LSL is calculated based on the sensor size and characterization parameters.
	USL	10.00 g/cm^3		Read only. USL is calculated based on the sensor size and characterization parameters.
	MinSpan	0.05 g/cm^3		Read-only.
	Fault action	Downscale		
	AO fault level – downscale	2.0 mA	1.0 – 3.6 mA	

Table D-1: Transmitter default values and ranges *(continued)*

Type	Parameter	Default	Range	Comments
	AO fault level – upscale	22 mA	21.0 – 24.0 mA	
	Last measured value timeout	0.00 sec		
LRV	Mass flow rate	−200.000 g/s		
	Volume flow rate	−0.200 L/s		
	Density	0.000 g/cm^3		
	Temperature	−240.000 °C		
	Drive gain	0.000%		
	Gas standard volume flow rate	−423.78SCFM		
	External temperature	−240.000 °C		
	External pressure	0.000 psi		
URV	Mass flow rate	200.000 g/s		
	Volume flow rate	0.200 L/s		
	Density	10.000 g/cm^3		
	Temperature	450.000 °C		
	Drive gain	100.000%		
	Gas standard volume flow rate	423.78 SCFM		
	External temperature	450.000 °C		
	External pressure	100.000 psi		
Frequency output	Tertiary variable	Mass flow		
	Frequency factor	1,000.00 Hz	0.001 – 10,000 Hz	
	Flow rate factor	1000 kg/min		
	Frequency pulse width	277.0 ms	0 or 0.5 – 277.5 ms	
	Scaling method	Freq=Flow		
	Frequency fault action	Downscale		
	Frequency fault level – upscale	15,000 Hz	10.0 – 15,000 Hz	
	Frequency output polarity	Active high		
	Last measured value timeout	0.0 seconds	0.0 – 60.0 sec	
Discrete output	Source	Flow direction		
	Fault Indicator	None		
	Power	Internal		
	Polarity	Active high		
Discrete output 2	Source	Flow switch		
	Polarity	Active high		

Table D-1: Transmitter default values and ranges *(continued)*

Type	Parameter	Default	Range	Comments
Discrete input	Actions	None		
	Polarity	Active low		
mA input	Process Variable (PV)	None		
Display	Backlight on/off	On		
	Backlight intensity	63	0 – 63	
	Refresh rate	200 millisec-onds	100 – 10,000 milliseconds	
	Variable 1	Mass flow rate		
	Variable 2	Mass total		
	Variable 3	Volume flow rate		
	Variable 4	Volume total		
	Variable 5	Density		
	Variable 6	Temperature		
	Variable 7	Drive gain		
	Variable 8–15	None		
	Display totalizer start/stop	Disabled		
	Display totalizer reset	Disabled		
	Display auto scroll	Disabled		
	Display offline menu	Enabled		
	Display offline password	Disabled		
	Display alarm menu	Enabled		
	Display acknowledge all alarms	Enabled		
	Offline password	1234		
	Auto scroll rate	10 sec		
Digital com-munications	Fault action	None		
	Fault timeout	0 seconds	0.0 – 60.0 sec	
	Modbus address	1		
	Modbus ASCII support	Enabled		
	Floating-point byte order	3–4–1–2		

Appendix E
Transmitter components and installation wiring

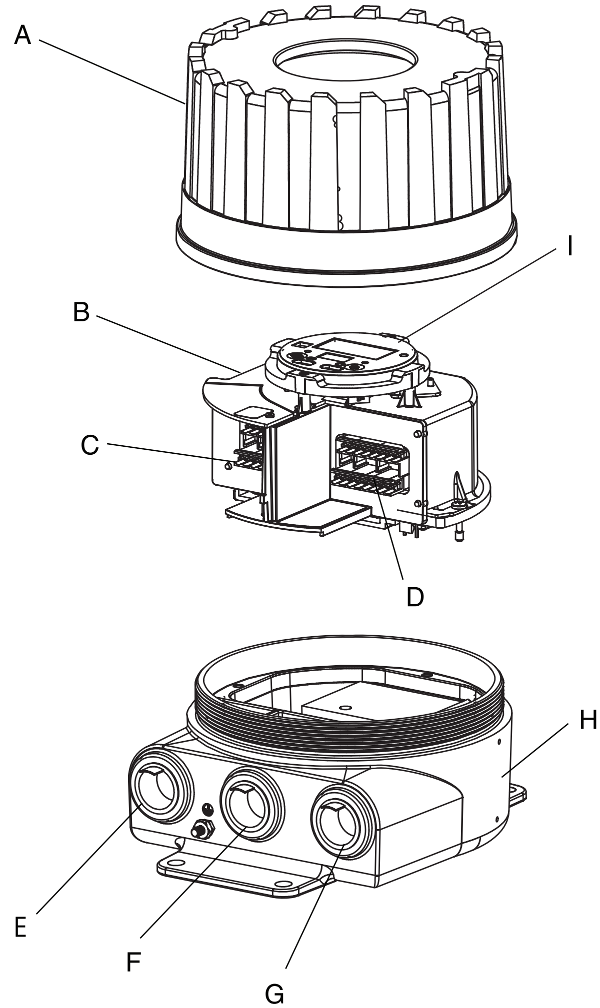
Topics covered in this appendix:

- *Transmitter components*
- *Transmitter-to-sensor wiring*
- *Power supply terminals*
- *Input/output (I/O) terminals*

E.1 Transmitter components

You may need to identify the transmitter components for certain operational or troubleshooting tasks.

Figure E-1: Transmitter components



A. *Removable housing cover*
B. *Electronics module*
C. *Intrinsically safe sensor wiring terminals*
D. *Non–intrinsically-safe output wiring terminals*
E. *Conduit opening for sensor wiring*
F. *Conduit opening for power supply wiring*
G. *Conduit opening for output wiring*
H. *Housing base*
I. *User interface: with or without display options*

E.2 Transmitter-to-sensor wiring

The transmitter is always installed remotely from the sensor. A 9-wire cable is used to connect the transmitter to the sensor.

⚠ **CAUTION!**

Refer to the *Micro Motion 9739 MVD Transmitters: Installation Manual* for all safety and detailed wiring information for the transmitter. You are responsible for following all safety and wiring instructions documented in the transmitter installation manual, plus any additional site requirements.

You can wire the transmitter to the following sensors:

- ELITE®, H-Series, T-Series, and F-Series
- Model D and Model DL
- Model DT (with user-supplied metal junction box with terminal block)

Each wire of the 9-wire cable is inserted into the corresponding terminal at the sensor and transmitter, matching by color.

Table E-1: Sensor and transmitter terminal designations

Wire color	Sensor terminal	Transmitter terminal	Function
Black	No connection	0	Drain wires
Brown	1	1	Drive +
Red	2	2	Drive -
Orange	3	3	Temperature -
Yellow	4	4	Temperature return
Green	5	5	Left pickoff +
Blue	6	6	Right pickoff +
Violet	7	7	Temperature +
Gray	8	8	Right pickoff -
White	9	9	Left pickoff -

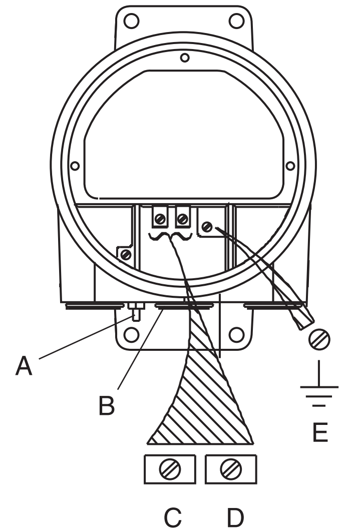
E.3 Power supply terminals

The power supply terminals on the transmitter must be connected to a power supply.

⚠ **CAUTION!**

Refer to the *Micro Motion 9739 MVD Transmitters: Installation Manual* for all safety and detailed wiring information for the 9739 MVD transmitter. You are responsible for following all safety and wiring instructions documented in the transmitter installation manual, plus any additional site requirements.

Figure E-2: Power supply terminals



A. *External ground terminal*
B. *Power supply conduit opening*
C. *L / L1 for AC; + for DC*
D. *N / L2 for AC; – for DC*
E. *Power ground terminal*

E.4 Input/output (I/O) terminals

The I/O terminals are used to connect the transmitter to remote devices such as other transmitters or valves, or to hosts.

⚠ CAUTION!

Refer to the *Micro Motion 9739 MVD Transmitters: Installation Manual* for all safety and detailed wiring information for the 9739 MVD transmitter. You are responsible for following all safety and wiring instructions documented in the transmitter installation manual, plus any additional site requirements.

Figure E-3: I/O terminals

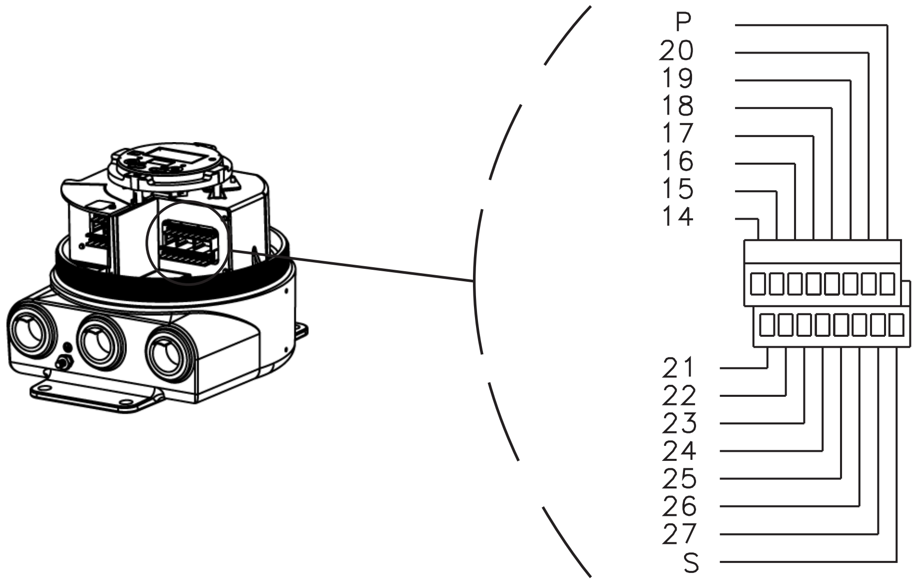


Table E-2: I/O terminals and functions

Terminal	Function
14	Frequency output, DC supply voltage (+)
15 and 16	Frequency/pulse output (+)
16	Return
17	Primary variable (PV+) mA output
18	Primary variable (PV–) mA output
19	Secondary variable (SV+) mA output
20	Secondary variable (SV–) mA output
21 and 16	Discrete input (Zero) (+)
22 and 16	Discrete output (Control output)
23	Signal ground
24 and 23	Temperature output (mV signal)
25 and 23	Tube period output
26	RS-485 I/O (A+): shared with Service port A on the user interface
27	RS-485 I/O (B–): shared with Service port B on the user interface
P	DC power to pressure or DP transmitter
S	mA input from pressure or DP transmitter

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