Configuration and Use Manual
P/N MMI-20016855, Rev. AA
June 2010

Micro Motion® 9739 MVD Transmitters Configuration and Use Manual

Configuration

Operation

Maintenance

Micro Motion customer service

Location		Telephone Number
U.S.A.		800-522-MASS (800-522-6277) (toll free)
Canada and Latin America		+1 303-527-5200 (U.S.A.)
Asia	Japan	3 5769-6803
	All other locations	+65 6777-8211 (Singapore)
Europe	U.K.	0870 240 1978 (toll-free)
	All other locations	+31 (0) 318 495 555 (The Netherlands)
Customers outside the U.S.A. can also send an email to flow.support@emerson.com.		

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Getting started

Chapters covered in this part:

Chapter 1

Before you begin

Topics covered in this chapter:

- ♦ Safety messages
- ♦ Obtain version information
- ♦ Available communications tools
- ♦ Additional documentation and resources
- ♦ 9739 MVD transmitter configuration worksheet

1.1 Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

1.2 Obtain version information

To configure, use, and troubleshoot the transmitter, you may need to know the version information of your transmitter software, ProLink II software application, and/or HART device description.

Procedure

See Table 1-1 for information on how to obtain the version information.

Table 1-1 Methods to obtain version information

Component	With display	With ProLink II	With Field Communicator
Transmitter software	**OFF-LINE MAINT→VER**	**View→Installed Options→Software Revisions**	**Overview→Shortcuts→Device Information→Revisions→Xmtr Software Rev**
ProLink II	Not applicable	**Help→About ProLink II**	Not applicable
HART device description	Not applicable	Not applicable	**Overview →Shortcuts→Device Information→Revisions→DD Revision**

1.3 Available communications tools

You can use a variety of communications tools to interface with the 9739 MVD transmitter.

The following communications tools are supported:

- Transmitter display, if the transmitter was ordered with a display
- ProLink II software (v2.91 or later)
- Field Communicator (DD v2 or later)

Tip

You may be able to use other 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. For your reference, 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.

This manual provides basic information on using the transmitter display, ProLink II, and the Field Communicator. For more information on using ProLink II, see the ProLink II user manual available on the Micro Motion web site (www.micromotion.com) or on the Micro Motion user documentation CD. For more information on using Field Communicator, see the Field Communicator documentation available on the Micro Motion web site (www.micromotion.com).

1.4 Additional documentation and resources

Micro Motion provides additional documentation to support the installation and operation of the 9739 MVD transmitter.

See Table 1-2 for the documentation resources available to support the 9739 MVD transmitter. All documentation resources are available on the Micro Motion web site at www.micromotion.com or on the Micro Motion user documentation CD.

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*

1.5 9739 MVD transmitter configuration worksheet

Use the 9739 MVD transmitter configuration worksheet for both planning and recording the transmitter configuration.

Additionally, the configuration worksheet shows the parameters that are accessible from the different communications tools. Choose a communications tool that provides access to the parameters that you plan to configure.

Table 1-3 9739 MVD transmitter configuration settings

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
Sensor Type	❑ T-Series (Straight Tube) ❑ Other (Curved Tube)		✓	✓
Flow calibration factor			✓	✓
D1			✓	✓
D2			✓	✓
Density temperature coefficient (DT)			✓	✓
K1			✓	✓
K2			✓	✓
FD			✓	✓
Temperature calibration factor			✓	✓
Mass flow measurement unit		✓	✓	✓
If mass flow is a special unit	Base mass unit:		✓	✓
	Base time unit:		✓	✓
	Conversion factor:		✓	✓
	Flow text:		✓	✓
	Total text:		✓	✓
Flow damping			✓	✓
Mass flow cutoff			✓	✓
Volume type	❑ Liquid Volume ❑ Std Gas Volume	✓	✓	✓
Standard Gas Density			✓	✓
Volume flow measurement unit		✓	✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
If volume flow is a special unit	Base mass unit:		✓	✓
	Base time unit:		✓	✓
	Conversion factor:		✓	✓
	Flow text:		✓	✓
	Total text:		✓	✓
Volume flow cutoff			✓	✓
Flow direction	❑ Absolute Value ❑ Bidirectional ❑ Forward ❑ Negate Bidirectional ❑ Negate Forward ❑ Reverse		✓	✓
Density measurement unit		✓	✓	✓
Slug flow low limit			✓	✓
Slug flow high limit			✓	✓
Slug duration			✓	✓
Density damping			✓	✓
Density cutoff			✓	✓
Temperature measurement unit	❑ °C ❑ °F ❑ °R ❑ Kelvin	✓	✓	✓
Temperature damping			✓	✓
Pressure compensation	Pressure units:	✓	✓	✓
	Flow factor:		✓	✓
	Density factor:		✓	✓
	Calibration pressure:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communi-cator
Petroleum measurement application (if available)	API table type: ❑ Degrees API, reference temperature 60 °F ❑ Relative Density/Specific Gravity, reference temperature 60 °F ❑ kg/m³ at user-defined reference temperature (Temperature:____)		✓	✓
	API Units: ❑ Generalized Crude or JP4 (API Chapter 11.1 “A” Tables) ❑ Generalized Products (API Chapter 11.1 “B” Tables) ❑ User Defined TEC (API Chapter 11.1 “C” Tables)		✓	✓
Concentration measurement application (if available)	Active curve:		✓	✓
	Derived variable:		✓	✓
Weights & Measures application (if available)	Totalizer reset options: ❑ Not resettable from display or digital communications ❑ Resettable from digital communications only ❑ Resettable fro display and digital communications ❑ Resettable from display only		✓	
Transmitter display	Language: ❑ English ❑ French ❑ German ❑ Spanish	✓	✓	

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Display variables: • Var1: • Var2: • Var3: • Var4: • Var5: • Var6: • Var7: • Var8: • Var9: • Var10: • Var11: • Var12: • Var13: • Var14: • Var15:		✓	✓
	Update period (100 milliseconds to 10,000 milliseconds range; default is 200 milliseconds):	✓	✓	✓
	Auto scroll: ❑ Enable ❑ Disable	✓	✓	
	Auto scroll rate (default is 10 seconds):	✓	✓	
	Backlight: ❑ On ❑ Off	✓	✓	
	Totalizer start/stop: ❑ Enabled ❑ Disabled	✓	✓	
	Totalizer reset: ❑ Enabled ❑ Disabled	✓	✓	

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Acknowledge all alarms: ❑ Enabled ❑ Disabled	✓	✓	
	Offline menu: ❑ Enabled ❑ Disabled	✓	✓	
	Alarm password: ❑ Enabled ❑ Disabled	✓	✓	
	Response time: ❑ Normal ❑ Special		✓	
Informational parameters	Tag:		✓	✓
	Descriptor:			✓
	Message:			✓
	Date:			✓
	Sensor serial number:		✓	✓
	Sensor model:		✓	
	Material:		✓	✓
	Flange:		✓	✓
	Liner:		✓	✓
mA Output 1	Process Variable:	✓	✓	✓
	Measurement unit:	✓	✓	✓
	Lower range value (LRV):	✓	✓	✓
	Upper range value (URV):	✓	✓	✓
	Mass flow cutoff:		✓	✓
	Added damping:		✓	✓
	Fault action: ❑ Upscale ❑ Downscale ❑ Internal zero ❑ None		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Fault Level:		✓	✓
mA Output 2	Process Variable:	✓	✓	✓
	Measurement unit:	✓	✓	✓
	Lower range value (LRV):	✓	✓	✓
	Upper range value (URV):	✓	✓	✓
	Mass flow cutoff:		✓	✓
	Added damping:		✓	✓
	Fault action: ❑ Upscale ❑ Downscale ❑ Internal zero ❑ None		✓	✓
	Fault level:		✓	✓
Frequency output	Process variable:	✓	✓	✓
	Scaling method: ❑ Freqency = Flow ❑ Pulses/Unit ❑ Units/Pulse	✓	✓	✓
	Pulse width: ❑ Active High ❑ Active Low		✓	✓
	Polarity: ❑ Active High ❑ Active Low	✓	✓	✓
	Fault action: ❑ Upscale ❑ Downscale ❑ Internal zero ❑ None		✓	✓
	Fault level:		✓	✓
	Power type: ❑ Internal ❑ External	✓	✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
Discrete output	Assignment: ❑ Calibration in progress ❑ Discrete event 1 ❑ Discrete event 2 ❑ Discrete event 3 ❑ Discrete event 4 ❑ Discrete event 5 ❑ Event 1 ❑ Event 2 ❑ Fault condition indication ❑ Flow switch indication ❑ Forward/Reverse indication	✓	✓	✓
	Polarity: ❑ Active High ❑ Active Low	✓	✓	✓
	Power type: ❑ Internal ❑ External	✓	✓	✓
	Fault action: ❑ Upscale ❑ Downscale ❑ None		✓	✓
Discrete input	Polarity: ❑ Active High ❑ Active Low	✓	✓	✓
	Assignment: ❑ Start zero: ❑ Start/stop totalizers: ❑ Reset mass total: ❑ Reset gas standard volume total: ❑ Reset all totals: ❑ Reset API temperature-corrected volume total:	✓	✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with:		
		Display	ProLink II	Field Communi-cator
mA input	Process variable: ❑ External pressure ❑ Internal pressure ❑ None	✓	✓	✓
	Lower range value (LRV):	✓	✓	✓
	Upper range value (URV):	✓	✓	✓
HART Address or Modbus Address			✓	✓
Loop current mode (ProLink II) or mA output action (Field Communicator)	❑ Enable ❑ Disable		✓	✓
Modbus ASCII	❑ Enable ❑ Disable		✓	
Burst mode	❑ Enable ❑ Disable		✓	✓
Burst mode output	❑ Dynamic variables and PV current ❑ Primary variable ❑ PV current and percentage of range ❑ Read device variables with status ❑ Transmitter variables		✓	✓
HART variables	• Primary variable (PV): • Secondary variable (SV): • Tertiary variable (TV): • Quaternary variable (QV):		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communi-cator
Digital Communications Fault Actions Settings	❑ Upscale ❑ Downscale ❑ Report NAN (Not A Number) ❑ Flow Rates go to zero value = zero flow ❑ Flow Rates go to zero value = zero flow. Density and Temperature go to zero. ❑ No Action		✓	✓
Event 1	Output assignment:		✓	✓
	Process variable:		✓	✓
	Type: ❑ High alarm ❑ Low alarm		✓	✓
	Setpoint:		✓	✓
Event 2	Output assignment:		✓	✓
	Process variable:		✓	✓
	Type: ❑ High alarm ❑ Low alarm		✓	✓
	Setpoint:		✓	✓
Discrete Event 1	Event Type: ❑ HI ❑ LO ❑ IN ❑ OUT		✓	✓
	Process Variable:		✓	✓
	Setpoint A:		✓	✓
	Setpoint B:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communi-cator
	Action: ❑ None (default) ❑ Start Sensor Zero ❑ Start/stop all totalizers ❑ Reset mass total ❑ Reset volume total ❑ Reset gas standard volume total ❑ Reset all totals ❑ Reset temperature-corrected volume total ❑ Reset CM reference volume total ❑ Reset CM net mass total ❑ Reset CM net volume total ❑ Increment CM matrix		✓	✓
Discrete Event 2	Event Type: ❑ HI ❑ LO ❑ IN ❑ OUT		✓	✓
	Process Variable:		✓	✓
	Setpoint A:		✓	✓
	Setpoint B:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Action: ❑ None (default) ❑ Start Sensor Zero ❑ Start/stop all totalizers ❑ Reset mass total ❑ Reset volume total ❑ Reset gas standard volume total ❑ Reset all totals ❑ Reset temperature-corrected volume total ❑ Reset CM reference volume total ❑ Reset CM net mass total ❑ Reset CM net volume total ❑ Increment CM matrix		✓	✓
Discrete Event 3	Event Type: ❑ HI ❑ LO ❑ IN ❑ OUT		✓	✓
	Process Variable:		✓	✓
	Setpoint A:		✓	✓
	Setpoint B:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Action: ❑ None (default) ❑ Start Sensor Zero ❑ Start/stop all totalizers ❑ Reset mass total ❑ Reset volume total ❑ Reset gas standard volume total ❑ Reset all totals ❑ Reset temperature-corrected volume total ❑ Reset CM reference volume total ❑ Reset CM net mass total ❑ Reset CM net volume total ❑ Increment CM matrix		✓	✓
Discrete Event 4	Event Type: ❑ HI ❑ LO ❑ IN ❑ OUT		✓	✓
	Process Variable:		✓	✓
	Setpoint A:		✓	✓
	Setpoint B:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Action: ❑ None (default) ❑ Start Sensor Zero ❑ Start/stop all totalizers ❑ Reset mass total ❑ Reset volume total ❑ Reset gas standard volume total ❑ Reset all totals ❑ Reset temperature-corrected volume total ❑ Reset CM reference volume total ❑ Reset CM net mass total ❑ Reset CM net volume total ❑ Increment CM matrix		✓	✓
Discrete Event 5	Event Type: ❑ HI ❑ LO ❑ IN ❑ OUT		✓	✓
	Process Variable:		✓	✓
	Setpoint A:		✓	✓
	Setpoint B:		✓	✓

Table 1-3 9739 MVD transmitter configuration settings *continued*

Configuration parameter	Setting	Configurable with: Display	ProLink II	Field Communicator
	Action: ❑ None (default) ❑ Start Sensor Zero ❑ Start/stop all totalizers ❑ Reset mass total ❑ Reset volume total ❑ Reset gas standard volume total ❑ Reset all totals ❑ Reset temperature-corrected volume total ❑ Reset CM reference volume total ❑ Reset CM net mass total ❑ Reset CM net volume total ❑ Increment CM matrix		✓	✓
Polled variable 1	Polling control: ❑ None ❑ Poll As Primary ❑ Poll As Secondary		✓	✓
	External Tag:		✓	✓
	Variable type: ❑ External pressure ❑ External temperature ❑ None		✓	✓
Polled variable 2	Polling control: ❑ None ❑ Poll As Primary ❑ Poll As Secondary		✓	✓
	External Tag:		✓	✓
	Variable type: ❑ External pressure ❑ External temperature ❑ None		✓	✓

Chapter 2

Quick start with the display

Topics covered in this chapter:

- ♦ Apply power
- ♦ Configuration tips and tricks
- ♦ Configure the primary mA output to report mass flow rate in a user-selected measurement unit
- ♦ Perform a loop test
- ♦ Zero the flowmeter

2.1 Apply power

Prerequisites

Before you apply power to the flowmeter, close and tighten all housing covers.

⚠ **To prevent ignition of flammable or combustible atmospheres, make sure all covers are tightly closed. For hazardous area installations, applying power to the unit while housing covers are removed or loose can cause an explosion.**

Procedure

Turn on the electrical power at the power supply.

The flowmeter will automatically perform diagnostic routines. 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

Allow the electronics to warm up for approximately 10 minutes before relying on process measurements. Although the sensor is ready to receive process fluid shortly after power-up, the electronics can take up to 10 minutes to warm up completely.

2.2 Configuration tips and tricks

Review these tips before beginning configuration.

2.2.1 Access to OFFLINE menu

Access to the OFFLINE menu may be disabled. To configure the transmitter using the display, you must enable access to the OFFLINE menu.

2.2.2 Default values and ranges

Default values and ranges for the most commonly used parameters are provided in Appendix A.

2.3 Configure the primary mA output to report mass flow rate in a user-selected measurement unit

This procedure shows you how to perform these tasks using the display. For all other configuration tasks, including other options for the mA output, see the configuration sections of this manual.

Note

This procedure assumes that you are starting from the factory-default configuration.

Procedure

1. Navigate to the configuration menu.
    a. At the transmitter display, activate the Scroll and Select optical switches simultaneously until SEE ALARM appears on the display.
    b. Activate Scroll repeatedly until OFF-LINE MAINT appears on the display, then activate Select.
    c. Activate Scroll-Select-Scroll.

        This operator sequence is a safety precaution, designed to protect the transmitter from accidental configuration changes caused by unintentional activation of the off-line menu.

        Important

        If you have enabled a display password, the Scroll-Select-Scroll operator sequence is disabled. You are required to enter a password before you can continue. The default password is 1234.

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    d. Activate Scroll until OFF-LINE CONFG appears on the display, then activate Select.
2. Set Mass Flow Measurement Unit as desired.
    a. When CONFIG UNITS appears on the display, activate Select.
    b. When UNITS MASS appears on the display, activate Select.
    c. Activate Scroll to view the options for Mass Flow Measurement Unit. When you see the measurement unit you want to use, activate Select. If STORE/YES? flashes on the display, activate Select.
    d. Activate Scroll until UNITS EXIT appears on the display, then activate Select.
3. Set mA Output Process Variable to Mass Flow Rate.
    a. Activate Scroll until CONFIG IO appears on the display, then activate Select.
    b. When AO 1 appears on the display, activate Select.
    c. When AO 1 SRC appears on the display, activate Select.
    d. Activate Scroll to view the options for mA Output Process Variable options. When you see MFLOW, activate Select. If STORE/YES? flashes on the display, activate Select.
4. Set Lower Range Value (LRV).

Lower Range Value specifies the value of Mass Flow Rate to be represented by an output level of 0 mA or 4 mA.

a. Activate Scroll until AO 1 4 mA or AO 1 0 mA appears on the display, then activate Select.

b. Define each character in Lower Range Value, including the sign.

   Use Select to highlight a specific character. Use Scroll to set the value of the character.

c. When you have set all characters as desired, activate Scroll and Select simultaneously until SAVE/YES? flashes on the display, then activate Select to write the value to transmitter memory.

5. Set Upper Range Value (URV).

   Upper Range Value specifies the value of Mass Flow Rate to be represented by an output level of 20 mA.

   a. Activate Scroll until AO 1 20 mA appears on the display, then activate Select.

   b. Define each character in Upper Range Value, including the sign.

      Use Select to highlight a specific character. Use Scroll to set the value of the character.

   c. When you have set all characters as desired, activate Scroll and Select simultaneously until SAVE/YES? flashes on the display, then activate Select to write the value to transmitter memory.

6. Activate Scroll until AO EXIT appears on the display, then activate Select.

7. Return the display to normal operation (displaying process data).

   a. Activate Scroll until IO EXIT appears on the display, then activate Select.

   b. Activate Scroll until CONFIG EXIT appears on the display, then activate Select.

   c. Activate Scroll until OFF-LINE EXIT appears on the display, then activate Select.

   d. Activate Scroll until EXIT appears on the display, then activate Select.

Tip

Another way to exit the off-line menu is to rely on the time-out feature. If you have not used the off-line menu for approximately 60 seconds, the display will automatically return to normal operation.

2.4 Perform a loop test

A loop test is a way to verify that the transmitter and the receiving device are communicating properly. A loop test also helps you know whether you need to trim mA outputs. Performing a loop test is not a required procedure. However, Micro Motion recommends performing a loop test for every input or output available on your transmitter.

Procedure

1. Test the mA output.

   a. Choose **OFFLINE MAINT→SIM→AO1 SIM**, and select SET 4 MA or another mA output value.

      Dots traverse the display while the output is fixed.

   b. 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.

c. At the transmitter, activate Select.

d. Scroll to and select SET 20 MA.

Dots traverse the display while the output is fixed.

e. 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.

f. At the transmitter, activate Select.

2. Test the secondary mA output.

Choose **OFFLINE MAINT→SIM→AO2 SIM**, and repeat the loop test for the secondary mA output.

3. Test the frequency output.

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.

4. Test the discrete output.

a. Choose **OFFLINE MAINT→SIM→DO SIM**, and select SET ON.

Dots traverse the display while the output is fixed.

b. Verify the signal state at the receiving device.

c. At the transmitter, activate Select.

d. Scroll to and select SET OFF.

e. Verify the signal state at the receiving device.

f. At the transmitter, activate Select.

5. Read the discrete input.

a. Set the remote input device so that the desired signal is sent to the transmitter.

b. At the transmitter, choose **OFFLINE MAINT→SIM**, and select READ DI.

c. Verify the signal state at the transmitter.

d. Repeat the procedure for the other signal state.

6. Read the mA input.

a. Set the remote input device so that the desired current is sent to the transmitter.

b. At the transmitter, choose **OFFLINE MAINT→SIM**, and select READ MAI.

c. Verify the current value.

Postrequisites

- If the mA output readings were slightly off at the receiving device, you can correct this discrepancy by trimming the output.
- If the mA output reading was significantly off (±200 microamps), 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, trim and calibrate the input at the remote input device.

2.5 Zero the flowmeter

Zeroing the flowmeter establishes the flowmeter's point of reference when there is no flow.

Prerequisites

To prepare for the zero procedure:

1. Allow the flowmeter to warm up for at least 20 minutes after applying power.
2. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
3. Stop flow through the sensor by shutting a valve downstream from the sensor.
4. Ensure that flow has completely stopped through the sensor, and that the sensor is completely full of process fluid.
5. Check the flow rate. If the flow rate is close to zero, you should not need to zero the flowmeter.

Important
The meter was zeroed at the factory, and should not require a field zero.

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

Procedure

1. Initiate flowmeter zero by choosing **OFFLINE MAINT→ZERO→CAL ZERO**, and select CAL/YES?.

   Dots traverse the display while flowmeter zero is in progress.

2. Read the zero result on the display.

   The display will report CAL PASS if the zero was successful, or CAL FAIL if it was not. If the zero fails, restore the factory zero (if available).

2.5.1 Restore factory zero

Procedure

Restore the factory zero with the display.

OFFLINE MAINT→RESTORE ZERO→RESTORE/YES?

Chapter 3

Quick start with ProLink II

Topics covered in this chapter:

- ♦ Apply power
- ♦ Connect with ProLink II
- ♦ Configuration tips and tricks
- ♦ Configure the primary mA output to report mass flow rate in a user-selected measurement unit
- ♦ Perform a loop test
- ♦ Trim mA outputs
- ♦ Zero the flowmeter
- ♦ Test or tune the system using sensor simulation
- ♦ Back up transmitter configuration
- ♦ Enable/disable HART security

3.1 Apply power

Prerequisites

Before you apply power to the flowmeter, close and tighten all housing covers.

⚠ **To prevent ignition of flammable or combustible atmospheres, make sure all covers are tightly closed. For hazardous area installations, applying power to the unit while housing covers are removed or loose can cause an explosion.**

Procedure

Turn on the electrical power at the power supply.

The flowmeter will automatically perform diagnostic routines. 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

Allow the electronics to warm up for approximately 10 minutes before relying on process measurements. Although the sensor is ready to receive process fluid shortly after power-up, the electronics can take up to 10 minutes to warm up completely.

3.2 Connect with ProLink II

A connection from ProLink II to your transmitter allows you to read process data, configure the transmitter, and perform maintenance and troubleshooting tasks.

Prerequisites

You must have the following version of ProLink II installed on your computer: v2.91 or later.

3.2.1 ProLink II connection types

The 9739 MVD transmitter has several connections options for communicating via ProLink II. You choose a connection type based on what you need to accomplish with the transmitter and the digital communications you are using.

The 9739 MVD transmitter supports the following ProLink II connection types:

- Service port connections
- HART/Bell 202 connections
- HART/RS-485 connections
- Modbus/RS-485 7-bit connections (Modbus ASCII)
- Modbus/RS-485 8-bit connections (Modbus RTU)

When selecting a connection type, consider the following:

- Service port connections use standard connection parameters that are already defined in ProLink II, and therefore you do not have to configure them.
- HART/Bell 202 connections use standard HART connection parameters that are already defined in ProLink II. The only parameter you must configure is the transmitter address.
- The service port terminals (A and B) and the RS-485 terminals (26 and 27) use the same internal wiring. If you have wired the transmitter for RS-485 digital communications, you cannot make a service port connection.
- Service port connections require access to the service port terminals, which are located on the transmitter display and only accessible after removing the housing cover. Accordingly, service port connections should be used only for temporary connections, and may require extra safety precautions.
- Modbus connections, including service port connections, are typically faster than HART connections.
- When you are using a HART connection, ProLink II will not allow you to open more than one window at a time. This is done to manage network traffic and optimize speed.
- You cannot make a service port connection while an active connection exists between the transmitter and Modbus host.

3.2.2 Make a service port connection

Prerequisites

You will need the following:

- An installed, licensed copy of ProLink II
- An available serial or USB port
- One of the following types of signal converters:
  - RS-232 to RS-485 signal converter
  - USB to RS-485 signal converter
- Adapters as required (e.g. 9-pin to 25-pin)

Important

The SP (Service Port) clips on the display of the 9739 MVD transmitter are directly connected to the RS-485 terminals 26 and 27 of the transmitter. If you have wired the transmitter for RS-485 digital communications, you must directly connect to the transmitter using the RS-485 terminal block connections or disconnect the RS-485 terminal connections to use the Service Port connections.

Procedure

1. Attach the signal converter to your PC's serial or USB port.
2. At the transmitter, remove the housing cover to access the transmitter display.

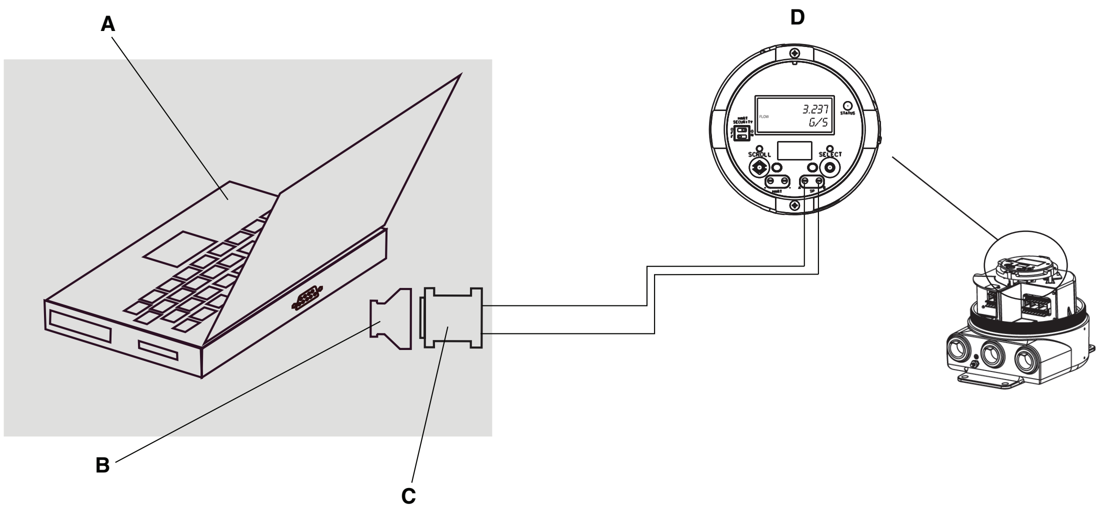
   ⚠ **If the transmitter is in a hazardous area, do not remove the housing cover while power is being supplied to the unit. Removing the housing cover while power is supplied to the unit could cause an explosion. To access transmitter information in a hazardous environment, use a communication method that does not require removing the transmitter housing cover.**

3. Connect the leads on your signal converter to the SP (Service Port) clips (A and B) on the face of the transmitter. See Figure 3-1 .

   Tip

   Usually, but not always, the black lead is RS-485/A and the red lead is RS-485/B.

Figure 3-1 ProLink II connection to service port



A PC
B 25-to-9 pin adapter, if necessary; or RS-232 to USB adapter, if necessary
C RS-232 to RS-485 signal converter
D Transmitter

Notes

- This figure shows a serial port connection. A USB port connection is also available.

4. Start ProLink II.
5. Choose **Connection→Connect to Device**.
6. Set Protocol to Service Port.

Tip

Service port connections use standard connection parameters and a standard address. You do not need to configure them here.

7. Set the COM Port value to the PC COM port that you are using for this connection.
8. Click Connect.

   If the connection is successful:

   - The status bar in the main window is updated to show an active connection.
   - The Process Variables window or Commissioning Wizard window is displayed.

If an error message appears:

- Switch the leads and try again.
- Ensure that you are using the correct COM port.
- Check the physical connection between the PC and the transmitter.

3.2.3 Make a HART/Bell 202 connection

Prerequisites

You will need the following:

- An installed, licensed copy of ProLink II
- An available serial or USB port
- One of the following types of signal converters:
  - RS-232 to Bell 202 signal converter
  - USB to Bell 202 signal converter
- Adapters as required (e.g. 9-pin to 25-pin)

Important
If 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, or perform calibration using the Field Communicator or ProLink II with a HART connection. When the HART security switch is set to OFF, no functions are disabled.

You can connect ProLink II to the HART clips on the transmitter, to any point in a local HART loop, or to any point in a HART multidrop network.

⚠ **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 transmitter information in a hazardous environment, use a communication method that does not require removing the transmitter housing cover.**

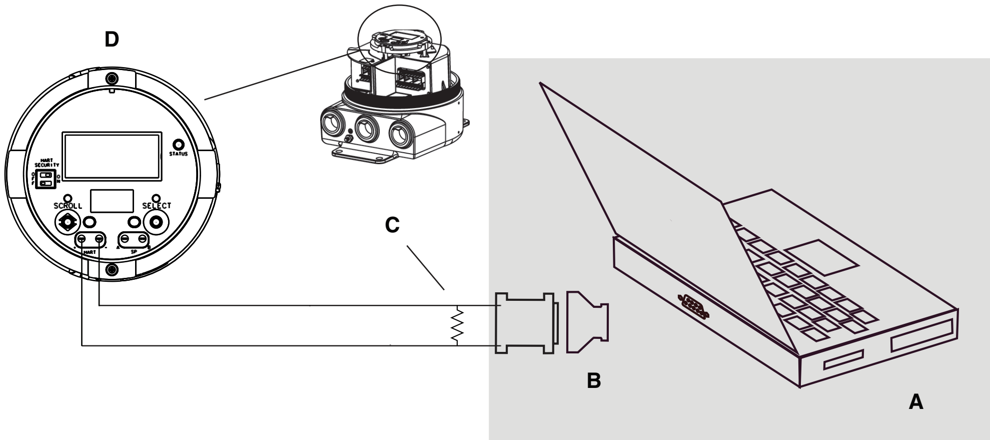
Procedure

1. To connect to the HART clips:
   a. Remove the transmitter housing cover.
   b. Attach the leads from the signal converter to the HART clips on the face of the transmitter and add resistance as necessary. See Figure 3-2.

      ProLink II must be connected across a resistance of 250–600 Ω.

      Tip
      HART connections are polarity-insensitive. It does not matter which lead you attach to which terminal.

Figure 3-2 ProLink II connection to HART clips



A PC
B HART interface
C 250–600 Ω resistance
D Transmitter

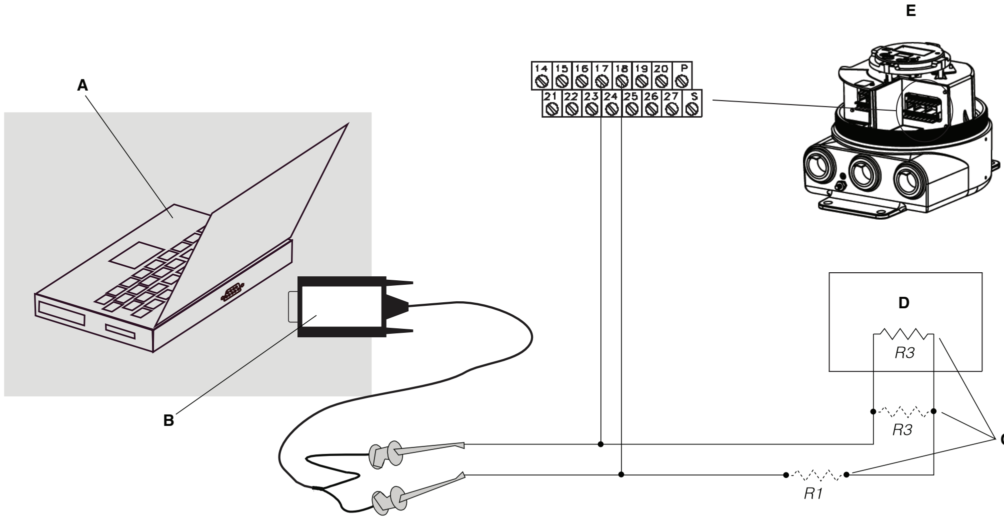
Notes

- This figure shows a serial port connection. A USB port connection is also available.

2. To connect to a point in the local HART loop, attach the leads from the signal converter to any point in the loop and add resistance as necessary. See Figure 3-3.

   ProLink II must be connected across a resistance of 250–600 Ω.

Figure 3-3 ProLink II connection to local HART loop



- **A** PC
- **B** HART interface
- **C** Any combination of resistors R1, R2, and R3 as necessary to meet HART communication resistance requirements
- **D** DCS or PLC
- **E** Transmitter

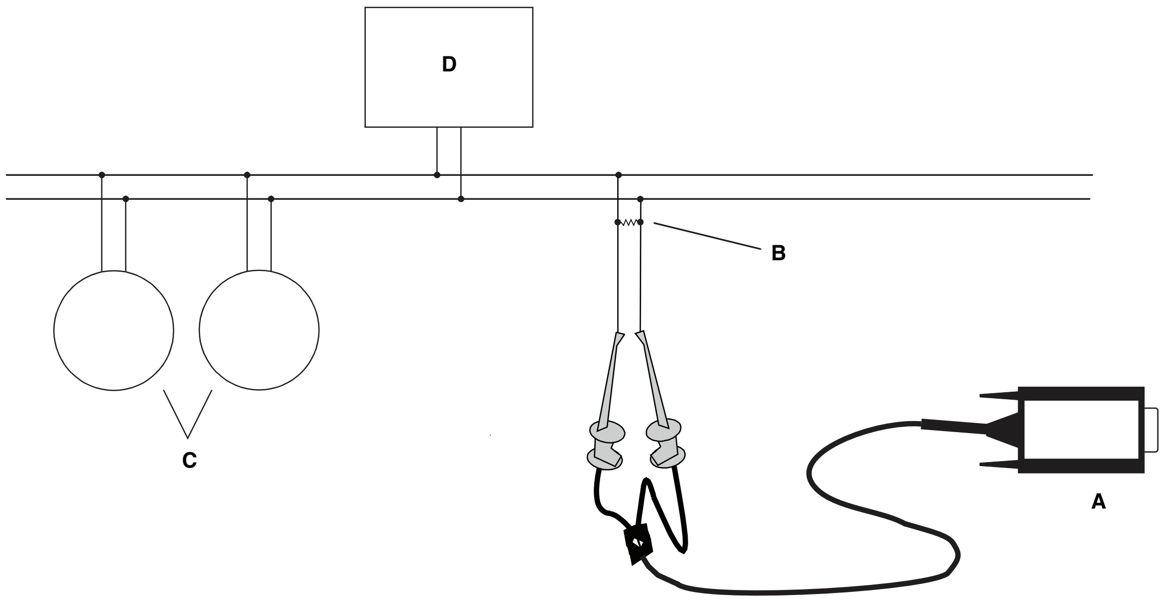
Notes

- This figure shows a serial port connection. A USB port connection is also available.

3. To connect to a point in the HART multidrop network, attach the leads from the signal converter to any point in the loop and add resistance as necessary. See Figure 3-4.

   ProLink II must be connected across a resistance of 250–600 Ω.

Figure 3-4 ProLink II connection to multidrop network



A HART interface (to PC)
B 250–600 Ω resistance
C Devices on the network
D Master device

Notes

- This figure shows a serial port connection. A USB port connection is also available.

4. Start ProLink II.
5. Choose **Connection→Connect to Device**.
6. Set Protocol to HART Bell 202.

Tip

HART/Bell 202 connections use standard connection parameters. You do not need to configure them here.

7. If you are using a USB port connection, enable Converter Toggles RTS.
8. Set Address/Tag to the HART polling address configured in the transmitter.

Tips

- If this is the first time you are connecting to the transmitter, use the default address: 0.
- If you are not in a HART multidrop environment, the HART polling address is typically left at the default value.
- If you are unsure of the transmitter's address, click Poll. ProLink II will search the network and return a list of the transmitters that it detects.

9. Set the COM Port value to the PC COM port that you are using for this connection.
10. Set Master as appropriate.

Option	Description
Secondary	Use this setting if another HART host such as a DCS is on the network.
Primary	Use this setting if no other host is on the network. The Field Communicator is not a host.

11. Click Connect.

    If the connection is successful:

    - The status bar in the main window is updated to show an active connection.
    - The Process Variables window or Commissioning Wizard window is displayed.

    If an error message appears:

    - Ensure that you are using the correct COM port.
    - Verify the HART polling address.
    - Check the physical connection between the PC and the transmitter.
    - Increase or decrease resistance.

3.2.4 Make a HART/RS-485 connection

Prerequisites

You will need the following:

- An installed, licensed copy of ProLink II
- An available serial or USB port
- One of the following types of signal converters:
  - RS-232 to RS-485 signal converter
  - USB to RS-485 signal converter
- Adapters as required (e.g. 9-pin to 25-pin)

Important

If 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, or perform calibration using the Field Communicator or ProLink II with a HART connection. When the HART security switch is set to OFF, no functions are disabled.

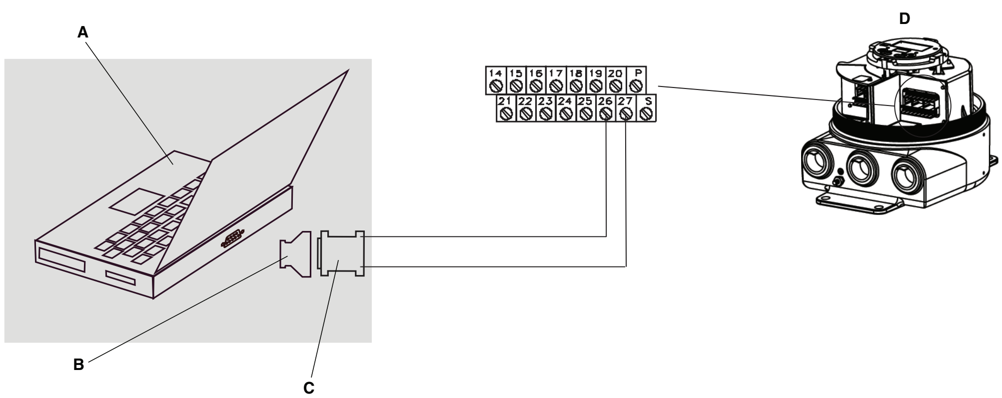
Procedure

1. Attach the signal converter to your PC's serial or USB port.
2. At the transmitter, remove the housing cover to access the RS-485 terminal connections.

   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 transmitter information in a hazardous environment, use a communication method that does not require removing the transmitter housing cover.

3. To connect directly to the transmitter, connect the leads on your signal converter to terminals 26 (RS-485/A) and 27 (RS-485/B) on your transmitter. See Figure 3-5.

Figure 3-5 ProLink II connection to transmitter terminals



A PC

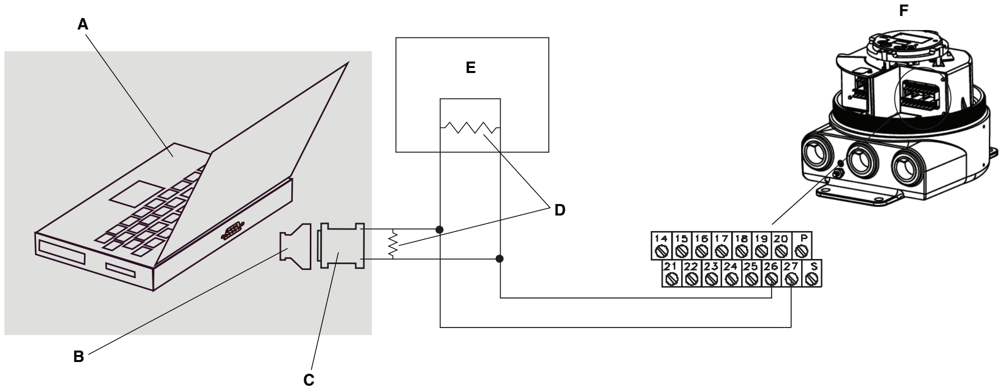
B 25-to-9 pin adapter, if necessary

C RS-485 to RS-232 signal converter

D Transmitter

4. To connect to a point in the RS-485 network, connect the leads on your signal converter to any point in the network and add resistance as necessary. See Figure 3-6.

Figure 3-6 ProLink II connection to an RS-485 network using HART



A PC

B 25-to-9 pin adapter, if necessary

C RS-485 to RS-232 signal converter

D 120-Ω, 1/2-watt terminating resistors at both ends of the segment, if necessary

E DCS or PLC (Auto-detect communication)

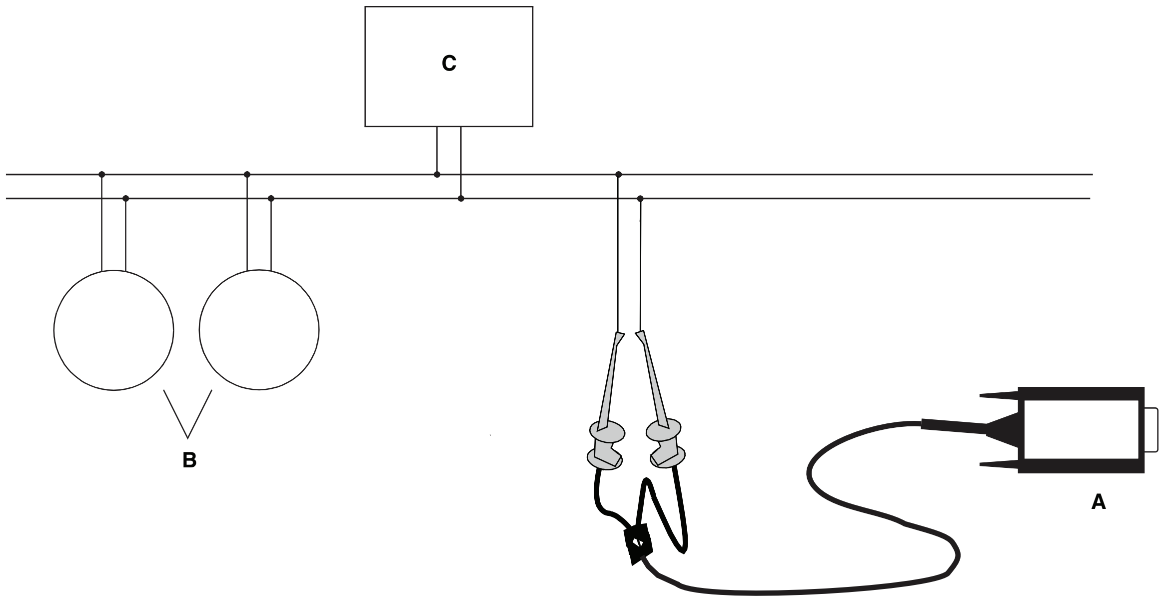
F Transmitter

Notes

- This figure shows a serial port connection. A USB port connection is also available.

5. To connect to a point in a multidrop network, attach the leads from the signal converter to any point in the wire. See Figure 3-7.

Figure 3-7 ProLink II connection to a multidrop network



A HART interface (to PC)
B Devices on the network
C Master device

6. Start ProLink II.
7. Choose **Connection→Connect to Device**.
8. If necessary, set the connection parameters to match the HART/RS-485 parameters configured in your transmitter.

   To minimize configuration requirements, the 9739 MVD transmitter uses an auto-detection scheme when responding to a connection request. The transmitter will accept all connection requests within the limits described in Table 3-1.

Table 3-1 Auto-detection limits

Parameter	Option
Protocol	HART, Modbus ASCII, Modbus RTU
Address	Responds to: • Service port address (111) • Configured HART address (default = 0) • Configured Modbus address (default = 1)
Baud rate	Standard rates between 1200 and 38,400
Stop bits	0, 1
Parity	Even, odd, none

9. Set the COM Port value to the PC COM port that you are using for this connection.

10. Set Master as appropriate:

Option	Description
Secondary	Use this setting if another host such as a DCS is on the network.
Primary	Use this setting if no other host is on the network. The Field Communicator is not a host.

11. Click Connect.

    If the connection is successful:

    - The status bar in the main window is updated to show an active connection.
    - The Process Variables window or Commissioning Wizard window is displayed.

    If an error message appears:

    - Ensure that you are using the correct COM port.
    - Check the physical connection between the PC and the transmitter.
    - For long-distance communication, or if noise from an external source interferes with the signal, install 120-Ω ½-W terminating resistors in parallel with the output at both ends of the communication segment.

3.2.5 Make a Modbus/RS-485 connection

Prerequisites

You will need the following:

- An installed, licensed copy of ProLink II
- An available serial or USB port
- One of the following types of signal converters:
  - RS-232 to RS-485 signal converter
  - USB to RS-485 signal converter
- Adapters as required (e.g. 9-pin to 25-pin)

Procedure

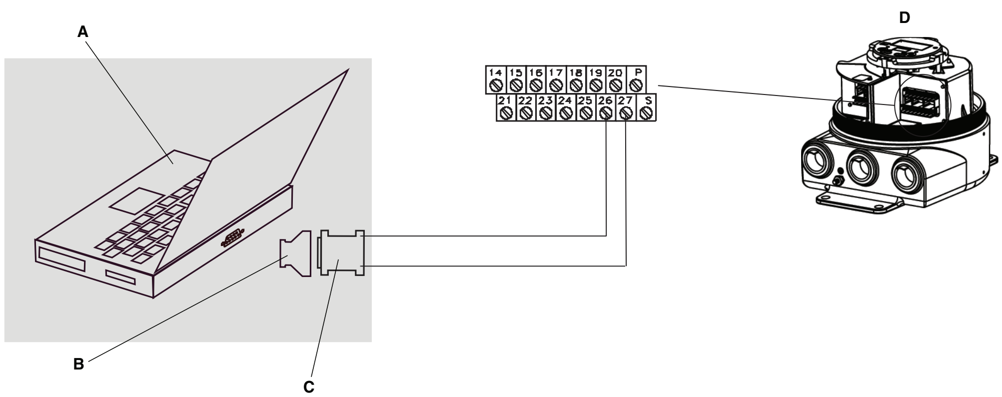
1. Attach the signal converter to your PC's serial or USB port.
2. At the transmitter, remove the housing cover to access the RS-485 terminal connections.

   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 transmitter information in a hazardous environment, use a communication method that does not require removing the transmitter housing cover.

3. To connect directly to the transmitter, connect the leads on your signal converter to terminals 26 (RS-485/A) and 27 (RS-485/B) on your transmitter. See Figure 3-8.

Tip
Usually, but not always, the black lead is RS-485/A and the red lead is RS-485/B.

Figure 3-8 ProLink II connection to transmitter terminals



A PC

B 25-to-9 pin adapter, if necessary

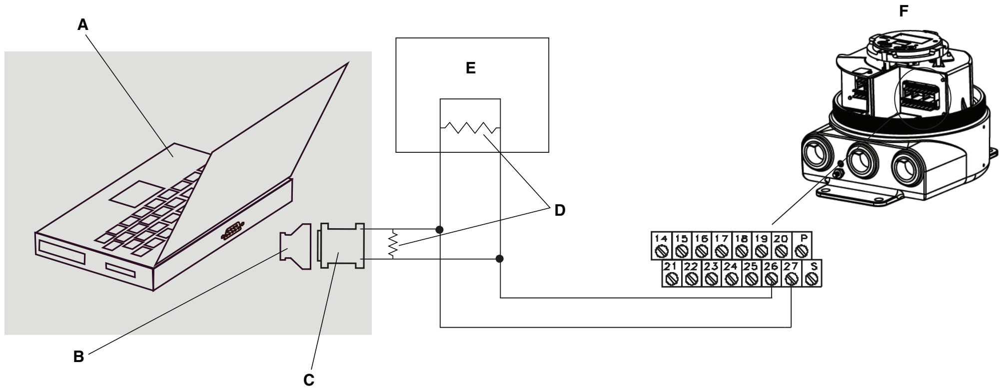
C RS-485 to RS-232 signal converter

D Transmitter

4. To connect to a point in RS-485 network, connect the leads on your signal converter to any point in the network and add resistance as necessary. See Figure 3-9.

Restriction
The Modbus host must not be communicating with the transmitter when you make the ProLink II connection. To make the connection, wait until the host communication is complete, or terminate the host connection.

Figure 3-9 ProLink II connection to RS-485 network



- **A** PC
- **B** 25-to-9 pin adapter, if necessary
- **C** RS-485 to RS-232 signal converter
- **D** 120-Ω, 1/2-watt terminating resistors at both ends of the segment, if necessary
- **E** DCS or PLC (must not be communicating with the transmitter during the ProLink II connection)
- **F** Transmitter

5. Start ProLink II.
6. Choose **Connection→Connect to Device**.
7. If necessary, set the connection parameters to match the Modbus/RS-485 parameters configured in your transmitter.

   To minimize configuration requirements, the transmitter uses an auto-detection scheme when responding to a connection request. The transmitter will accept all connection requests within the auto-detection limits (see Table 3-2).

Table 3-2 Auto-detection limits

Parameter	Option
Protocol	HART, Modbus ASCII, Modbus RTU
Address	Responds to: • Service port address (111) • Configured HART Address (default = 0) • Configured Modbus Address (default = 1)
Baud rate	Standard rates between 1200 and 38,400
Stop bits	0, 1
Parity	Even, Odd, None

Tip
If you do not know the transmitter's RS-485 communication settings, you can connect through the service port, which always uses default settings, or use another communications tool to view or change the settings.

8. Set the COM Port value to the PC COM port that you are using for this connection.
9. Click Connect.

   If the connection is successful:

   - The status bar in the main window is updated to show an active connection.
   - The Process Variables window or Commissioning Wizard window is displayed.

   If an error message appears:

   - Switch the leads and try again.
   - Ensure that you are using the correct COM port.
   - Check the physical connection between the PC and the transmitter.
   - For long-distance communication, or if noise from an external source interferes with the signal, install 120-Ω ½-W terminating resistors in parallel with the output at both ends of the communication segment.

3.3 Configuration tips and tricks

Review these tips before beginning configuration.

3.3.1 HART security

HART security may be enabled on the 9739 MVD transmitter. To configure the transmitter using HART protocol, you must disable HART security.

3.3.2 Default values and ranges

Default values and ranges for the most commonly used parameters are provided in Appendix A.

3.3.3 Restore the factory configuration

Restoring the factory configuration returns the transmitter to a known operational configuration.

Procedure

1. Make a connection from ProLink II to your transmitter.
2. Choose **ProLink→Configuration→Device→Restore Factory Configuration**.
3. In the Configuration window, click the Device tab.

4. Click **Restore Factory Configuration**.
5. Click **OK**.

3.4 Configure the primary mA output to report mass flow rate in a user-selected measurement unit

This procedure shows you how to perform these tasks using ProLink II. For all other configuration tasks, including other options for the mA output, see the configuration sections of this manual.

Note
This procedure assumes that you are starting from the factory-default configuration.

Procedure

1. Start ProLink II and connect to your transmitter.
2. Set the measurement unit for mass flow rate.
   a. Choose **ProLink→Configuration.**
   b. In the Configuration window, click the Flow tab.
   c. Select a measurement unit from the Mass Flow Units list, then click Apply.
3. Configure the mA output.
   a. In the Configuration window, click the Analog Output tab.
   b. Select Mass Flow Rate from the Primary Variable Is list.
   c. Enter appropriate values for Lower Range Value (LRV) and Upper Range Value (URV).

      Lower Range Value specifies the value of Mass Flow Rate to be represented by an output level of 0 mA or 4 mA. Upper Range Value specifies the value of Mass Flow Rate to be represented by an output level of 20 mA.
4. Click OK to apply the changes and close the Configuration window.
5. (Optional) Choose **ProLink→Output Levels** and observe the mA output reading.

   It should vary between 0 mA or 4 mA and 20 mA according to the mass flow rate of your process.

3.5 Perform a loop test

9739 MVD Transmitter	**ProLink→Test→Fix Milliamp 1** **ProLink→Test→Fix Milliamp 2** **ProLink→Test→Fix Freq Out** **ProLink→Test→Fix Discrete Out** **ProLink→Test→Read Discrete Input** **ProLink→Test→Read Milliamp Input**

A loop test is a way to verify that the transmitter and the receiving device are communicating properly. A loop test also helps you know whether you need to trim mA outputs.

A loop test is a way to verify that the transmitter and the receiving device are communicating properly. A loop test also helps you know whether you need to trim mA outputs. Performing a loop test is not a required procedure. However, Micro Motion recommends performing a loop test for every input or output available on your transmitter.

Procedure

1. Test the mA output.
    a. Choose **ProLink→Test→Fix Milliamp 1**.
    b. Enter 0 mA or 4 mA in Set Output To. Click Fix 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. Click UnFix mA.
    e. Enter 20 mA in Set Output To. Click Fix 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. Click UnFix mA.
2. Test the secondary mA output.

   Choose **ProLink→Test→Fix Millamp 2**, and repeat the loop test for the secondary mA output.
3. Test the frequency output.

   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. Choose **ProLink→Test→Fix Freq Out**.
    b. Enter the frequency output value in Set Output To. Click Fix Frequency.
    c. Read the frequency signal at the receiving device and compare it to the transmitter output.
    d. Click UnFix Freq.
4. Test the discrete output.
    a. Choose **ProLink→Test→Fix Discrete Output**.
    b. Select On.
    c. Verify the signal state at the receiving device.
    d. Click UnFix.
    e. Select Off.
    f. Verify the signal state at the receiving device.
    g. Click UnFix.
5. Read the discrete input.
    a. Set the remote input device so that the desired signal is sent to the transmitter.
    b. Choose **ProLink→Test→Read Discrete Input**.
    c. Verify the signal state at the transmitter.

   d. Repeat the procedure for the other signal state.

6. Read the mA input.

   a. Set the remote input device so that the desired signal is sent to the transmitter.

   b. Choose **ProLink→Test→Read MA Input**.

Postrequisites

- If the mA output readings were slightly off at the receiving device, you can correct this discrepancy by trimming the output.
- If the mA output reading was significantly off (±200 microamps), 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, trim and calibrate the input at the remote input device.

3.6 Trim mA outputs

Trimming the mA output establishes a common measurement range between the transmitter and the device that receives the mA output.

Trimming the mA outputs is not a required procedure. However, if there is a small discrepancy in the mA reading between the transmitter and the receiving device, trimming the output will correct this.

Note
Any trimming performed on the output should not exceed ±200 microamps. If more trimming is required, contact Micro Motion customer support.

Procedure

1. Choose **ProLink→Calibration→Milliamp 1 Trim** to start the mA trim procedure.
2. Follow the instructions in the guided method to trim the mA output.
3. Choose **ProLink→Calibration→Milliamp 2 Trim** to start the trim procedure for the secondary mA output.
4. Follow the instructions in the guided method to trim the mA output.

3.7 Zero the flowmeter

Prerequisites

To prepare for the zero procedure:

1. Allow the flowmeter to warm up for at least 20 minutes after applying power.
2. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
3. Stop flow through the sensor by shutting a valve downstream from the sensor.
4. Ensure that flow has completely stopped through the sensor, and that the sensor is completely full of process fluid.
5. Check the flow rate. If the flow rate is close to zero, you should not need to zero the flowmeter.

Important
The meter was zeroed at the factory, and should not require a field zero.

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

Procedure

1. Choose **ProLink→Calibration→Zero Calibration**.
2. Modify Zero Time, if required.

   Zero Time controls the amount of time the transmitter takes to determine its zero-flow reference point.

   - A *long* zero time may produce a more accurate zero reference, but is more likely to result in a zero failure. This is due to the increased possibility of noisy flow, which causes incorrect calibration.
   - A *short* zero time is less likely to result in a zero failure but may produce a less accurate zero reference.

   The default Zero Time is 20 seconds. For most applications, the default Zero Time is appropriate.
3. Click Perform Auto Zero to initiate the zero procedure.

   The Calibration in Progress light will turn red during the zero procedure. At the end of the procedure:

   - The Calibration in Progress light will return to green if the zero was successful.
   - The Calibration Failure light will turn red if the zero procedure failed.
4. In case of failure, you have two options:

Option	Description
Restore Prior Zero	Restore Prior Zero restores the flowmeter to the zero value it had just prior to starting the zero procedure. If you close the Flow Calibration window, you will no longer be able to restore the prior zero.
Restore Factory Zero	Restore Factory Zero is available only if you ordered a transmitter and a sensor together.

3.8 Test or tune the system using sensor simulation

Sensor simulation allows you to set specific values or value ranges for mass flow, density, and temperature. The transmitter will report the specified values and take all appropriate actions, e.g., apply a cutoff, activate an event, or post an alarm. You can use this feature to test the system's response to a variety of process conditions, including boundary conditions, problem conditions, or alarm conditions, or to tune the loop.

When you enable sensor simulation, the simulated values are stored in the same memory locations used for process data from the sensor. Therefore, the simulated values will be used throughout transmitter functioning. For example, sensor simulation will affect:

- All mass flow, temperature, or density values shown on the display or reported via outputs or digital communications
- The mass total and mass inventory values
- All volume calculations and data, including reported values, volume totals, and volume inventories
- All mass, temperature, density, or volume values logged to Data Logger

Sensor simulation does not affect any diagnostic values.

Unlike actual mass flow and density values, the simulated values are not temperature-compensated (adjusted for the effect of temperature on the sensor's flow tubes).

Important
Do not enable sensor simulation unless your process can tolerate the effects of the simulated process values.

Procedure

1. Click **ProLink→Configuration→Sensor Simulation**.
2. Enable sensor simulation.
3. For mass flow, set Wave Form as desired and enter the required values.

Option	Required values
Fixed	Fixed Value
Sawtooth	Period Minimum Maximum
Sine	Period Minimum Maximum

4. For density, set Wave Form as desired and enter the required values.

Option	Required values
Fixed value	Fixed Value
Triangular wave	Period Minimum Maximum
Sine wave	Period Minimum Maximum

5. For temperature, set Wave Form as desired and enter the required values.

Option	Required values
Fixed value	Fixed Value
Triangular wave	Period Minimum Maximum
Sine wave	Period Minimum Maximum

6. Observe the system response to the simulated values and make any appropriate changes to the transmitter configuration or to the system.
7. Modify the simulated values and repeat.
8. When you have finished testing or tuning, disable sensor simulation.

3.9 Back up transmitter configuration

ProLink II provides 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, and is also a convenient way to replicate a configuration across multiple devices.

Procedure

Choose **File→Load from Xmtr to File** to save the transmitter configuration to your PC.

3.10 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.

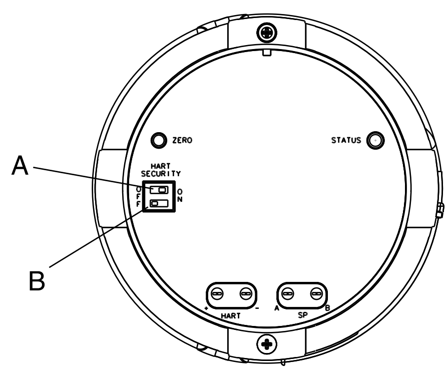
Important
The HART security switch does not affect Modbus communications.

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 (see Figure 3-10).

Figure 3-10 HART security switch (on blank display)



A HART security switch
B Unused

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

Chapter 4

Quick start with the Field Communicator

Topics covered in this chapter:

4.1 Apply power

Prerequisites

Before you apply power to the flowmeter, close and tighten all housing covers.

⚠ **To prevent ignition of flammable or combustible atmospheres, make sure all covers are tightly closed. For hazardous area installations, applying power to the unit while housing covers are removed or loose can cause an explosion.**

Procedure

Turn on the electrical power at the power supply.

The flowmeter will automatically perform diagnostic routines. 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

Allow the electronics to warm up for approximately 10 minutes before relying on process measurements. Although the sensor is ready to receive process fluid shortly after power-up, the electronics can take up to 10 minutes to warm up completely.

4.2 Connect with the Field Communicator

Prerequisites

The following HART device description (DD) must be installed on the Field Communicator: DD v2.
A connection from the Field Communicator to your transmitter allows you to read process data, configure the transmitter, and perform maintenance and troubleshooting tasks.

You can connect the Field Communicator to the HART clips on the transmitter, to any point in a local HART loop, or to any point in a HART multidrop network.

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 transmitter information in a hazardous environment, use a communication method that does not require removing the transmitter housing cover.

Important

If 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, or perform calibration using the Field Communicator or ProLink II with a HART connection. When the HART security switch is set to OFF, no functions are disabled.

Procedure

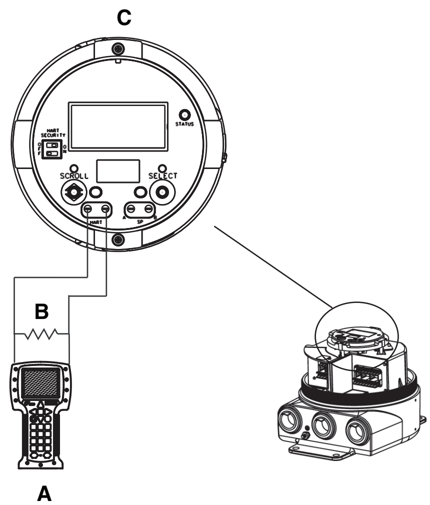
1. To connect to the HART clips:
   a. Remove the transmitter housing cover.
   b. Attach the leads from the Field Communicator to the HART clips on the face of the transmitter and add resistance as necessary.

      The Field Communicator must be connected across a resistance of 250–600 Ω.

      Tip

      HART connections are polarity-insensitive. It does not matter which lead you attach to which terminal.

Figure 4-1 Field Communicator connection to HART clips

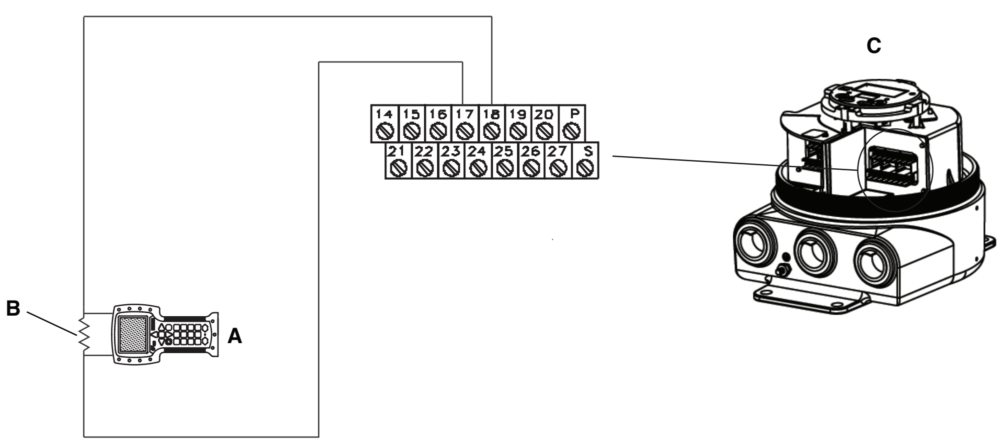


A Field Communicator
B 250–600 Ω resistance
C Transmitter

2. To connect to a point in the local HART loop, attach the leads from the Field Communicator to any point in the loop and add resistance as necessary. See Figure 4-2.

   The Field Communicator must be connected across a resistance of 250–600 Ω.

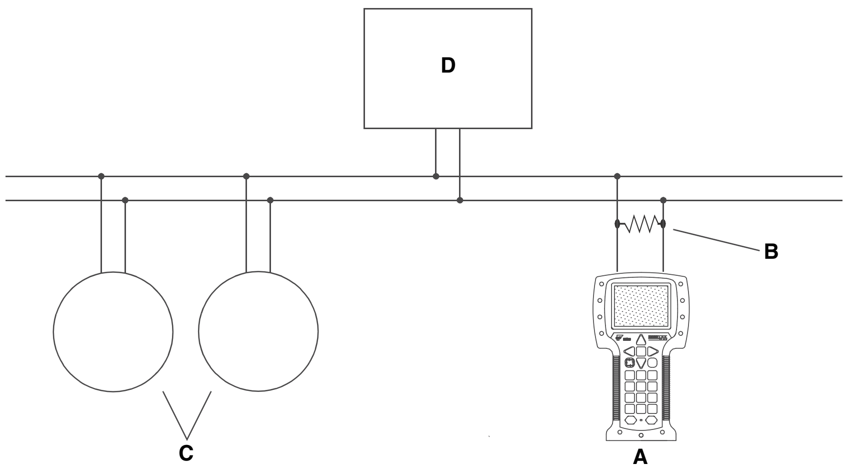
Figure 4-2 Field Communicator connection to local HART loop



A Field Communicator
B 250–600 Ω resistance
C Transmitter terminals

3. To connect to a point in the HART multidrop network, attach the leads from the Field Communicator to any point on the network. See Figure 4-3.

Figure 4-3 Field Communicator connection to multidrop network



A Field Communicator
B 250–600 Ω resistance
C Devices on the network
D Master device

4. Turn on the Field Communicator and wait until the main menu is displayed.
5. If you are connecting across a multidrop network:
   a. Set the Field Communicator to poll.

      The device returns all addresses that are valid.
   b. Enter the appropriate HART address.

   The default HART address is 0. However, for multidrop operation, the HART address must be unique on the network.
6. (Optional) To navigate to the Online menu, press **HART Application→2 Online**.

   Most configuration, maintenance, and troubleshooting tasks are performed from the Online menu.

Tip
You may see messages related to the DD or active alerts. Press the appropriate buttons to ignore the message and continue.

4.3 Configuration tips and tricks

Review these tips before beginning configuration.

4.3.1 HART security

HART security may be enabled on the 9739 MVD transmitter. To configure the transmitter using HART protocol, you must disable HART security.

4.3.2 Default values and ranges

Default values and ranges for the most commonly used parameters are provided in Appendix A.

4.4 Configure the primary mA output to report mass flow rate in a user-selected measurement unit

---

Note
This procedure assumes that you are starting from the factory-default configuration.

Procedure

1. Make a connection from the Field Communicator to your transmitter.
2. Navigate to the On-Line Menu.
3. Set the measurement unit for mass flow rate.
   a. Press **Configure→Manual Setup→Measurements→Flow→Mass Flow Unit**.
   b. Select the desired measurement unit from the list.
   c. Press the left arrow until you are returned to the Manual Setup menu.
4. Configure the mA output.
   a. Press **Inputs/Outputs→mA Output 1→Primary Variable**.
   b. Select Mass Flow Rate from the list.
   c. Press ENTER until you are returned to the mA Output 1 menu.
   d. Press mA Output Settings.
   e. Press PV LRV and enter an appropriate value for Lower Range Value (LRV).
      Lower Range Value specifies the value of Mass Flow Rate to be represented by an output level of 0 mA or 4 mA.
   f. Press ENTER.
   g. Press PV URV and enter an appropriate value for Upper Range Value (LRV).
      Upper Range Value specifies the value of Mass Flow Rate to be represented by an output level of 20 mA.
   h. Press ENTER.
5. (Optional) Press **Overview→Shortcuts→Variables→Outputs→Current (mA output 1)** and observe the mA output reading.

It should vary between 0 mA or 4 mA and 20 mA according to the mass flow rate of your process.

4.5 Perform a loop test

A loop test is a way to verify that the transmitter and the receiving device are communicating properly. A loop test also helps you know whether you need to trim mA outputs. Performing a loop test is not a required procedure. However, Micro Motion recommends performing a loop test for every input or output available on your transmitter.

Procedure

1. Test the mA output.
   a. Press **Service Tools→Simulate→Simulate Outputs→mA Output Loop Tests**, and select 4 mA.
   b. 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.
   c. Select 20 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.
2. Test the secondary mA output.

   Press **Service Tools→Maintenance→Simulate Outputs→mA Output 2 Loop Test**, and repeat the loop test for the secondary mA output.
3. Test the frequency output.

   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.
4. Test the discrete output.
   a. Press **Service Tools→Simulate→Simulate Outputs→Discrete Output Test**.
   b. Choose Off.
   c. Verify the signal state at the receiving device.
   d. Choose On.
   e. Verify the signal state at the receiving device.

f. Choose End.

Postrequisites

- If the mA output readings were slightly off at the receiving device, you can correct this discrepancy by trimming the output.
- If the mA output reading was significantly off (±200 microamps), 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, trim and calibrate the input at the remote input device.

4.6 Trim mA outputs

Trimming the mA outputs is not a required procedure. However, if there is a small discrepancy in the mA reading between the transmitter and the receiving device, trimming the output will correct this.

Note
Any trimming performed on the output should not exceed ±200 microamps. If more trimming is required, contact Micro Motion customer support.

Procedure

1. Press **Service Tools→Maintenance→Routine Maintenance→Trim mA output 1** to start the mA trim procedure.
2. Follow the instructions in the guided method to trim the mA output.
3. Choose **Service Tools→Maintenance→Routine Maintenance→Trim mA output 2** to start the trim procedure for the secondary mA output.
4. Follow the instructions in the guided method to trim the mA output.

4.7 Zero the flowmeter

Prerequisites

To prepare for the zero procedure:

1. Allow the flowmeter to warm up for at least 20 minutes after applying power.
2. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
3. Stop flow through the sensor by shutting a valve downstream from the sensor.
4. Ensure that flow has completely stopped through the sensor, and that the sensor is completely full of process fluid.
5. Check the flow rate. If the flow rate is close to zero, you should not need to zero the flowmeter.

Important
The meter was zeroed at the factory, and should not require a field zero.

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

Procedure

To initiate the flowmeter zero, press **Service Tools→Maintenance→Zero Calibration→Perform Auto Zero**.

The display will report Calibration in progress. When the calibration is complete, the display reports Auto zero complete if the zero was successful, or Auto zero failed if it was not.

4.8 Test or tune the system using sensor simulation

Sensor simulation allows you to set specific values or value ranges for mass flow, density, and temperature. The transmitter will report the specified values and take all appropriate actions, e.g., apply a cutoff, activate an event, or post an alarm. You can use this feature to test the system's response to a variety of process conditions, including boundary conditions, problem conditions, or alarm conditions, or to tune the loop.

When you enable sensor simulation, the simulated values are stored in the same memory locations used for process data from the sensor. Therefore, the simulated values will be used throughout transmitter functioning. For example, sensor simulation will affect:

- All mass flow, temperature, or density values shown on the display or reported via outputs or digital communications
- The mass total and mass inventory values
- All volume calculations and data, including reported values, volume totals, and volume inventories
- All mass, temperature, density, or volume values logged to Data Logger

Sensor simulation does not affect any diagnostic values.

Unlike actual mass flow and density values, the simulated values are not temperature-compensated (adjusted for the effect of temperature on the sensor's flow tubes).

Important
Do not enable sensor simulation unless your process can tolerate the effects of the simulated process values.

Procedure

1. Navigate to the sensor simulation menu: **Service Tools→Simulate→Simulate Sensor**.
2. Enable sensor simulation.
3. For mass flow, set Wave Form as desired and enter the required values.

Option	Required values
Fixed	Sim Fixed Value
Sawtooth	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period
Sine	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period

4. For density, set Wave Form as desired and enter the required values.

Option	Required values
Fixed value	Sim Fixed Value
Triangular wave	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period
Sine wave	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period

5. For temperature, set Wave Form as desired and enter the required values.

Option	Required values
Fixed value	Sim Fixed Value
Triangular wave	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period
Sine wave	Sim Ramp Low Point Sim Ramp High Point Sim Ramp Period

6. Observe the system response to the simulated values and make any appropriate changes to the transmitter configuration or to the system.

7. Modify the simulated values and repeat.
8. When you have finished testing or tuning, disable sensor simulation.

4.9 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

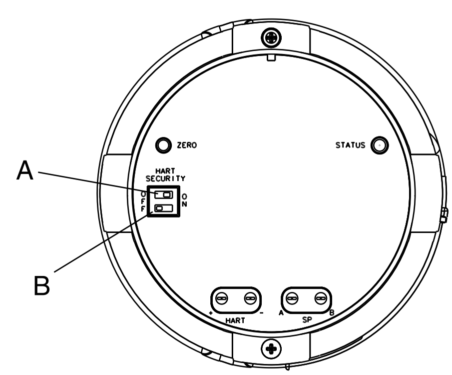
The HART security switch does not affect Modbus communications.

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 (see Figure 4-4).

Figure 4-4 HART security switch (on blank display)



A HART security switch

B Unused

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

II
Reference information for commissioning

Chapters covered in this part:

- Configure process measurement
- Configure device options and preferences
- Integrate the meter with the control system

Chapter 5

Configure process measurement

Topics covered in this chapter:

- ♦ Characterize the flowmeter
- ♦ Configure mass flow measurement
- ♦ Configure volume flow measurement for liquid applications
- ♦ Configure gas standard volume flow measurement
- ♦ Configure Flow Direction
- ♦ Configure density measurement
- ♦ Configure temperature measurement
- ♦ Configure pressure compensation
- ♦ Configure the petroleum measurement application
- ♦ Configure the concentration measurement application

5.1 Characterize the flowmeter

Display	Not available
ProLink II	**ProLink→Configuration→DensityProLink→Configuration→Flow**
Field Communicator	**Configure→Manual Setup→Characterize**

Characterizing the flowmeter adjusts the transmitter's measurement algorithms 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.

Note
If your sensor and transmitter were ordered together, the transmitter has already been characterized at the factory. However, you should still verify 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.)

5.1.1 Sources and formats for characterization parameters

Different sensor tags display characterization parameters differently, and older sensors may not have all the required parameters on the tag.

Sample sensor tags

Sample sensor tags are shown in the following illustrations:

- Figure 5-1: Older curved-tube sensors (all sensors except T-Series)
- Figure 5-2: Newer curved-tube sensors (all sensors except T-Series)
- Figure 5-3: Older straight-tube sensors (T-Series)
- Figure 5-4: Newer straight-tube sensors (T-Series)

Figure 5-1 Tag on older curved-tube sensors (all sensors except T-Series)

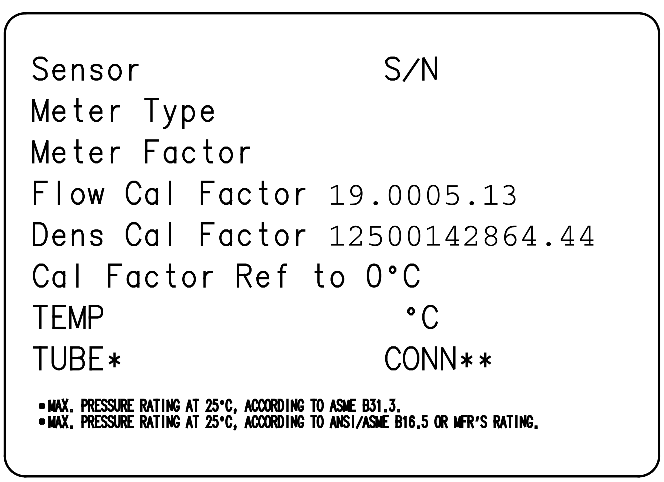


Figure 5-2 Tag on newer curved-tube sensors (all sensors except T-Series)

```
MODEL
S/N
FLOW CAL* 19.0005.13
DENS CAL* 12502142824.44
   D1 0.0010    K1 12502.000
   D2 0.9980    K2 14282.000
   TC 4.44000   FD 310
TEMP RANGE          TO       C
TUBE**   CONN***  CASE**

  * CALIBRATION FACTORS REFERENCE TO 0  C°
 ** MAXIMUM PRESSURE RATING AT 25 C, ACCORDING TO ASME B31.3
*** MAXIMUM PRESSURE RATING AT 25C, ACCORDING TO ANSI/ASME B16.5 OR MFR'S RATING
```

Figure 5-3 Tag on older straight-tube sensor (T-Series)

```
MODEL T100T628SCAZEZZZZ   S/N 1234567890
FLOW FCF X.XXXX  FT      X.XX
     FTG X.XX    FFQ     X.XX
DENS D1  X.XXXXX K1      XXXXX.XXX
     D2  X.XXXXX K2      XXXXX.XXX
     DT  X.XX    FD      XX.XX
     DTG X.XX    DFQ1    XX.XX DFQ2 X.XX
TEMP RANGE -XXX TO XXX C
TUBE*   CONN**   CASE*
XXXX    XXXXX    XXXX XXXXXX

          * MAXIMUM PRESSURE RATING AT 25°C, ACCORDING TO ASME B31.3
         ** MAXIMUM PRESSURE RATING AT 25°C, ACCORDING TO ANSI/ASME B16.5, OR MFR'S RATING
```

Figure 5-4 Tag on newer straight-tube sensor (T-Series)

```
MODEL T100T628SCAZEZZZZ  S/N 1234567890
FLOW FCF XXXX.XX.XX
     FTG X.XX    FFQ     X.XX
DENS D1  X.XXXXX K1      XXXXX.XXX
     D2  X.XXXXX K2      XXXXX.XXX
     DT  X.XX    FD      XX.XX
     DTG X.XX    DFQ1    XX.XX DFQ2 X.XX
TEMP RANGE -XXX TO XXX C
TUBE*   CONN**   CASE*
XXXX    XXXXX    XXXX XXXXXX

      * MAXIMUM PRESSURE RATING AT 25°C, ACCORDING TO ASME B31.3
     ** MAXIMUM PRESSURE RATING AT 25°C, ACCORDING TO ANSI/ASME B16.5, OR MFR'S RATING
```

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

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 in Figure 5-1, this value is shown as 12500.
- For K2, enter the second 5 digits of the density calibration factor. In the sample tag in Figure 5-1, this value is shown as 14286.

If your sensor does not show an FD value, contact flow.support@emerson.com.

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 in Figure 5-1, this value is shown as 4.44.

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. Both values contain decimal points. During characterization, these are entered as a single 10-character string that includes two decimal points. This parameter is called either Flowcal or FCF.

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

♦ Example: Concatenating FCF and FT

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

5.2 Configure mass flow measurement

Display	**OFF-LINE MAINT→OFF-LINE CONFG→UNITS→MASS**
ProLink II	**ProLink→Configuration→Flow**
Field Communicator	**Configure→Manual Setup→Measurements→Flow**

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

5.2.1 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**

Mass Flow Measurement Unit specifies the unit 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 desired unit.

The default setting for Mass Flow Measurement Unit is g/s (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 tool use different labels for the units.

Options for Mass Flow Measurement Unit are shown in Table 5-1 .

Table 5-1 Options for Mass Flow Measurement Unit

	Label		
Unit description	**Display**	**ProLink II**	**Field Communicator**
Grams per second	G/S	g/s	g/s
Grams per minute	G/MIN	g/min	g/min
Grams per hour	G/H	g/hr	g/h
Kilograms per second	KG/S	kg/s	kg/s
Kilograms per minute	KG/MIN	kg/min	kg/min
Kilograms per hour	KG/H	kg/hr	kg/h
Kilograms per day	KG/D	kg/day	kg/d
Metric tons per minute	T/MIN	mTon/min	MetTon/min
Metric tons per hour	T/H	mTon/hr	MetTon/h
Metric tons per day	T/D	mTon/day	MetTon/d
Pounds per second	LB/S	lbs/s	lb/s
Pounds per minute	LB/MIN	lbs/min	lb/min
Pounds per hour	LB/H	lbs/hr	lb/h
Pounds per day	LB/D	lbs/day	lb/d
Short tons (2000 pounds) per minute	ST/MIN	sTon/min	STon/min

Table 5-1 Options for Mass Flow Measurement Unit *continued*

Unit description	Label		
	Display	**ProLink II**	**Field Communicator**
Short tons (2000 pounds) per hour	ST/H	sTon/hr	STon/h
Short tons (2000 pounds) per day	ST/D	sTon/day	STon/d
Long tons (2240 pounds) per hour	LT/H	lTon/hr	LTon/h
Long tons (2240 pounds) per day	LT/D	lTon/day	LTon/d
Special unit	SPECL	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**

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

Restriction
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.

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 label to be used for the mass flow unit.
6. Set Mass Total Label to the label to be used 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.

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.

5.2.2 Configure Flow Damping

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

Damping is used to smooth out small, rapid fluctuations in process measurement. The 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.

Tips

- A high damping value makes the process variable appear smoother because the reported value must change slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.

Procedure

Set Flow Damping to the desired value.

The default value is 0.8 seconds. The range is 0 to 10.24 seconds. When you enter a value for Flow Damping, the transmitter automatically rounds it down to the nearest valid value. The valid values for Flow Damping are: 0, 0.04, 0.08, 0.16, ... 10.24.

Tips

For gas applications, Micro Motion recommends setting Flow Damping to 2.56 or higher.

Effect of Flow Damping on volume measurement

Flow Damping effects volume measurement for both liquid volume and gas standard volume. Volume data is calculated from the damped mass flow data rather than the measured flow value.

Interaction between Flow Damping and Added Damping

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.

5.2.3 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**

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

Procedure

Set Mass Flow Cutoff to the desired value.

The default value for Mass Flow Cutoff is 0.0 g/s. The recommended setting is 0.05% of the sensor's rated maximum flow rate.

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 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

Configuration:

- mA Output Process Variable for the primary mA output: Mass Flow Rate
- Frequency Output Process Variable: Mass Flow Rate
- AO Cutoff for the primary mA output: 10 grams/second
- Mass Flow Cutoff: 15 grams/second

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

♦ Example: Cutoff interaction

Configuration:

- mA Output Process Variable for the primary mA output: Mass Flow Rate
- Frequency Output Process Variable: Mass Flow Rate
- AO Cutoff for the primary mA output: 15 grams/second
- Mass Flow Cutoff: 10 grams/second

Result:

- If the mass flow rate drops below 15 grams/second but not below 10 grams/second:
  - 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 mass flow rate drops below 10 grams/second, both outputs will report zero flow, and 0 will be used in all internal processing.

5.3 Configure volume flow measurement for liquid applications

Display	**OFF-LINE MAINT→OFF-LINE CONFG→UNITS→VOL**
ProLink II	**ProLink→Configuration→Flow**
Field Communicator	**Configure→Manual Setup→Measurements→Flow**

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. You must choose one or the other.

5.3.1 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**

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

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.

5.3.2 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**

Volume Flow Measurement Unit specifies the unit will be used for the volume flow rate. The unit used for the volume total and the volume inventory is derived from 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 desired unit.

The default setting for Volume Flow Measurement Unit is L/s (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 special measurement unit. Different communications tool use different labels for the units.

Options for Volume Flow Measurement Unit are shown in Table 5-2.

Table 5-2 Options for Volume Flow Measurement Unit for liquid applications

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

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

Restriction

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.

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:
   a. x base units = y special units
   b. Volume Flow Conversion Factor = x/y
4. Enter the Volume Flow Conversion Factor.
5. Set Volume Flow Label to the label to be used for the volume flow unit.
6. Set Volume Total Label to the label to be used 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.

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.

5.3.3 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**

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

Procedure

Set Volume Flow Cutoff to the desired value.

The default value for Volume Flow Cutoff is 0.0 L/s. The lower limit is 0. The upper limit is the sensor's flow calibration factor, in units of L/s, 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 volume flow values reported via outputs and volume flow values used in other transmitter behavior (e.g., events defined on 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 for the primary mA output: Volume Flow Rate
- Frequency Output Process Variable: Volume Flow Rate
- AO Cutoff for the primary mA output: 10 liters/second
- Volume Flow Cutoff: 15 liters/second

Result: If the mass flow rate drops below 15 liters/second, 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 for the primary mA output: Volume Flow Rate
- Frequency Output Process Variable: Volume Flow Rate
- AO Cutoff for the primary mA output: 15 liters/second
- Volume Flow Cutoff: 10 liters/second

Result:

- If the volume flow rate drops below 15 liters/second but not below 10 liters/second:
  - 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 volume flow rate drops below 10 liters/second, both outputs will report zero flow, and 0 will be used in all internal processing.

5.4 Configure gas standard volume flow measurement

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

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

The gas standard volume 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. You must choose one or the other.

5.4.1 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**

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

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 Gas Standard Volume.

5.4.2 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**

Standard Gas Density is used to convert the measured flow data to reference (standard) values.

Prerequisites

Ensure that Density Measurement Unit is set to the units you will use for Standard Gas Density.

Procedure

Enter the appropriate Standard Gas Density value for the gas you are measuring.

Tip
ProLink II provides a Gas Wizard that you can use to calculate the standard density of your gas, if you do not know it.

5.4.3 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**

Gas Standard Volume Flow Measurement Unit specifies the unit will be used for the gas standard volume flow rate. The 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 desired unit.

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 tool use different labels for the units.

Options for Gas Standard Volume Flow Measurement Unit are shown in Table 5-3.

Table 5-3 Options for Gas Standard Volume Measurement Unit

Unit description	Label		
	Display	**ProLink II**	**Field Communicator**
Normal cubic meters per second	NM3/S	Nm3/sec	Not available
Normal cubic meters per minute	NM3/MN	Nm3/min	Not available
Normal cubic meters per hour	NM3/H	Nm3/hr	Not available
Normal cubic meters per day	NM3/D	Nm3/day	Not available
Normal liter per second	NLPS	NLPS	Not available
Normal liter per minute	NLPM	NLPM	Not available
Normal liter per hour	NLPH	NLPH	Not available
Normal liter per day	NLPD	NLPD	Not available
Standard cubic feet per second	SCFS	SCFS	Not available
Standard cubic feet per minute	SCFM	SCFM	Not available
Standard cubic feet per hour	SCFH	SCFH	Not available
Standard cubic feet per day	SCFD	SCFD	Not available
Standard cubic meters per second	SM3/S	Sm3/S	Not available
Standard cubic meters per minute	SM3/MN	Sm3/min	Not available
Standard cubic meters per hour	SM3/H	Sm3/hr	Not available
Standard cubic meters per day	SM3/D	Sm3/day	Not available
Standard liter per second	SLPS	SLPS	Not available
Standard liter per minute	SLPM	SLPM	Not available

Table 5-3 Options for Gas Standard Volume Measurement Unit *continued*

Unit description	Label		
	Display	**ProLink II**	**Field Communicator**
Standard liter per hour	SLPH	SLPH	Not available
Standard liter per day	SLPD	SLPD	Not available
Special measurement unit	SPECL	special	Spcl

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**

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

Restriction

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.

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 label to be used for the Gas Standard Volume flow unit.
6. Set Gas Standard Volume Total Label to the label to be used 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 the Base Gas Standard Volume Unit to SCFM.

2. Set the 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.

5.4.4 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**

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

Procedure

Set Volume Flow Cutoff to the desired value.

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 gas standard volume flow values reported via outputs and 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, 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.

5.5 Configure Flow Direction

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

Flow Direction controls how conditions of 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.

Procedure

Set Flow Direction as desired.

5.5.1 Options for Flow Direction

Flow Direction controls how the outputs report flow and how the totalizers and inventories increment totals.

Table 5-4 Options for Flow Direction

Flow Direction setting	
ProLink II	**Field Communicator**
Forward	Forward
Reverse	Reverse
Absolute Value	Absolute Value
Bidirectional	Bi directional
Negate Forward	Negate/Forward Only
Negate Bidirectional	Negate/Bi-directional

5.5.2 Effect of Flow Direction on transmitter outputs and totalizers

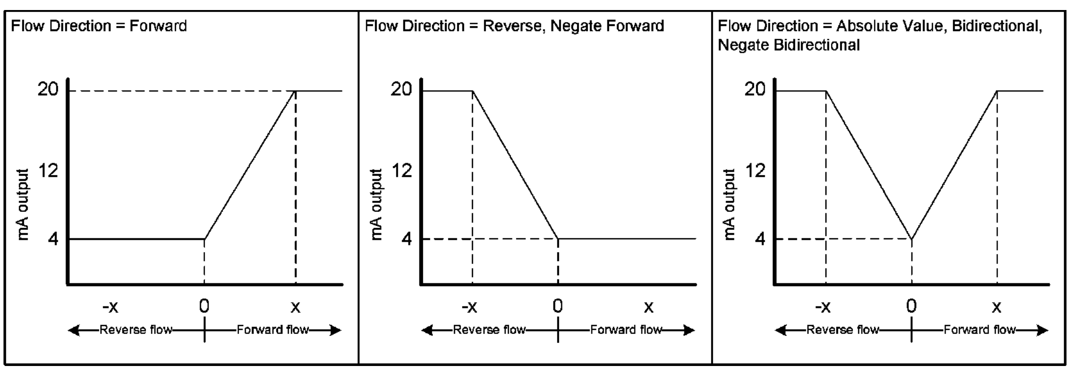
Flow Direction and mA outputs

mA outputs are affected by Flow Direction only if mA Output Process Variable is set to a flow variable.

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

- If Lower Range Value is set to 0, see Figure 5-5.
- If Lower Range Value is set to a negative value, see Figure 5-6.

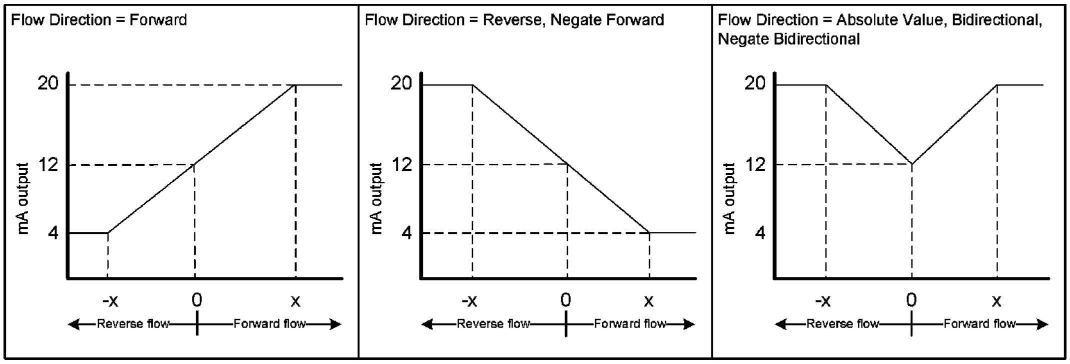
Figure 5-5 Effect of Flow Direction on the mA output: Lower Range Value = 0



Notes

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

Figure 5-6 Effect of Flow Direction **on the mA output:** Lower Range Value **< 0**



Notes

- 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/s
- Upper Range Value = 100 g/s

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/s, 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/s, 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/s
- Upper Range Value = +100 g/s

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/s, 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/s, 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/s, 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/s, 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/s
- Upper Range Value = 100 g/s

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/s, 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/s, 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.

Flow Direction and frequency outputs

Frequency outputs are affected by Flow Direction only if Frequency Output Process Variable is set to a flow variable. Frequency output levels for different combinations of Flow Direction and actual flow direction are shown in Table 5-5.

Table 5-5 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	Zero[1]	0 Hz	Hz > 0
Negate Bidirectional	Hz > 0	0 Hz	Hz > 0

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

Flow Direction and discrete outputs

Discrete outputs are affected by Flow Direction only if Discrete Output Source is set to Flow Direction. Discrete output states for different combinations of Flow Direction and actual flow direction are shown in Table 5-6.

Table 5-6 Effect of the Flow Direction parameter and actual flow direction on discrete outputs

	Actual flow direction		
Flow Direction **setting**	**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

Flow Direction and digital communications

Digital communications values for different combinations of Flow Direction and actual flow direction are shown in Table 5-7.

Table 5-7 Effect of the Flow Direction parameter and actual flow direction on flow values reported via digital communications

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

Flow Direction and flow totals

Totalizer and inventory behaviors for different combinations of Flow Direction and actual flow direction are shown in Table 5-8.

Table 5-8 Effect of the Flow Direction parameter and actual flow direction on flow totals

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

5.6 Configure density measurement

Display	**OFF-LINE MAINT→OFF-LINE CONFG→UNITS→DENS**
ProLink II	**ProLink→Configuration→Density**
Field Communicator	**Configure→Manual Setup→Measurements→Density**

The density measurement parameters control how density is measured and reported.

The density measurement parameters include:

- Density Measurement Unit
- The slug flow parameters:
  - Slug High Limit
  - Slug Low Limit
  - Slug Duration

5.6.1 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**

Density Measurement Unit specifies the unit that will be used for density measurement.

Procedure

Set Density Measurement Unit to the desired option.

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 units for Density Measurement Unit. Different communications tools use different labels.

Options for Density Measurement Unit are shown in Table 5-9.

Table 5-9 Options for Density Measurement Unit

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

5.6.2 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**

The slug flow parameters control how the transmitter detects and reports two-phase flow.

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 another unit has been configured for density measurement.

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

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

   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.

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

   The default value for Slug High Limit is 5.0 g/cm^3. The range is 0.0 g/cm^3 to 10.0 g/cm^3.

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 seconds 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 condition of slug flow 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, outputs that represent flow rate report a flow rate of 0.

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

5.6.3 Configure Density Damping

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

Damping is used to smooth out small, rapid fluctuations in process measurement. The 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.

Tips

- A high damping value makes the process variable appear smoother because the reported value must change slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.

Procedure

Set Density Damping to the desired value.

The default value is 1.6 seconds. The range is 0 to 10.24 seconds. When you enter a value for Flow Damping, the transmitter automatically rounds it down to the nearest valid value. The valid values for Flow Damping are: 0, 0.04, 0.08, 0.16, ... 10.24.

Effect of Density Damping on volume measurement

Density Damping affects liquid volume measurement. Density Damping does not affect gas standard volume measurement.

Interaction between Density Damping and Added Damping

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.

5.6.4 Configure Density Cutoff

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

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

Procedure

Set Density Cutoff to the desired value.

The default value for Density Cutoff is 0.2 g/cm³. The range is 0.0 g/cm³ to 0.5 g/cm³.

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 goes to 0. Density Cutoff does not affect gas standard volume measurement. Gas standard volume values are always calculated from the measured density value.

5.7 Configure temperature measurement

Display	**OFF-LINE MAINT→OFF-LINE CONFG→UNITS→TEMP**
ProLink II	**ProLink→Configuration→Density→Low Density Cutoff**
Field Communicator	**Configure→Manual Setup→Measurements→Temperature**

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

The temperature measurement parameters include:

- Temperature Measurement Unit
- Temperature Damping

5.7.1 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**

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

Procedure

Set Temperature Measurement Unit to the desired option.

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 use different labels.

Options for Temperature Measurement Unit are shown in Table 5-10.

Table 5-10 Options for Temperature Measurement Unit

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

5.7.2 Configure Temperature Damping

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

Damping is used to smooth out small, rapid fluctuations in process measurement. The 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.

Tips

- A high damping value makes the process variable appear smoother because the reported value must change slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.

Procedure

Enter the desired value for Temperature Damping.

The default value is 4.8 seconds. The range is 0.0 seconds to 38.4 seconds.

When you enter a value for Temperature Damping, the transmitter automatically rounds it down to the nearest valid value. Valid values for Temperature Damping are 0, 0.6, 1.2, 2.4, 4.8, … 38.4.

Effect of Temperature Damping

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

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.

5.8 Configure pressure compensation

Display	Not available
ProLink II	**ProLink→Configuration→Pressure→Pressure Compensation**
Field Communicator	**Configure→Manual Setup→Measurements→External Compensation**

Pressure compensation adjusts process measurement to compensate for the pressure effect on the sensor's flow tubes. Pressure effect is defined as the change in the sensor's sensitivity to flow and density associated with the difference between calibration pressure and process pressure.

Tip
Not all sensors or applications require pressure compensation. If you are uncertain about implementing pressure compensation, contact flow.support@emerson.com.

Procedure

1. Enable pressure compensation.
2. Enter Flow Factor for your sensor.

   Flow Factor is the percent change in the flow rate per PSI. Flow Factor for your sensor is provided on the sensor product data sheet. When entering the value, reverse the sign.

   Example: If the flow factor is 0.000004 % per PSI, enter −0.000004 % per PSI.
3. Enter Density Factor for your sensor.

   Density Factor is the change in fluid density, in g/cm³/PSI. Density Factor for your sensor is provided on the sensor product data sheet. When entering the value, reverse the sign.

   Example: If the density factor is 0.000006 g/cm³/PSI, enter −0.000006 g/cm3/PSI.
4. Enter Calibration Pressure for your sensor.

Calibration Pressure is the pressure at which your sensor was calibrated, and therefore defines the pressure at which there will be no pressure effect. Calibration Pressure for your sensor is provided on the sensor calibration sheet. If the data is unavailable, enter 20 PSI.

5. Decide how pressure data will be provided to the transmitter, and perform the required setup.
   - If you will poll an external pressure device, set up polling for pressure.
   - If you will use a static pressure value, set Pressure Units to the units you are using, enter External Pressure, and ensure that polling for pressure is disabled.
   - If you will use digital communications or a direct analog current to write pressure data to the transmitter, set Pressure Units to the units to be used and ensure that polling for pressure is disabled. Then ensure that the appropriate value is written to transmitter memory at appropriate intervals.
   - If you will use an external measurement device, configure the mA input to External Pressure. You must also enable External Pressure Compensation and set the Pressure Units to the units set at the external measurement device.

5.9 Configure the petroleum measurement application

Display	Not available
ProLink II	**ProLink→Configuration→API Setup**
Field Communicator	**Configure→Manual Setup→Measurements→Petroleum Measurement**

The petroleum measurement parameters control the values that will be used in the transmitter's petroleum measurement application.

The petroleum measurement parameters include:

- API Table Type
- Thermal Expansion Coefficient (TEC) (if required by API Table Type)
- Reference Temperature (if required by API Table Type)

Restriction

The petroleum measurement parameters are available only if the petroleum measurement application has been purchased and is enabled on your transmitter.

Procedure

1. Select API Table Type.
2. If you set API Table Type to 53A, 53B, 53D, or 54C, set Reference Temperature to the appropriate value for your application. Enter the value in °C.
3. If you set API Table Type to 6C, 24C, or 54C, set Thermal Expansion Coefficient to the appropriate value for your application.
4. (Optional) Set the temperature unit configured on the transmitter to the temperature unit used by your API reference table.

Tip

Although configuring the temperature unit to match the temperature units used by your API reference table is not required, Micro Motion recommends it.

5. (Optional) If you want to use temperature data from an external temperature sensor:
   a. Set Temperature Source to External.
   b. Depending on your external setup, do one of the following:
      - Set up polling for temperature
      - Use digital communications to write temperature data to the sensor at appropriate intervals
      - Configure the mA input to receive temperature data from an external measurement device

You can now configure your transmitter to report and handle petroleum measurement process variables in the same way that it reports and handles other process variables.

5.9.1 Petroleum measurement application

The petroleum measurement application enables Correction for the effect of Temperature on 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 Measurement (API) standards.

API reference tables are used to control how CTL is calculated. Your selection of API Table Type specifies the type of process fluid that the calculations will assume, and the CTL source data, the reference temperature, and the density unit that the calculations will use. Depending on your selection of API Table Type, you may or may not need to specify Reference Temperature and Thermal Expansion Coefficient. See Table 5-11 for a listing of the API reference tables and related information.

Table 5-11 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
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: −0 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

Table 5-11 API reference tables, associated process fluids, and associated calculation values *continued*

Table name	Process fluid	CTL source data	Reference temperature	Density unit
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: 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

5.10 Configure the concentration measurement application

Display	Not available
ProLink II	**ProLink→Configuration→CM Setup**
Field Communicator	**Configure→Manual Setup→Measurements→Concentration Measurement**

The concentration measurement parameters control how the transmitter calculates concentration from temperature and density data.

The concentration measurement parameters include:

- Active Curve
- Derived Variable

Restriction
The concentration measurement parameters are available only if the concentration measurement application has been purchased and is enabled on your transmitter.

Prerequisites

Before you can configure concentration measurement:

- The concentration measurement application must be enabled on your transmitter.
- The curve you want to use must be available on your transmitter.

Note
Curves can be made available on your transmitter either by loading an existing curve or by configuring a new curve. Up to six curves 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 Manual* for information on loading or configuring a curve.

Procedure

1. Identify the curve you want to use.
2. Set Density Measurement Unit to match the density unit used by your curve.
3. Set Temperature Measurement Unit to match the temperature unit used by your curve.
4. Set Derived Variable to one of the derived variables available with your curve.

   Tip
   Select a Derived Variable that will provide the concentration measurement process variables that you want to use. If you are using one of the standard curves from Micro Motion, set Derived Variable to Mass Conc (Dens). If you are using a custom curve, see the reference information for your curve.

5. Set Active Curve to the curve you identified in Step 1.
6. (Optional) If you want the concentration measurement application to use temperature data from an external temperature sensor:
   a. Set Temperature Source to External.
   b. Set up polling for temperature, or configure the mA input to receive temperature data from an external measurement device.

You can now configure your transmitter to report and handle concentration process variables in the same way that it reports and handles other process variables.

5.10.1 Concentration measurement application

The concentration measurement application calculates concentration data from process temperature and density. Micro Motion provides a set of concentration curves that calculate concentration data for several standard industry applications and process fluids. If desired, you can configure a custom curve for your process fluid, or purchase a custom curve from Micro Motion.

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

5.10.2 Standard curves for the concentration measurement application

The standard curves available from Micro Motion are applicable to a variety of process fluids.

Table 5-12 describes the standard concentration curves available from Micro Motion, along with the density and temperature measurement units used in calculation, and the unit used to report concentration data. If these curves are available on your transmitter, you can set Active Curve to any one of them.

Table 5-12 Standard concentration curves and associated measurement units

Curve name	Description	Density unit	Temperature unit	Concentration unit
Deg Balling	Curve 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	Curve 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	Curve 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	Curve 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	Curve 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	%

Table 5-12 Standard concentration curves and associated measurement units *continued*

Curve name	Description	Density unit	Temperature unit	Concentration unit
HFCS 90	Curve 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	%

5.10.3 Derived variables and calculated process variables

When you configure the concentration measurement application, your choice of Derived Variable determines the process variables that will be calculated by the application.

Table 5-13 lists the options for Derived Variable, and the set of process variables that are calculated for each option.

Table 5-13 Derived variables and calculated process variables

		Calculated process variables					
Derived Variable	Description	Density at reference tempera-ture	Standard volume flow rate	Specific gravity	Concen-tration	Net mass flow rate	Net volume flow rate
Density at reference temperature	Mass/unit volume, corrected to a given reference 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 temperature conditions do not need to be the same.	✓	✓	✓			
Mass concentration derived from reference density	The percent mass of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓	✓	

Table 5-13 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**
Mass concentration derived from specific gravity	The percent mass of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓	✓	
Volume concentration derived from reference density	The percent volume of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓		✓
Volume concentration derived from specific gravity	The percent volume of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓		✓
Concentration derived from reference density	The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the total solution, derived from reference density	✓	✓		✓		
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	✓	✓	✓	✓		

Chapter 6

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 the speed of the transmitter's response to changes in process data
- ♦ Configure alarm handling
- ♦ Configure informational parameters

6.1 Configure the transmitter display

Display	**OFF-LINE MAINT→OFF-LINE CONFG→DISPLAY**
ProLink II	**ProLink→Configuration→Display**
Field Communicator	**Configure→Manual Setup→Display**

The transmitter display parameters control the process variables shown on the display and a variety of other display behaviors.

The transmitter display parameters include:

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

6.1.1 Configure the language used for display menus and process data shown on the display

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

Display Language controls the language used for process data and menus on the display. Different languages are available, depending on your transmitter model and version.

Procedure

Set Display Language to the desired option.

6.1.2 Configure the process variables that are shown on the display

Display	Not available
ProLink II	**ProLink→Configuration→Display→Display Var X**
Field Communicator	**Configure→Manual Setup→Display→Set Up Display Variables**

Display Variables controls the process variables shown on the display. The display can scroll through up to 15 process variables in any order. You can configure the process variables to be displayed and the order in which they will appear. You can repeat variables, and you can leave slots empty.

Restrictions

- You cannot set Display Variable 1 to None. Display Variable 1 must always be set to a process variable.
- If you have fixed Display Variable 1 to the primary mA output, you cannot change the setting of Display Variable 1 using this method. To change the setting of Display Variable 1, you must change the configuration of mA Output Process Variable for the primary mA output.

Note

If you have configured a volume process variable as a display variable, and you subsequently change the setting of Volume Flow Type, the display variable is automatically changed to the equivalent process variable. For example, if Display Variable 2 was set to Volume Flow Rate, it will be changed to Gas Standard Volume Flow Rate.

Procedure

1. Select a slot.
2. Set Display Variable to the variable that you want to appear in that slot.

♦ Example: Display variable configuration

Display variable	Process variable assignment
Display Variable 1	Mass flow
Display Variable 2	Mass totalizer
Display Variable 3	Volume flow
Display Variable 4	Volume totalizer
Display Variable 5	Density

Display variable	Process variable assignment
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

6.1.3 Configure the precision of process variables shown on the display

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

For each process variable, Display Precision controls the number of digits to the right of the decimal place that are shown on the display. You can set Display Precision independently for each process variable. Display Precision does not affect the value of the process variable reported via other methods or used in calculations.

Procedure

1. Select a process variable.
2. Set Display Precision to the precision to be applied when this process variable is shown on the display.

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

   Tip
   The lower the precision, the larger a process change must be in order to be reflected in the displayed value. Do not set Display Precision too low or too high to be useful.

6.1.4 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**

Update Period controls how often the display is refreshed with current data.

Procedure

Set Update Period as desired.

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

6.1.5 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

You can configure the display to show a single display variable indefinitely (until the operator activates Scroll), or to scroll through the configured display variables and display each one for a user-defined number of seconds.

Procedure

1. Enable or disable Auto Scroll as desired.

Option	Description
Enabled	The display will automatically scroll through the list of display variables, showing each display variable for the number of seconds specified by Scroll Rate. The operator can move to the next display variable by activating Scroll.
Disabled (default)	The display will show Display Variable 1 and will not scroll automatically. The operator can move to the next display variable by activating Scroll.

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

   The default value is 10 seconds.

Tip
You may need to apply the Auto Scroll setting before you can access Scroll Rate.

6.1.6 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

You can enable or disable the backlight on the display's LCD panel.

Procedure

Enable or disable Backlight as desired.

The default setting is Enabled.

6.2 Enable or disable operator actions from the display

Display	**OFF-LINE MAINT→OFF-LINE CONFG→DISPLAY**
ProLink II	**ProLink→Configuration→Display→Display Options**
Field Communicator	Not available

You can control whether or not the operator will be able to perform specific actions from the transmitter display.

You can:

- Enable or disable Totalizer Start/Stop
- Enable or disable Totalizer Reset
- Enable or disable Acknowledge All Alarms

6.2.1 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

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

Restrictions

- You cannot start and stop totalizers individually from the display. When you use the display to start or stop totalizers, 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. Enable or disable Totalizer Start/Stop 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.

2. Ensure that at least one totalizer has been configured as a display variable.

   This function is accessed from a totalizer value on the display. To ensure that the operator can start and stop totalizers and inventories, at least one totalizer must be shown on the display.

6.2.2 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

You can control whether or not the operator will be able to reset totalizers from the display.

Restrictions

- Totalizer Reset does not apply to inventories. Operators cannot reset inventories from the display, even if Totalizer Reset is enabled.
- You cannot use the display to reset all totalizers as a group. From the display, 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. Enable or disable Totalizer Reset as desired.

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

2. Ensure that the totalizers to be reset from the display have been configured as display variables.

This function is accessed from the totalizer value on the display. If the appropriate totalizer is not configured as a display variable, the operator will not be able to reset it.

6.2.3 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

You can control whether or not the operator will be able to use a single command to acknowledge all alarms from the display.

Procedure

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 acknowledge alarms individually.

Note
To acknowledge alarms from the display, the operator must have access to the alarm menu, whether Acknowledge All Alarms is enabled or disabled.

6.3 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

You can control operator access to different sections of the display off-line menu, and you can control whether or not a password is required at specific entry points.

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.
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 configuration, or calibration.
Disabled	Operator cannot access the alarm menu.

Note
The status LED on the transmitter face shows whether or not alarms are active, but does not show specific alarms.

3. Enable or disable Off-Line Password as desired.

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

4. Enable or disable Alarm Password as desired.

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 at the top of the off-line menu, and is not prompted thereafter.

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

   The default value is 1234. The range is 0000 to 9999.

Tip
Record your password for future reference.

6.4 Configure the speed of the transmitter's response to changes in process data

Display	Not available
ProLink II	**ProLink→Configuration→Device→Response Time**
Field Communicator	Not available

You can configure the speed of the transmitter's response to changes in process data.

The following parameter is used to control the speed of the transmitter's response:

- Response Time

6.4.1 Configure Response Time

Display	Not available
ProLink II	**ProLink→Configuration→Device→Response Time**
Field Communicator	Not available

Response Time controls the rate at which the transmitter updates its outputs to reflect changes in process data.

Procedure

Set Response Time as desired.

Option	Description
Normal (default)	Transmitter outputs track process data at the standard speed.
Special	Transmitter outputs track process data as fast as possible.

Tip
If you set Response Time to Special, additional process "noise" will be present in the transmitter outputs.

6.5 Configure alarm handling

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

Alarm handling parameters control the transmitter's response to a variety of process and device conditions.

Alarm handling parameters include:

- Fault Timeout
- Status Alarm Severity

6.5.1 Configure Fault Timeout

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

For certain alarms only, Fault Timeout controls how long the transmitter will delay before performing fault actions. The fault timeout period begins as soon as the transmitter detects the alarm condition. During the fault timeout period, the transmitter continues to report its last valid measurements. If the fault timeout period expires and the alarm is still active, fault actions are performed. If the alarm condition clears before the fault timeout expires, no fault actions are performed. For all other alarms, the fault action is performed as soon as the alarm is detected.

Restriction
Fault Timeout is applied only to the following alarms (listed by Status Alarm Code): A003, A004, A005, A008, A016, A017, A033.

Procedure

Set Fault Timeout as desired.

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

If you set Fault Timeout to 0, the transmitter will perform fault actions as soon as the alarm is detected.

6.5.2 Configure Status Alarm Severity

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

Status Alarm Severity controls which set of fault actions the transmitter will perform when it detects an alarm.

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.

Procedure

1. Select a status alarm.
2. Set Status Alarm Severity as desired.

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

Status alarms and options for Status Alarm Severity

Each status alarm has a default Status Alarm Severity. Some status alarms can be configured for other severity levels.

Status alarms, default severity settings, and related information are listed in Table 6-1.

Table 6-1 Status alarms and Status Alarm Severity

Alarm code	Status message	Default severity	Notes	Configurable?
A003	Sensor failure	Fault		Yes
A004	Temperature sensor failure	Fault		No
A005	Input overrange	Fault		Yes
A006	Transmitter not configured	Fault		Yes
A008	Density overrange	Fault		Yes
A009	Transmitter initializing/warming up	Fault		Yes
A010	Calibration failure	Fault		No
A011	Calibration too low	Fault		Yes
A012	Calibration too high	Fault		Yes
A013	Zero too noisy	Fault		Yes
A014	Transmitter failed	Fault		No
A016	Line temperature out-of-range	Fault		Yes
A017	Meter RTD temperature out-of-range	Fault		Yes
A018	EEPROM checksum error	Fault		No
A019	RAM or ROM test error	Fault		No
A020	Calibration factors unentered	Fault		Yes
A021	Incorrect sensor type	Fault		No
A027	Security breach	Fault		No
A100	Primary mA output saturated	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A101	Primary mA output fixed	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
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

Table 6-1 Status alarms and Status Alarm Severity *continued*

Alarm code	**Status message**	**Default severity**	**Notes**	**Configurable?**
A105	Slug flow	Informational		Yes
A106	Burst mode enabled	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A107	Power reset occurred	Informational	Normal transmitter behavior; occurs after every power cycle.	Yes
A108	Event 1 triggered	Informational	Applies only to basic events.	Yes
A109	Event 2 triggered	Informational	Applies only to basic events.	Yes
A110	Frequency output saturated	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A111	Frequency output fixed	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A113	Secondary mA output saturated	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A114	Secondary mA output fixed	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A115	External input error	Informational		Yes
A116	API temperature outside standard range	Informational	Applies only to transmitters with the petroleum measurement application.	Yes
A117	API density out of limits	Informational	Applies only to transmitters with the petroleum measurement application.	Yes
A118	Discrete output 1 fixed	Informational	Can be set to either Informational or Ignore, but cannot be set to Fault.	Yes
A120	Concentration measurement: unable to fix curve data	Informational	Applies only to transmitters with the concentration measurement application.	No
A121	Concentration measurement: extrapolation alarm	Informational	Applies only to transmitters with the concentration measurement application.	Yes

Alarm data in transmitter memory

For each alarm occurrence that is posted, information is maintained in three different ways in transmitter memory:

- Alert List
- Alert Statistics
- Recent Alerts

Table 6-2 describes these three types of alarm data structures.

Table 6-2 Alarm data in transmitter memory

Alarm data structure	Transmitter action if condition occurs: Contents	Transmitter action if condition occurs: Clearing
Alert List	List of: • All currently active alarms • All previously active alarms that have not been acknowledged as determined by the alarm status bits	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

6.6 Configure informational parameters

Display	Not available
ProLink II	**ProLink→Configuration→Sensor**
Field Communicator	**Configure→Manual Setup→Info Parameters**

The informational parameters can be used to identify or describe your flowmeter. 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 Model Number
  - Sensor Material
  - Sensor Liner Material
  - Sensor Flange Type

6.6.1 Configure Descriptor

Display	Not available
ProLink II	Not available
Field Communicator	**Configure→Manual Setup→Info Parameters→Transmitter Info→Descriptor**

Descriptor provides a place to store any phrase you like in transmitter memory. You can use Descriptor to describe your transmitter or flowmeter. Descriptor is not used in transmitter processing and is not required.

Procedure

Enter any desired phrase.

Descriptor can contain a maximum of 16 characters.

6.6.2 Configure Message

Display	Not available
ProLink II	Not available
Field Communicator	**Configure→Manual Setup→Info Parameters→Transmitter Info→Message**

Message provides a place to store any phrase you like in transmitter memory. You can use Message to describe your transmitter or flowmeter. Message is not used in transmitter processing and is not required.

Procedure

Enter any desired phrase.

Message can contain a maximum of 32 characters.

6.6.3 Configure Date

Display	Not available
ProLink II	Not available
Field Communicator	**Configure→Manual Setup→Info Parameters→Transmitter Info→Date**

Date provides a place to store any date you like in transmitter memory. Date is a static value and is not updated by the transmitter. Date is not used in transmitter processing and is not required.

Procedure

Enter any desired Date in the form mm/dd/yyyy.

If you are using ProLink II, you can access a calendar tool from the Device panel to select and enter the data. To access the calendar tool, click Down Arrow in the Date field.

6.6.4 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**

Sensor Serial Number provides a place to store the serial number of the sensor component of your flowmeter in transmitter memory. Sensor Serial Number is not used in transmitter processing and is not required.

Procedure

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

6.6.5 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**

Sensor Material provides a place to store the type of material used for your sensor's wetted parts in transmitter memory. Sensor Material is not used in transmitter 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.

6.6.6 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**

Sensor Liner Material provides a place to store the type of material used for your sensor liner in transmitter memory. Sensor Liner Material is not used in transmitter 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.

6.6.7 Configure Sensor Flange Type

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

Sensor Flange Type provides a place to your sensor's flange type in transmitter memory. Sensor Flange Type is not used in transmitter 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.

Chapter 7

Integrate the meter with the control system

Topics covered in this chapter:

7.1 Configure the mA outputs

Display	**OFF-LINE MAINT→OFF-LINE CONFG→IO→AO 1** **OFF-LINE MAINT→OFF-LINE CONFG→IO→AO 2**
ProLink II	**ProLink→Configuration→Analog Output**
Field Communicator	**Configure→Manual Setup→Inputs/Outputs→mA Output 1** **Configure→Manual Setup→Inputs/Outputs→mA Output 2**

The mA output is used to report a 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

Postrequisites

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.

7.1.1 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**

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

Prerequisites

If you plan to configure an 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 use different labels for the options.

Options for mA Output Process Variable are listed in Table 7-1.

Table 7-1 Options for mA Output Process Variable

	Label		
Process variable	**Display**	**ProLink II**	**Field Communicator**
Mass flow rate	MFLOW	Mass Flow Rate	Mass flo
Volume flow rate	VFLOW	Volume Flow Rate	Vol flo

Table 7-1 Options for mA Output Process Variable *continued*

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

7.1.2 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**

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

Note
If you change LRV and URV from 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 configure mA Output Process Variable as mass flow and change the LRV and URV for mass flow, then you configure mA Output Process Variable as density, and finally you change mA Output Process Variable back to mass flow, LRV and URV for mass flow are reset to the configured values.

Procedure

1. Set LRV as desired.

   LRV is the value of mA Output Process Variable represented by an output of 0 or 4 mA. The default value depends on the setting of mA Output Process Variable.

   Enter LRV in the measurement units that are configured for mA Output Process Variable.

2. Set URV as desired.

   URV is the value of mA Output Process Variable represented by an output of 20 mA. The default value depends on the setting of mA Output Process Variable.

   Enter URV in the measurement units that are configured for mA Output Process Variable.

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

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.

Default values for LRV and URV are shown in Table 7-2.

Table 7-2 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

7.1.3 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**

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 the 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/s
- 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.

Cutoff interaction

When mA Output Process Variable is set to a flow variable (mass flow, volume flow, or gas standard volume flow), AO Cutoff interacts with Mass Flow Cutoff, Volume Flow Cutoff, or Gas Standard 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/s
- Mass Flow Cutoff = 15 g/s

Result: If the mass flow rate drops below 15 g/s, 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/s
- Mass Flow Cutoff = 10 g/s

Result:

- If the mass flow rate drops below 15 g/s but not below 10 g/s:
  - 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/s, both outputs will report zero flow.

7.1.4 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**

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. Valid values are shown in Table 7-3.

Table 7-3 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, 55.0, 110, 220, 440

Interaction of damping parameters

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.

7.1.5 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**

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

Note
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 Downscale, set mA Output Fault Level as desired.

The default value is 2.0 mA. The range is 1.0 mA to 3.6 mA.

Options for mA Output Fault Action and mA Output Fault Level

Options for mA Output Fault Action and mA Output Fault Level are shown in Table 7-4.

Table 7-4 Options for mA Output Fault Action and mA Output Fault Level

Code			
ProLink II	**Field Communicator**	mA Output Fault Level	**mA output behavior**
Upscale	Upscale	21–24 mA Default: 22 mA	Goes to the configured fault level
Downscale (default)	Downscale (default)	0.0–3.6 mA Default: 2.0 mA	Goes to the configured fault level
Internal Zero	Intrnl Zero	Not applicable	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
None	None	Not applicable	Tracks data for the assigned process variable; no fault action

⚠ **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 error or unintended consequences for your process.**

⚠ **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.**

7.2 Configure the frequency output

Display	**OFF-LINE MAINT→OFF-LINE CONFG→IO→FO**
ProLink II	**ProLink→Configuration→Frequency**
Field Communicator	**Configure→Manual Setup→Inputs/Outputs→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 Scaling Method
- Frequency Output Maximum Pulse Width
- Frequency Output Polarity
- Frequency Output Fault Action and Frequency Output Fault Value
- Frequency Output Power Source

Postrequisites

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.

7.2.1 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**

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 flowrate
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.

Frequency=Flow

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:

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

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 than 1 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 less than 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:

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

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

$$FrequencyFactor = 333.33$$

Set parameters as follows:

- Rate Factor: 2000
- Frequency Factor: 333.33

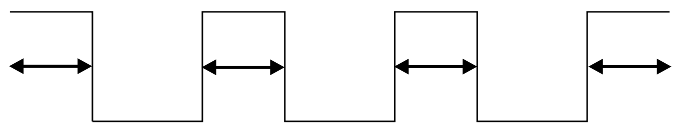
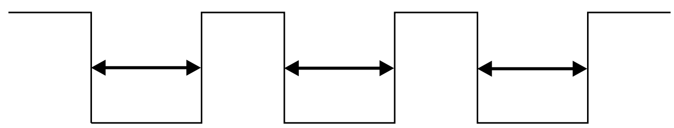
7.2.2 Configure Frequency Output Maximum Pulse Width

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**

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, as shown in Table 7-5.

Table 7-5 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 flow.support@emerson.com before changing Frequency Output Maximum Pulse Width.

7.2.3 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**

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

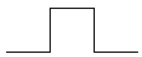
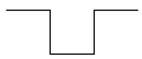
Set Frequency Output Polarity as desired.

The default setting is Active High.

Options for Frequency Output Polarity

Options for Frequency Output Polarity are shown in Table 7-6.

Table 7-6 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

7.2.4 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**

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

Note
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 Hz to 15000 Hz.

Options for Frequency Output Fault Action

Options for Frequency Output Fault Action are shown in Table 7-7.

Table 7-7 Options for Frequency Output Fault Action

Code		
ProLink II	**Field Communicator**	**Frequency output behavior**
Upscale	Upscale	Goes to configured Upscale value: • Range: 10 Hz to 15000 Hz • Default: 15000 Hz
Downscale	Downscale	0 Hz
Internal Zero	Intrnl Zero	0 Hz
None (default)	None (default)	Tracks data for the assigned process variable

⚠ **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 error or unintended consequences for your process.**

⚠ **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.**

7.2.5 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**

Use Frequency Output Power Source to set the output 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.

7.3 Configure the discrete output

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

Postrequisites

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.

7.3.1 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**

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

Options for Discrete Output Source are shown in Table 7-8.

Table 7-8 Options for Discrete Output Source

Option	Code: Display	Code: ProLink II	Code: Field Communicator	Condition	Discrete output voltage(2)
Discrete Event 1–5(3)	D EV x	Discrete Event x	Discrete Event x	ON	Site-specific
				OFF	0 V
Event 1–2(4)	EVNT1 EVNT2 E1OR2	Event 1 Event 2 Event 1 or Event 2	Event 1 Event 2 Event 1 or Event 2	ON	Site-specific
				OFF	0 V

(2) Assumes that Discrete Output Polarity is set to Active High. If Discrete Output Polarity is set to Active Low, reverse the voltage values.
(3) Events configured using the enhanced event model.
(4) Events configured using the basic event model.

Table 7-8 Options for Discrete Output Source *continued*

Option	Code			Condition	Discrete output voltage(2)
	Display	ProLink II	Field Communicator		
Flow Switch(5)(6)	FL SW	Flow Switch Indication	Flow Switch	ON	Site-specific
				OFF	0 V
Flow Direction	FLDIR	Forward/Reverse Indication	Forward/Reverse	Forward flow	0 V
				Reverse flow	Site-specific
Calibration in Progress	ZERO	Calibration in Progress	Calibration in Progress	ON	Site-specific
				OFF	0 V
Fault	FAULT	Fault Condition Indication	Fault	ON	Site-specific
				OFF	0 V

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**

Flow Switch is used to indicate that the flow rate (measured by the configured flow variable) has dropped below the configured setpoint. 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 will be used to control the flow switch.
3. Set Flow Switch Setpoint to the flow rate below which you want the flow switch to turn on.
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%.

(5) If you assign flow switch to the discrete output, you must also configure Flow Switch Variable, Flow Switch Setpoint, and Hysteresis.
(6) If your transmitter is configured with two discrete outputs, you can assign flow switch to both of them. However, they will share the settings for Flow Switch Variable, Flow Switch Setpoint, and Hysteresis.

Example: For example, if Flow Switch Setpoint = 100 g/sec and Hysteresis = 5%, and the flow rate drops below 95 g/sec, the discrete output will turn ON. It will stay 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.

7.3.2 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**

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

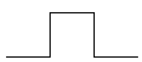
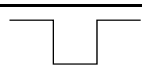
Set Discrete Output Polarity as desired.

The default setting is Active High.

Options for Discrete Output Polarity

Options for Discrete Output Polarity are shown in Table 7-9.

Table 7-9 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.

7.3.3 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**

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

Note

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.

⚠ **Do not use Discrete Output Fault Action as a fault indicator. Because the discrete output is always ON or OFF, you may not be able to distinguish its fault action from its normal operating state.**

Procedure

Set Discrete Output Fault Action as desired.

The default setting is None.

Options for Discrete Output Fault Action

Options for Discrete Output Fault Action are shown in Table 7-10.

Table 7-10 Options for Discrete Output Fault Action

Code		Discrete output behavior	
ProLink II	**Field Communicator**	**Polarity=**Active High	**Polarity=**Active Low
Upscale	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	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)	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.

7.3.4 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**

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.

7.4 Configure the discrete input

Display	**OFF-LINE MAINT→OFF-LINE CONFG→IO→DI**
ProLink II	**ProLink→Configuration→Discrete Input**
Field Communicator	**Configure→Manual Setup→Inputs/Outputs→Discrete Input**

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

The discrete input parameters include:

- Discrete Input Action
- Discrete Input Polarity

7.4.1 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**

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

⚠ **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

Set Discrete Input Action as desired.

The default setting is None.

Options for Discrete Input Action

Options for Discrete Input Action are shown in Table 7-11.

Table 7-11 Options for Discrete Input Action or Enhanced Event Action

	Label		
Action	**Display**	**ProLink II**	**Field Communicator**
None (default)	NONE	None	None
Start sensor zero	START ZERO	Start Sensor Zero	Perform auto zero
Start/stop all totalizers	START STOP	Start/Stop All Totalization	Start/stop totals
Reset mass total	RESET MASS	Reset Mass Total	Reset mass total
Reset volume total	RESET VOL	Reset Volume Total	Reset volume total
Reset gas standard volume total	RESET GSVT	Reset Gas Std Volume Total	Reset gas standard volume total
Reset all totals	RESET ALL	Reset All Totals	Reset totals
Reset temperature-corrected volume total	TCVOL	Reset API Ref Vol Total	Reset corrected volume total
Reset CM reference volume total	RESET STD V	Reset CM Ref Vol Total	N/A
Reset CM net mass total	RESET NET M	Reset CM Net Mass Total	N/A
Reset CM net volume total	RESET NET V	Reset CM Net Vol Total	N/A
Increment CM matrix	INCr CURVE	Increment Current CM Curve	N/A

⚠ **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.**

7.4.2 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**

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.

7.5 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**

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

The milliamp input parameters include:

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

7.5.1 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**

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

Procedure

1. Set the 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.

7.5.2 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**

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.

7.6 Configure digital communications

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

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

The 9739 MVD 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 9739 MVD transmitter are directly connected to 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.

7.6.1 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**

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 (Field Communicator)
- Burst Parameters (optional)
- HART Variables (optional)

Procedure

1. Set HART Address to a value between 0 and 15.

   HART Address must be unique on the network. 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. You may configure either or both, as required by your other HART devices.

   ---

2. Check the setting of Loop Current Mode (mA Output Action) and change it if required.

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.

   Tip
   Whenever you use ProLink II to set HART Address to 0, ProLink II also enables Loop Current Mode. Whenever you use ProLink II to set HART Address to any other value, ProLink II also disables Loop Current Mode. This is designed to make it easier to configure the transmitter for legacy behavior. Be sure to 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	N/A
ProLink II	**ProLink→Configuration→Device→Burst Setup**
Field Communicator	**Configure→Manual Setup→Inputs/Outputs→Communications→HART Burst Mode**

Burst mode is a specialized 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.

Primary Variable (ProLink II) PV (Field Communicator)	The transmitter sends the primary variable (PV) in the configured measurement units in each burst (e.g., 14.0 g/s, 13.5 g/s, 12.0 g/s).
PV current & % of range (ProLink II) % range/current (Field Communicator)	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 (ProLink II) Process variables/current (Field Communicator)	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/s, 23 °C, 50 g/s, 0.0023 g/cm^3, 11.8 mA).
Transmitter vars (ProLink II) Fld dev var (Field Communicator)	The transmitter sends four user-specified process variables in each burst.

3. Set or verify the burst output variables.
   - If you are using ProLink II and you set Burst Mode Output to Transmitter Vars (ProLink II), set the four process variables to be sent in each burst:
     ProLink→Configuration→Device→Burst Setup→Burst Var 1–4
   - If you are using the Field Communicator and you set Burst Mode Output to Field Device Vars, set the four process variables to be sent in each burst:
     Configure→Manual Setup→Inputs/Outputs→Communications→HART Burst Mode→Field Device Var 1–4
   - If you set Burst Mode Output to any other option, verify that the HART variables are set as desired.

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

Display	N/A
ProLink II	**ProLink→Configuration→Variable Mapping**
Field Communicator	Not available

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

Options for HART variables are shown in Table 7-12.

Table 7-12 Options for HART variables

Process variable	PV	SV	TV	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				✓
API density	✓	✓		✓
API volume flow rate	✓	✓	✓	✓
API volume total				✓
API volume inventory				✓
API average density	✓	✓		✓
API average temperature	✓	✓		✓
API CTL				✓
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 7-12 Options for HART variables *continued*

Process variable	PV	SV	TV	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, as described in Table 7-13.

Table 7-13 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.

7.6.2 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**

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)

Important
To minimize configuration requirements, the 9739 MVD transmitter uses an auto-detection scheme when responding to a connection request. With this auto-detect feature, you do not need to enter some HART communication parameters.

Procedure

Set HART Address to a value between 0 and 15.

HART Address must be unique on the network. 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. You may configure either or both, as required by your other HART devices.

7.6.3 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**

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

Modbus/RS-485 communications parameters include:

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

Important
To minimize configuration requirements, the 9739 MVD 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.

The primary reason to disable Modbus ASCII support is to allow you to use the full range of Modbus addresses that are available for your Modbus connections (1 to 127). If Modbus ASCII support is enabled, you are limited to using the following Modbus addresses: 1–15, 32–47, 64–79, and 96–110.

2. Set Modbus Address to a value between 1 and 127, excluding 111. (111 is reserved for the service port.)
3. 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

The bit structure of bytes 1, 2, 3, and 4 is shown in Table 7-14.

Table 7-14 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

4. (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 serial 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.

7.6.4 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**

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

Options for Digital Communications Fault Action are shown in Table 7-15.

Table 7-15 Options for Digital Communications Fault Action

Code		
ProLink II	**Field Communicator**	**Description**
Upscale	Upscale	• Process variable values indicate that the value is greater than the upper sensor limit. • Totalizers stop incrementing.
Downscale	Downscale	• Process variable values indicate that the value is greater than the upper sensor limit. • Totalizers stop incrementing.
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	• 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	IntZero-Flow 0	• Flow rates are reported as 0. • Other process variables are reported as measured. • Totalizers stop incrementing.
None (default)	None (default)	• All process variables are reported as measured. • Totalizers increment if they are running.

⚠ **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 error or unintended consequences for your process.**

⚠ **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.**

7.7 Configure events

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

An event occurs if 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.

The 9739 MVD transmitter supports two event models:

- Basic event model
- Enhanced event model

7.7.1 Configure a basic event

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

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 Event 1 or Event 2 from Event Number.
2. Specify Event Type.

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

3. Assign a process variable to the event.

4. Set a value for the setpoint (Setpoint A).
5. (Optional) Configure a discrete output to switch states according to event status.

7.7.2 Configure an enhanced event

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

An “enhanced” event is used 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 Event 1, Event 2, Event 3, Event 4, or Event 5 from Event Name.
2. Specify Event Type.

HI	The event will occur if the value of the assigned process variable (*x*) is greater than the setpoint (Setpoint A), endpoint not included. $x > A$
LO	The event will occur if the value of the assigned process variable (*x*) is less than the setpoint (Setpoint A), endpoint not included. $x < A$
IN	The event will occur if the value of the assigned process variable (*x*) is “in range,” i.e., between Setpoint A and Setpoint B, endpoints included. $A \le x \le B$
OUT	The event will occur if the value of the assigned process variable (*x*) is “out of range,” i.e., less than Setpoint A or greater than Setpoint B, endpoints included. $x \le A$ or $x \ge B$

3. Assign a process variable to the event.
4. Set values for the required setpoints.
   - For HI or LO events, set Setpoint A.
   - For IN or OUT events, set Setpoint A and Setpoint B.

5. (Optional) Configure a discrete output to switch states according to event status.
6. (Optional) Specify the action or actions that the transmitter will perform when the event occurs. To do this:
   - With ProLink II: **ProLink→Configuration→Discrete Input**
   - With the Field Communicator: **Configure→Alert Setup→Discrete Events→Assign Discrete Action**

Options for Enhanced Event Action

Options for Enhanced Event Action are shown in Table 7-16.

Table 7-16 Options for Discrete Input Action or Enhanced Event Action

	Label		
Action	**Display**	**ProLink II**	**Field Communicator**
None (default)	NONE	None	None
Start sensor zero	START ZERO	Start Sensor Zero	Perform auto zero
Start/stop all totalizers	START STOP	Start/Stop All Totalization	Start/stop totals
Reset mass total	RESET MASS	Reset Mass Total	Reset mass total
Reset volume total	RESET VOL	Reset Volume Total	Reset volume total
Reset gas standard volume total	RESET GSVT	Reset Gas Std Volume Total	Reset gas standard volume total
Reset all totals	RESET ALL	Reset All Totals	Reset totals
Reset temperature-corrected volume total	TCVOL	Reset API Ref Vol Total	Reset corrected volume total
Reset CM reference volume total	RESET STD V	Reset CM Ref Vol Total	N/A
Reset CM net mass total	RESET NET M	Reset CM Net Mass Total	N/A
Reset CM net volume total	RESET NET V	Reset CM Net Vol Total	N/A
Increment CM matrix	INCr CURVE	Increment Current CM Curve	N/A

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.

7.8 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**

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**

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.

7.9 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**

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.**

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.

III
Operations, maintenance, and troubleshooting

Chapters covered in this part:

Chapter 8
Transmitter operation

Topics covered in this chapter:

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. Making a record of the variable measurements 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	Typical high	Typical low
Flow rate			
Density			
Temperature			
Tube frequency			
Pickoff voltage			
Drive gain			

8.2 View process variables

Display	Scroll to the desired process variable, or if AutoScroll is enabled, you can wait until the process variable is displayed.
ProLink II	**ProLink→Process Variables**
Field Communicator	**Overview→Shortcuts→Variables→Process Variables**

Process variables provide information about the state of the process fluid, such as flow rate, density, and temperature, as well as running totals. Process variables can also include data about flowmeter operation, such as drive gain and pickoff voltage. This information can be used to understand and troubleshoot your process.

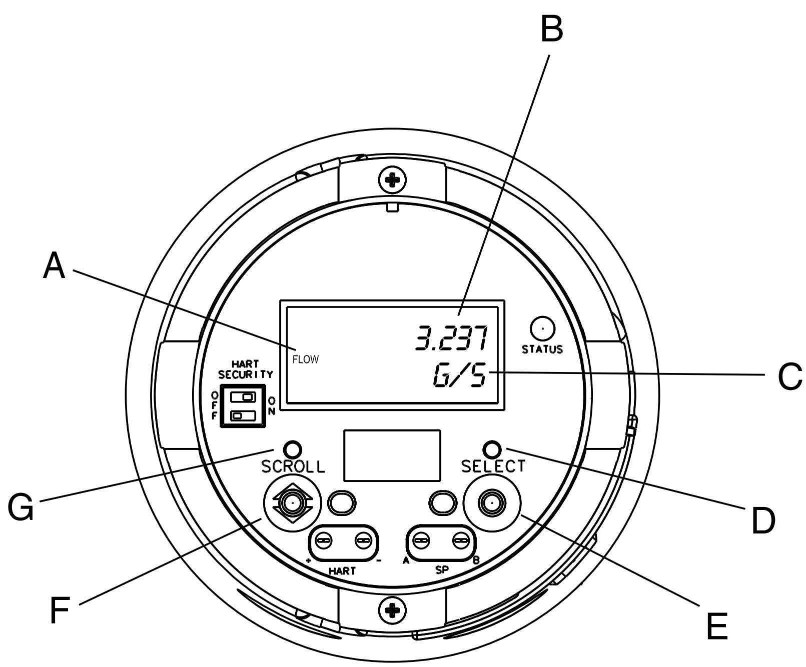
Procedure

View the desired process variable(s).

If you are using the transmitter display, by default the display shows the mass flow rate, mass total, volume flow rate, volume total, temperature, density, and drive gain. If desired, you can configure the display to show other process variables, such as totalizers and inventories. The display reports the abbreviated name of the process variable (for example, DENS for density), the current value of that process variable, and the associated unit of measure (for example, G/CM3). If Auto Scroll is enabled, the display cycles through the configured display variables, showing each display variable for a user-specified number of seconds.

Figure 8-1 identifies the features of the transmitter display.

Figure 8-1 Transmitter display features



A Process variable
B Current value
C Unit of measure
D Optical switch indicator, turns red when Select activated
E Optical switch: Select
F Optical switch: Scroll
G Optical switch indicator, turns red when Scroll activated

8.3 View transmitter status

Display	See Section 8.3.1.
ProLink II	**Prolink→Status**
Field Communicator	**Overview→Check Status**

8.3.1 View transmitter status using the status LED

The status LED is located on the user interface module of the transmitter.

Procedure

View the status LED on the user interface module of the transmitter.

- For transmitters with a display, you can view the status LED with the transmitter housing cover in place.
- For transmitters without a display, the transmitter housing cover must be removed to view the status LED.

⚠ **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 communication method that does not require removing the transmitter housing cover.**

To interpret the status LED, see Table 8-1.

Table 8-1 9739 MVD status LED states

LED behavior	Alarm condition	Description
Solid green	No alarm	Normal operation
Flashing yellow	No alarm	Zero 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)

8.4 View and acknowledge status alarms

To view and acknowledge status alarms, you can use the transmitter display, ProLink II, or the Field Communicator.
The transmitter maintains two status flags for a status alarm:

- The first status flag indicates Active or Inactive.
- The second status flag indicates Acknowledged or Unacknowledged.

An alarm is Active when the transmitter detects that the alarm condition exists. An alarm is Inactive when the transmitter detects that the alarm condition has cleared. When an alarm is posted, it is set to Unacknowledged. Operator action is required to change the status from Unacknowledged to Acknowledged, whether or not the alarm is still active.

8.4.1 View or acknowledge status alarms with the display

All active Fault or Information alarms are listed in the display alarm menu. The transmitter automatically filters out Ignore alarms.

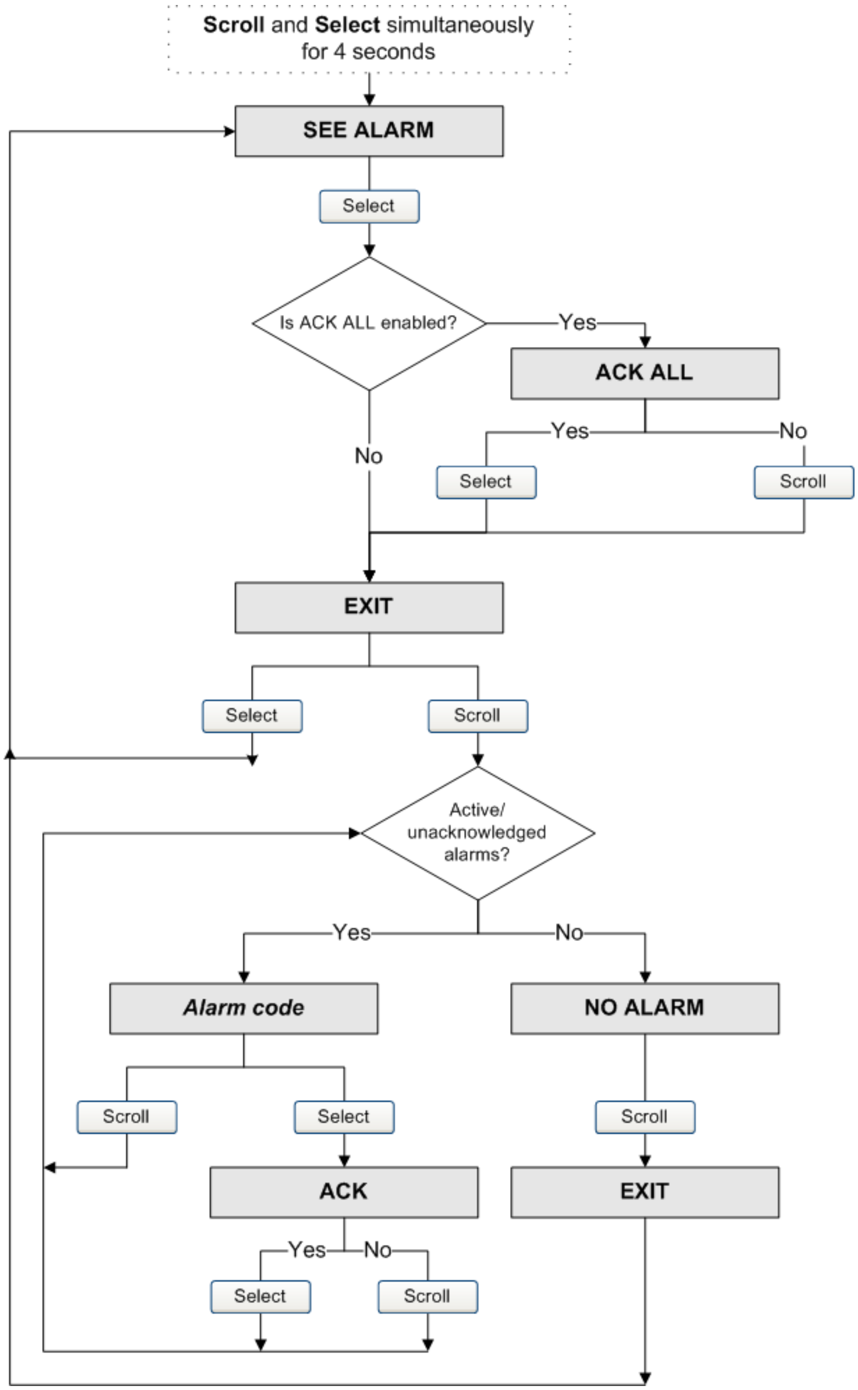
Prerequisites

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

Procedure

To view or acknowledge status alarms, follow the procedure in Figure 8-2.

Figure 8-2 Using the display to view and acknowledge the status alarms



8.4.2 View or acknowledge status alarms with ProLink II

You can view or acknowledge alarms two ways: using the Status window or the Alarm Log window. You can view alarms in both windows, but you cannot acknowledge alarms from within the Status window. You must view alarms in the Alarm Log window to acknowledge the alarm.

Procedure

- To view the current status of all possible alarms, select **ProLink→Status**. To view status indicators in an alarm category, click on one of three tabs in the Status window: Critical, Informational, or Operational.

  The Status window displays the current status of all possible alarms, including Ignore alarms on the three panels. A tab is red if one or more status indicators in that category is "on."

  - A green LED indicates an Inactive alarm.
  - A red status indicator indicates an Active alarm.
- To view and acknowledge active and inactive Fault and Information alarms, select **ProLink→Alarm Log**. To acknowledge an alarm, check the ACK check box.

  The transmitter automatically filters out Ignore alarms. Entries in the alarm log are divided into two categories: High priority and Low priority. These priorities correspond to the default severity levels for the type of alarm. Within each category:

  - A red LED indicates an Active alarm.
  - A green LED indicates an Inactive alarm that has not been acknowledged.

8.4.3 View alarms using the Field Communicator

Procedure

- Press **Service Tools→Alerts** to view the active Fault and Informational alarms. The transmitter automatically filters out Ignore alarms.
- Press **Service Tools→Alerts→Refresh Alerts** to refresh the view of the active alarms.
- Press **Service Tools→Alerts**, and select the individual alarm to view and acknowledge the alarm.

8.4.4 Interaction of transmitter fault actions and Alarm Severity level

When an alarm condition occurs, the transmitter responds by reporting a status alarm. Each status alarm has an alarm. Alarms are classified into three severity levels: Fault, Information, and Ignore. Severity level controls how the transmitter responds to the alarm condition. You can change the Alarm Severity for some alarms.

The transmitter maintains two status flags for each alarm:

- The first status flag indicates Active or Inactive.
- The second status flag indicates Acknowledged or Unacknowledged.

When the transmitter detects an alarm condition, the following occurs:

- An alarm is posted for the corresponding alarm:
  - First status flag is set to Active.
  - Second status flag is set to Unacknowledged.
- The transmitter checks the severity level for the specific alarm:
  - If Severity is Fault, outputs go to their configured Fault Action (after the configured fault timeout has expired).
  - If the Severity is Information or Ignore, outputs are not affected. They continue to report process data.

When the transmitter detects that the alarm condition has cleared:

- First status flag is set to Inactive.
- Second status flag is unchanged: Unacknowledged.
- (For Fault alarms only) Outputs return to reporting process data.

Operator action is required to change the second status flag; however, alarm acknowledgement is not necessary.

8.5 Start and stop totalizers and inventories

Display	See Section 8.5.1.
ProLink II	**ProLink→Totalizer Control→Start** **ProLink→Totalizer Control→Stop→Stop Totalizers**
Field Communicator	**Service Tools→Variables→Totalizer Control→All Totalizers→Start Totalizers** **Service Tools→Variables→Totalizer Control→All Totalizers→Stop Totalizers**

8.5.1 Start and stop totalizers and inventories using the display

Prerequisites

To start and stop the totalizers and inventories using the display, this feature must be enabled.

Procedure

- To stop all totalizers and inventories using the display:
  a. 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 to start or stop the totalizers.

  b. Select.
  c. Scroll until STOP appears beneath the current totalizer value.
  d. Select.
  e. Select again to confirm.
  f. Scroll to EXIT.
- To start all totalizers and inventories using the display:
  a. 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 to start or stop the totalizers.

  b. Select.
  c. Scroll until START appears beneath the current totalizer value.
  d. Select.

e. Select again to confirm.

f. Scroll to EXIT.

8.6 Reset mass and volume 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**

8.6.1 Reset mass and volume totalizers using the display

Prerequisites

To reset the totalizers using the display, this feature must be enabled and the appropriate process variable (Mass Total, Volume Total, or Gas Volume Total) must be configured as a display variable.

Procedure

- To reset the mass totalizer using the display:
  a. Scroll until the mass totalizer value appears.
  b. Select.
  c. Scroll until RESET appears beneath the current totalizer value.
  d. Select.
  e. Select again to confirm.
  f. Scroll to EXIT.
  g. Select.
- To reset the volume (liquid or gas) totalizers using the display:
  a. Scroll until the volume totalizer value appears.
  b. Select.
  c. Scroll until RESET appears beneath the current totalizer value.
  d. Select.
  e. Select again to confirm.
  f. Scroll to EXIT.
  g. Select.

8.7 Reset mass and volume inventories using ProLink II

Prerequisites

To reset the mass and volume inventories, you must enable this feature in the ProLink II Preferences window.

To enable inventory reset using ProLink II, do the following:

1. Click **View→Preferences**.
2. Check the Enable Inventory Totals Reset checkbox.
3. Click Apply.

Procedure

- To reset all inventories simultaneously, click **ProLink→Totalizer Control→Reset Inventories**.
- To reset the mass inventory, click **ProLink→Totalizer Control→Reset Mass Inventory**.
- To reset the volume (liquid) inventory, click **ProLink→Totalizer Control→Reset Volume Inventory**.
- To reset the volume (gas) inventory, click **ProLink→Totalizer Control→Reset Gas Volume Inventory**.

Chapter 9

Measurement support

Topics covered in this chapter:

- ♦ Options for measurement support
- ♦ 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.

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.

9.2 Validate the meter

Meter validation compares flowmeter measurements reported by the transmitter to an external measurement standard. If the transmitter 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

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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 9.2.1 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:

$$NewMeterFactor = ConfiguredMeterFactor \times \frac{ReferenceMeasurement}{FlowmeterMeasurement}$$

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.
   - To set the meter factor using the display: **OFF-LINE MAINT→CONFG→UNITS→MTR F**
   - To set the meter factor using ProLink II: **ProLink→Configuration→Flow**
   - To set the meter factor using the Field Communicator:
     - **Configure→Manual Setup→Measurements→Flow**
     - **Configure→Manual Setup→Measurements→Density**

♦ 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. A mass flow meter factor is determined 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 flowmeter mass measurement is 250.07 lb; the reference device measurement is 250.25 lb. A new mass flow meter factor is determined as follows:

$$MeterFactor_{MassFlow} = 0.9989 \times \frac{250.25}{250.07} = 0.9996$$

The new meter factor for mass flow is 0.9996.

9.2.1 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 9.2).
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.

$$MeterFactor_{Volume} = ConfiguredMeterFactor_{Density} \times \frac{Density_{Flowmeter}}{Density_{ReferenceDevice}}$$

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.
   - To set the meter factor using the display: **OFF-LINE MAINT→CONFG→UNITS→MTR F**
   - To set the meter factor using ProLink II: **ProLink→Configuration→Flow**
   - To set the meter factor using the Field Communicator: **Configure→Manual Setup→Measurements→Flow**

9.3 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.
You can calibrate for density using ProLink II or the Field Communicator.

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.

9.3.1 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.
- 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.

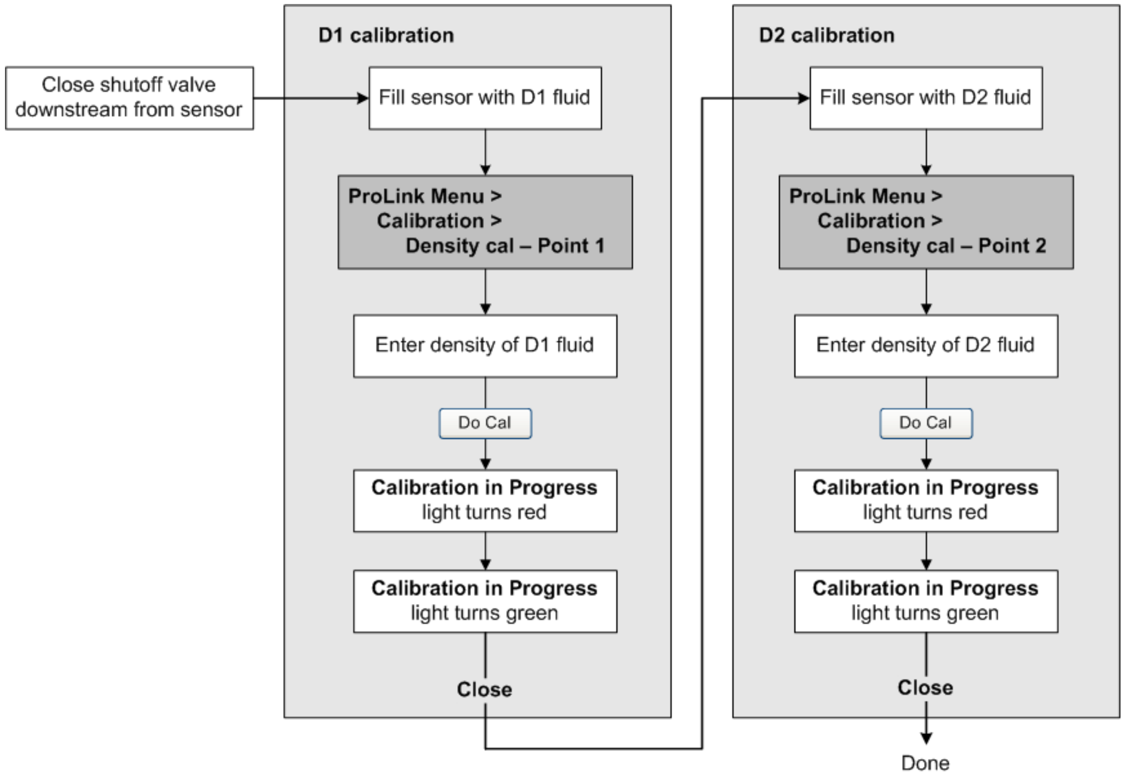
Restriction
For T-Series sensors, the D1 calibration must be performed on air and the D2 calibration must be performed on water.

Tip
For T-Series sensors only, you have the option to perform a D3 and D4 calibration to improve the accuracy of the density measurement if the fluid density is outside of the 0.8 g/cm^3 to 1.2 g/cm^3 density range. If you choose to perform the D3 and D4 calibration, do not perform the D1 and D2 calibration.

Procedure

To perform a D1 and D2 calibration, see Figure 9-1.

Figure 9-1 D1 and D2 density calibration using ProLink II



9.3.2 Perform a D1 and D2 density calibration using 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.
- 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.

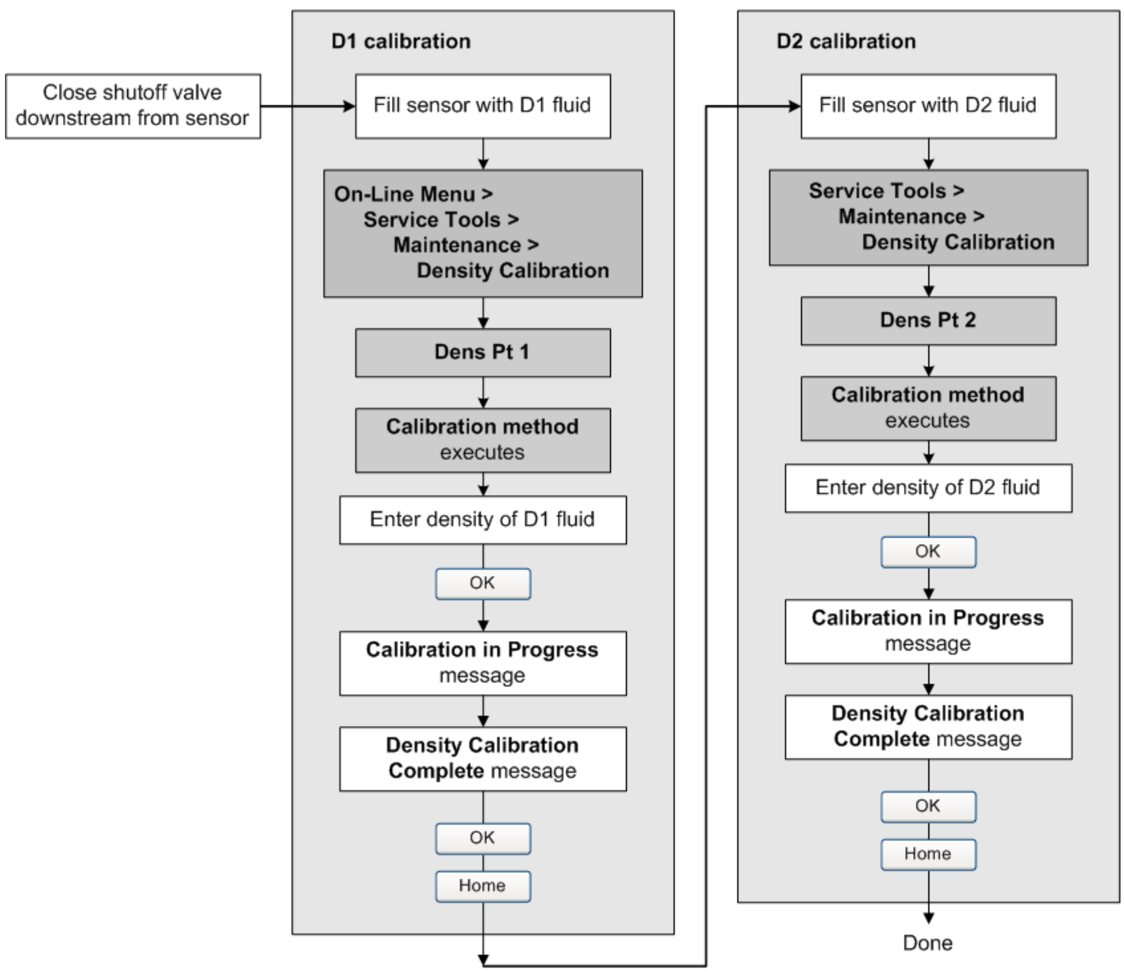
Tip

For T-Series sensors only, you have the option to perform a D3 and D4 calibration to improve the accuracy of the density measurement if the fluid density is outside of the 0.8 g/cm^3 to 1.2 g/cm^3 density range. If you choose to perform the D3 and D4 calibration, do not perform the D1 and D2 calibration.

Procedure

To perform a D1 and D2 calibration, see Figure 9-2.

Figure 9-2 D1 and D2 density calibration using Field Communicator



9.4 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 fluid density is outside of the 0.8 g/cm^3 to 1.2 g/cm^3 density range.

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.

9.4.1 Perform a D3 and D4 density calibration using ProLink II

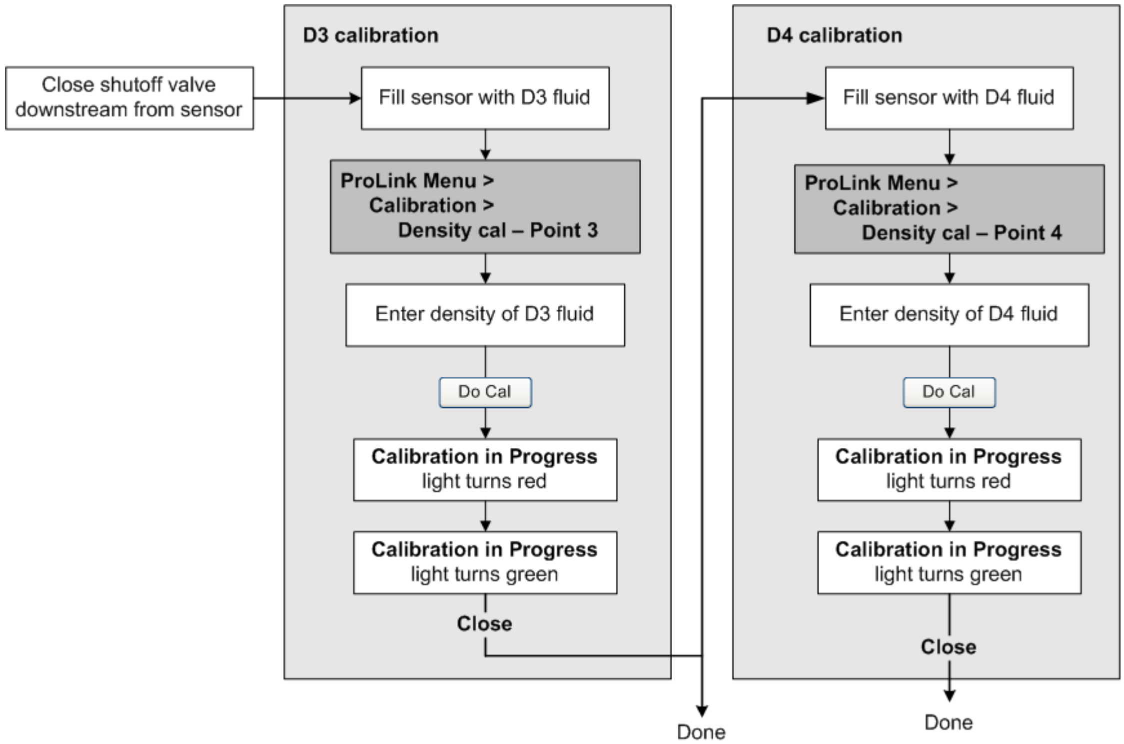
Prerequisites

- 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

To perform a D3 calibration or D3 and D4 calibration using ProLink II, see Figure 9-3.

Figure 9-3 D3 or D3 and D4 density calibration using ProLink II



9.4.2 Perform a D3 and D4 density calibration using Field Communicator

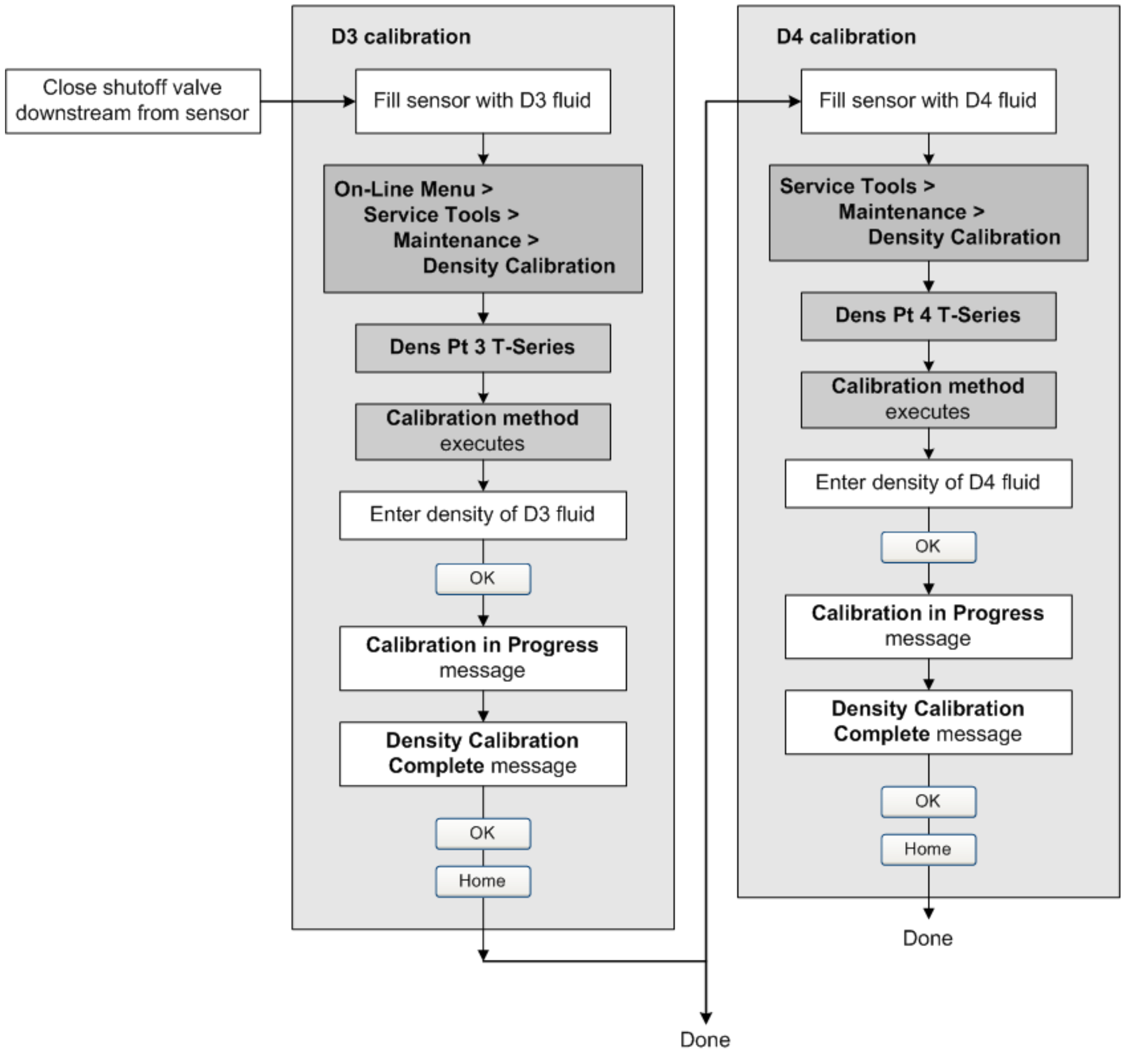
Prerequisites

- 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/cm³
  - Minimum difference of 0.1 g/cm³ 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/cm³
  - Minimum difference of 0.1 g/cm³ 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/cm³ 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

To perform a D3 calibration or D3 and D4 calibration, see Figure 9-4.

Figure 9-4 D3 or D3 and D4 density calibration using the Field Communicator



9.5 Perform temperature calibration

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. Make sure that you are prepared to complete the process without interruption.

You must use ProLink II to calibrate for temperature.

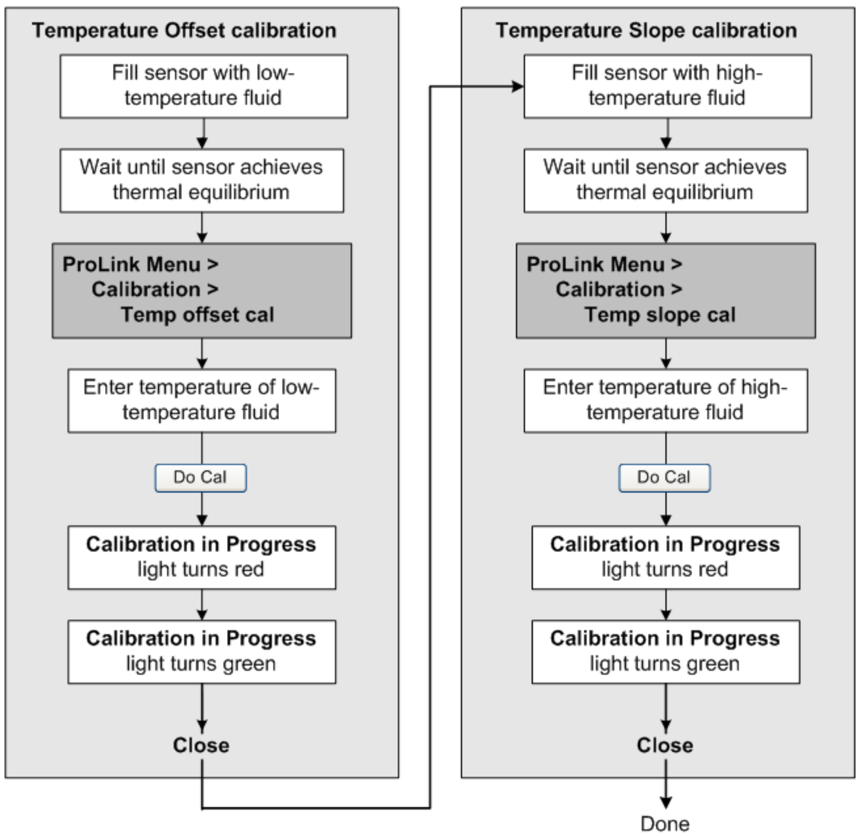
Important

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 for the procedure to perform a temperature calibration using ProLink II.

Figure 9-5 Temperature calibration using ProLink II



Chapter 10

Troubleshooting

Topics covered in this chapter:

10.1 Transmitter status LED states

If the transmitter status LED indicates a status change, refer to the status alarms for more information about the actions recommended to address the problem.

9739 MVD LED states

The 9739 MVD transmitter has a status LED located on the user interface.

Table 10-1 9739 MVD status LED states

LED behavior	Alarm condition	Description
Solid green	No alarm	Normal operation
Flashing yellow	No alarm	Zero 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
A003	Sensor failure	Continuity failure of drive circuit, LPO, or RPO, or LPO-RPO mismatch when driving.	• Check the drive gain and the pickoff voltage. See Section 10.25 and Section 10.26. • Check the wiring between the sensor and transmitter. See Section 10.10. • Check for electrical shorts. See Section 10.27. • Check sensor tubes.
A004	Temperature sensor failure	Combination of A016 and A017	• Check the sensor wiring. See Section 10.27.1. • Check the wiring between the sensor and transmitter. See Section 10.10. • Verify temperature characterization parameters (Temp Cal Factor). • Verify process conditions. • Contact Micro Motion.
A005	Input 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. • Verify process conditions. • Check for slug flow. See Section 10.24. • Check the drive gain and the pickoff voltage. See Section 10.25 and Section 10.26. • Check for electrical shorts. See Section 10.27. • Check sensor tubes. • Contact Micro Motion.

Table 10-2 Status alarms and recommended actions *continued*

Alarm code	Description	Cause	Recommended actions
A006	Transmitter not configured	Calibration factors have not been entered and the sensor type is incorrect.	• Verify characterization parameters. • Contact Micro Motion.
A008	Density overrange	The measured density has exceeded 0 to 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 10.24. • If accompanied by an A003 alarm, check for electrical shorts. See Section 10.27. • Verify characterization parameters. • Check the drive gain and the pickoff voltage. See Section 10.25 and Section 10.26. • 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	Mechanical zero: the resulting zero was greater than 3 μs Temperature/Density calibration: many possible causes	• 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.
A011	Calibration too low	Mechanical zero: corresponds with high reverse flow — a zero magnitude (absolute value) greater than 3 μs Temperature/Density calibration: many possible causes	• 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
A012	Calibration too high	Mechanical zero: corresponds with high forward flow — the resulting zero was greater than 3 µs Temperature/Density calibration: many possible causes	• Verify that there is no flow through the sensor, then retry the procedure. • Cycle power to the meter, then retry the procedure.
A013	Zero too noisy	Mechanical zero: Unstable value exists	• 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 failed	Many possible causes	• Cycle power to the meter. • Contact Micro Motion.
A016	Line temperature out-of-range	The value computed for the resistance of the Line RTD is outside limits	• Check the sensor wiring. See Section 10.27.1 . • Verify process conditions. • Contact Micro Motion.
A017	Meter RTD temperature out-of-range	The value computed for the resistance of the Meter/Case RTD is outside limits	• Check the sensor wiring. See Section 10.27.1 . • Verify process conditions. Temperature should be between –200 °F and +400 °F. • Verify characterization parameters. • Contact Micro Motion.
A018	EEPROM checksum error		• Cycle power to the meter. • Contact Micro Motion.
A019	RAM or ROM test error		• Cycle power to the meter. • Contact Micro Motion.
A020	Calibration factors unentered	The flow calibration factor and/or K1 has not been entered since the last master reset.	• Verify characterization parameters.
A021	Incorrect sensor type	The sensor is recognized as a straight tube but the K1 value indicates a curved tube, or vice versa.	• Verify characterization parameters.

Table 10-2 Status alarms and recommended actions *continued*

Alarm code	Description	Cause	Recommended actions
A027	Security breach		• Check the HART device ID. • The weights and measures security seal has been broken. An authorized procedure is required to reestablish security.
A029	Internal communication failure	Transmitter electronics failure	• Cycle power to the meter. • Contact Micro Motion.
A030	Hardware/software incompatible	The loaded software is not compatible with the programmed board type.	• Cycle power to the meter. • Contact Micro Motion.
A100	Primary mA output 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 normally expected 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.
A101	Primary mA output fixed	Non-zero HART address configured, or user has fixed the mA output.	• Check that the transmitter is in loop test mode. • Exit mA output trim. • Check the HART polling address. • Check that the output has been fixed 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 10.25 and Section 10.26. • Check for electrical shorts. See Section 10.27.
A103	Data loss possible	Totalizers are not properly saved.	• Check the power supply and power supply wiring. See Section 10.9. • Contact Micro Motion.
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.

Table 10-2 Status alarms and recommended actions *continued*

Alarm code	Description	Cause	Recommended actions
A105	Slug flow	The density has exceeded the user-defined slug (density) limits.	• Check for slug flow. See Section 10.24.
A106	Burst mode enabled	The device is in HART burst mode.	• 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	Event 1 triggered		• No action required. • Review event configuration if you believe the event was triggered erroneously.
A109	Event 2 triggered		• 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 10.20. • Check process conditions. Actual conditions may be outside of the normally expected 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	User has fixed the frequency output.	• Check that the transmitter is in loop test mode. • Check that the output has been fixed via digital communication.

Table 10-2 Status alarms and recommended actions *continued*

Alarm code	Description	Cause	Recommended actions
A113	Secondary mA output saturated		• Check process conditions. Actual conditions may be outside of the normally expected 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	Secondary mA output fixed		• Check that the transmitter is in loop test mode. • Exit mA output trim. • Check that the output has been fixed via digital communication.
A115	External input error	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	API temperature outside standard range		• Verify process conditions. • Verify the configuration of the petroleum measurement table type and temperature.
A117	API density out of limits		• Verify process conditions. • Verify the configuration of the petroleum measurement table type and density.
A118	Discrete output 1 fixed	The user has fixed the discrete output.	• Check that the transmitter is in loop test mode.
A120	Concentration measurement: unable to fix curve data		• Verify the configuration of the concentration measurement application.

Table 10-2 Status alarms and recommended actions *continued*

Alarm code	Description	Cause	Recommended actions
A121	Concentration measurement: extrapolation alarm		• Verify process conditions. • Verify the configuration of the concentration measurement application.
A132	Simulation mode active	Simulation mode is enabled.	• No action required. • Disable sensor simulation.
A133	PIC UI EEPROM error	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 1st point calibration in progress		• Allow the procedure to complete.
N/A	Density 2nd point calibration in progress		• Allow the procedure to complete.
N/A	Density 3rd point calibration in progress		• Allow the procedure to complete.
N/A	Density 4th point calibration in progress		• Allow the procedure to complete.
N/A	Mechanical zero calibration in progress		• Allow the procedure to complete.
N/A	Flow is in reverse direction		• No action required.

10.3 Flow problems

Table 10-3 Flow problems and recommended actions

Problem	Possible causes	Recommended actions
Steady non-zero flow rate under no-flow conditions	• Misaligned piping (especially in new installations) • Open or leaking valve • Bad sensor zero	• Verify characterization parameters. • If the flow reading is not excessively high, zero the meter. (Zeroing with a high false flow reading can result in a zero failure.) • 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 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 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 • Sensor cross-talk	• 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 10.25 and Section 10.26. • For installation with 9-wire cabling, verify that the 9-wire cable is 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 10.24. • Check for radio frequency interference. See Section 10.12. • If two sensors with similar frequency are too near each other, separate them. • Contact Micro Motion.

Table 10-3 Flow problems and recommended actions *continued*

Problem	Possible causes	Recommended actions
Erratic non-zero flow rate when flow is steady	• Slug flow • Damping value too low • Plugged flow tube • Excessive or erratic drive gain • 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 10.25 and Section 10.26. • For installation with 9-wire cabling, verify that the 9-wire cable is 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 10.24. • Check for radio frequency interference. See Section 10.12. • Contact Micro Motion.
Inaccurate flow rate or batch total	• Bad flow calibration factor • Inappropriate measurement unit • Bad sensor zero • Bad density calibration factors • Bad flowmeter grounding • Slug flow • Problem with receiving device • Wiring problem	• Verify characterization parameters. • Verify that the measurement units are configured correctly for your application. • Zero the meter. • Check grounding. See Section 10.11. • Check for slug flow. See Section 10.24. • Verify that the receiving device, and the wiring between the transmitter and the receiving device • Check the wiring between the sensor and transmitter. See Section 10.10.

10.4 Density problems

Table 10-4 Density problems and recommended actions

Problem	Possible causes	Recommended actions
Inaccurate density reading	• Problem with process fluid • Bad density calibration factors • Wiring problem • Bad flowmeter grounding • Slug flow • Sensor cross-talk • Plugged flow tube • Incorrect sensor orientation • RTD failure • Physical characteristics of sensor have changed	• Verify process conditions. • Verify characterization parameters. • Check the wiring between the sensor and transmitter. See Section 10.10. • Check grounding. See Section 10.11. • Check for slug flow. See Section 10.24. • If two sensors with similar frequency are too near each other, separate them. • Purge the flow tubes.
Unusually high density reading	• Plugged flow tube • Incorrect K2 value	• Verify characterization parameters. • Purge the flow tubes. • Check for coating in the flow tubes.
Unusually low density reading	• Slug flow • Incorrect K2 value	• Verify process conditions. • Verify characterization parameters. • 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 problems

Table 10-5 Temperature problems and recommended actions

Problem	Possible causes	Recommended actions
Temperature reading significantly different from process temperature	• RTD failure • Wiring problem	• 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 leaking heat	• Perform temperature calibration.

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 Fault Action settings. See Section 10.18. • Measure DC voltage across output terminals to verify that the output is active. • Check the mA output wiring. • Contact Micro Motion.
Loop test failed	• Power supply problem • Incorrect internal/external power configuration • Output not powered • Wiring problem • Circuit failure	• Check the power supply and power supply wiring. See Section 10.9. • Check the Fault Action settings. See Section 10.18. • Check the mA output wiring. • Contact Micro Motion.
mA output below 4 mA	• Process condition below LRV • LRV and URV are not set correctly • Fault condition if fault indicator is set to internal zero or downscale • Open in wiring • Bad mA receiving device • Bad output circuit	• Verify process conditions. • Check the settings of Upper Range Value and Lower Range Value. See Section 10.17. • Check the Fault Action settings. See Section 10.18. • Verify that the receiving device, and the wiring between the transmitter and the receiving device
Constant mA output	• Non-zero HART address (mA output 1) • Output is fixed in text mode • Zero calibration failure	• Check the HART address and Loop Current Mode. See Section 10.14, • Check the loop test mode. • Check HART burst mode configuration. See Section 10.15. • If related to a zero calibration failure, cycle power to the meter and retry the zeroing procedure.
mA output consistently out of range	• Fault condition if fault indicator is set to upscale or downscale • LRV and URV are not set correctly	• Check the Fault Action settings. See Section 10.18. • Check the settings of Upper Range Value and Lower Range Value. See Section 10.17.

Table 10-6 Milliamp output problems and recommended actions *continued*

Problem	Possible causes	Recommended actions
Consistently incorrect mA measurement	• 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 10.16. • 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	• Process condition below cutoff • Fault condition if fault indicator 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 10.24. • Check flow direction. See Section 10.22. • Verify that the receiving device, and the wiring between the transmitter and the receiving device • Verify which wiring terminals are configured for frequency output. • Perform a loop test. • Verify that the power configuration for the frequency output (internal vs. external). • Check the pulse width. See Section 10.20.

Table 10-7 Frequency output problems and recommended actions *continued*

Problem	Possible causes	Recommended actions
Consistently incorrect frequency measurement	• Output not scaled correctly • Incorrect flow measurement unit configured	• Check the frequency output scaling. See Section 10.20. • Verify that the measurement units are configured correctly for your application.
Erratic frequency output	• RF (radio frequency) interference from environment	• Check for radio frequency interference. See Section 10.12.

10.8 Use sensor simulation for troubleshooting

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. Do not enable simulation mode unless your application can tolerate these effects, and be sure to disable simulation mode when you have finished testing.

10.9 Check power supply wiring

Prerequisites

To verify wiring, you will need a copy of the installation manual for your transmitter. To check power supply wiring for the 9739 MVD transmitter, you must remove the electronics module from the transmitter housing base.

Procedure

1. Before inspecting the power supply wiring, disconnect the power source.

   ⚠ **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.

⚠ **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

Prerequisites

You will need a copy of the installation manual for your transmitter.

Procedure

1. Before opening the wiring compartments, disconnect the power source.

   ⚠ **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

Prerequisites

You will need a copy of your sensor installation manual and your transmitter installation manual.

Procedure

Refer to the sensor and transmitter installation manuals for grounding requirements and instructions.

10.12 Check for radio frequency interference

Perform the actions described here if you suspect your frequency or discrete output is being 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.

Procedure

- Eliminate the RFI source.
- Move the transmitter.
- Use shielded cable for the frequency 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.

10.13 Check HART communication loop

Prerequisites

You will need the following:

- 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 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.

10.14 Check HART Address and Loop Current Mode

The default HART Address is 0. This address is appropriate unless the transmitter is in a multidrop environment. If the HART Address is configured to a value other than 0, some configuration tools will automatically change Loop Current Mode as well.

If Loop Current Mode is Disabled, the primary mA output will not report process variable data or indicate fault conditions.

Procedure

1. Set HART Address as appropriate for your HART network.
2. Set Loop Current Mode to Enabled.

10.15 Check HART burst mode

Procedure

1. Check to see if burst mode is enabled or disabled.
2. If burst mode is enabled, disable it.

10.16 Check mA output trim

There are four mA output trim values: a 4 mA and a 20 mA trim value for each mA output.9739 MVD transmitters have a 4 and 20 mA trim value for each mA output. Verify the configuration of all the trim values.

Procedure

Verify the trim values for the mA output.

Note
Micro Motion does not recommend attempting to trim an mA output if the reading is off by more than ±200 microamps. If this is the case, contact Micro Motion Customer Service.

10.17 Check Lower Range Value and Upper Range Value

Procedure

1. Verify current process conditions.
2. Check the configuration of the LRV and URV.

10.18 Check mA Output Fault Action

Procedure

1. Check the status alarms for fault conditions.

   If no fault conditions are present, the source of the problem is something other than the mA fault configuration.
2. Check the configuration of mA Output Fault Action.

10.19 Check Frequency Output Mode

Frequency Output Mode is used only to defined the relationship between two frequency outputs. If your transmitter is not configured for two frequency outputs, Frequency Output Mode is not causing your output problem.

Procedure

Verify the configuration of Frequency Output Mode.

10.20 Check Frequency Output Maximum Pulse Width and Frequency Output Scaling Method

Procedure

1. Verify the configuration of Frequency Output Scaling Method.

   The scaling method should be set as required by your frequency receiving device. If you change the scaling method, you may need to configure additional frequency output parameters.

2. Verify the configuration of Frequency Output Maximum Pulse Width.

   For most applications, the default frequency pulse width is appropriate. This corresponds to a 50% duty cycle.

10.21 Check Frequency Output Fault Action

Procedure

1. Check the status alarms for fault conditions.

   If no fault conditions are present, the source of the problem is something other than the frequency output fault configuration.

2. Check the configuration of Frequency Output Fault Action.

10.22 Check Flow Direction

The interaction of the flow direction parameter, flow values reported by the transmitter, and flow totals reported by the transmitter is complex. For the simplest operation, actual process flow should match the flow arrow printed 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.

10.23 Check cutoffs

There are separate cutoff parameters for mass flow, volume flow (including gas standard volume flow), and density. Furthermore, there is an independent cutoff for each mA output. The interaction between cutoffs sometimes produce unexpected results.

Procedure

Verify the configuration of the cutoffs.

Tip

For typical applications, Micro Motion recommends setting Flow Cutoff to the zero stability of your sensor, multiplied by 10.

10.24 Check for slug flow

The default slug flow limits are appropriate for most applications. Raising the low slug flow limit or lowering the high slug flow limit will increase the possibility of the transmitter reporting slug flow conditions.

If slug limits have been configured, and slug flow occurs, a slug flow alarm will be generated. Outputs that are configured for flow rate hold their last known value until the slug flow clears, or up to the configured slug flow duration, whichever comes first.

Procedure

1. Check whether slug flow alarms have been generated.

   If the transmitter is not generating slug flow alarms, then slug flow is not the source of your problem.

2. Check the process for cavitation, flashing, or leaks.

3. Check the configured slug flow limits and duration.

   A slug flow duration of 0.0 seconds will cause flow outputs to report zero flow as soon as slug flow is detected. If you are experiencing slug flow alarms and no flow output, this maybe resolved by increasing the slug flow duration.

   Tip

   The default high slug flow limit (5.0 g/cm^3) is appropriate for most applications.

   ---

4. Monitor the density output under normal process conditions.

   It may be necessary to adjust the slug flow limits and duration to account for the normal density variation in your process.

10.25 Check the drive gain

Collecting drive gain data

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 drive gain

Table 10-8 Possible causes and recommended actions for excessive drive gain

Possible cause	Recommended actions
Slug flow	Check for slug flow. See Section 10.24.
Plugged flow tube	• Purge the flow tubes. • Replace the sensor.
Cavitation or flashing	• Increase inlet or back pressure at the sensor. • If a pump is located upstream from the sensor, increase the distance between the pump and sensor.
Drive board or module failure	Contact Micro Motion.
Cracked flow tube	Contact Micro Motion.
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 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 10.24.
Foreign material caught in flow tubes	• Purge the flow tubes. • Replace the sensor.

10.25.1 Collect drive gain data

Prerequisites

You will need either ProLink II or a Field Communicator to collect the drive gain data.

Procedure

1. Navigate to the drive gain data:
   - If you are using ProLink II, choose **ProLink→Diagnostic Information**.
   - If you are using a Field Communicator, choose **3 Service Tools→4 Maintenance→5 Diagnostic Variables**
2. Observe and record drive gain data over an appropriate period of time, under a variety of process conditions.

10.26 Check the pickoff voltage

Collecting pickoff voltage data

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
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 10.24.
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 10.27.1.
Moisture in the sensor electronics	Eliminate the moisture in the sensor electronics.
The sensor is damaged	Contact Micro Motion.

10.26.1 Collect pickoff voltage data

Prerequisites

You will need either ProLink II or a Field Communicator to collect the pickoff voltage data.

Procedure

1. Navigate to the picikoff voltage data:
   - If you are using ProLink II, choose **ProLink→Diagnostic Information.**
   - If you are using a Field Communicator, choose **Service Tools→Maintenance→Diagnostic Variables**
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.

10.27 Check for electrical shorts

Table 10-11 Possible causes and recommended actions for electrical shorts

Possible cause	Recommended action
Moisture inside the junction box	Make sure 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.

10.27.1 Check the sensor coils for 9-wire transmitter

Procedure

1. Disconnect power to the transmitter

   If the transmitter is in a hazardous area, wait 5 minutes.
2. Remove the transmitter housing cover.
3. Unplug the terminal blocks from the terminal board.
4. Using a digital multimeter (DMM), check the pickoff coils listed in Table 10-12 by placing the DMM leads on the unplugged terminal blocks for each terminal pair. 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	Yellow to orange
Composite RTD	T-Series	Yellow to orange
Fixed resistor	CMF400	Yellow to orange

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.

Note
When reassembling the meter components, be sure to grease all O-rings.

Appendices and reference

Appendix A

Default values and ranges

Topics covered in this appendix:

- Default values and ranges

A.1 Default values and ranges

See Table A-1 for the default values and ranges for the most frequently used transmitter settings.

Table A-1 Transmitter default values and ranges

Type	Setting	Default	Range	Comments
Flow	Flow direction	Forward		
	Flow damping	0.8 sec	0.0 – 40.96 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.
	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		

Table A-1 Transmitter default values and ranges *continued*

Type	Setting	Default	Range	Comments
Density	Density damping	1.28 sec	0.0 – 40.96 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		
	D2	1		
	K1	1000		
	K2	50,000.00		
	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 – 38.4 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		
	D4	0		
	K3	0		
	K4	0		
	FTG	0		
	FFQ	0		
	DTG	0		
	DFQ1	0		
	DFQ2	0		

Table A-1 Transmitter default values and ranges *continued*

Type	Setting	Default	Range	Comments
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		
Variable mapping	Primary variable	Mass flow		
	Secondary variable	Density		
	Tertiary variable	Mass flow		
	Quaternary variable	Volume flow		
mA output	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 and USL are calculated based on the sensor size and characterization parameters
	USL	200 g/s		
	MinSpan	0.3 g/s		Read-only
	Fault action	Downscale		
	AO fault level – downscale	2.0 mA	0.0 – 3.6 mA	
	AO fault level – upscale	22 mA	21.0 – 24.0 mA	
	Last measured value timeout	0.00 sec		
Frequency output	Tertiary variable	Mass flow		
	Frequency factor	1,000.00 Hz	.00091 – 10,000.00 Hz	
	Rate factor	16,666.66992 g/s		
	Frequency pulse width	0 (50% duty cycle)	0.01 – 655.35 millisec	
	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	

Table A-1 Transmitter default values and ranges *continued*

Type	Setting	Default	Range	Comments
Discrete output	Assignment	Forward/Reverse		
	Fault Indicator	None		
	Power	Internal		
	Polarity	Active High		
Discrete input	Assignment	None		
	Polarity	Active Low		
mA input	Process Variable (PV)	None		
Display	Backlight on/off	On		
	Backlight intensity	63	0 – 63	
	Update period	200 milliseconds	100 – 10,000 milliseconds	
	Variable 1	Mass flow rate		
	Variable 2	Mass total		
	Variable 3	Volume flow rate		
	Variable 4	Volume total		
	Variable 5	Temperature		
	Variable 6	Density		
	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		

Appendix B

Transmitter components and installation wiring

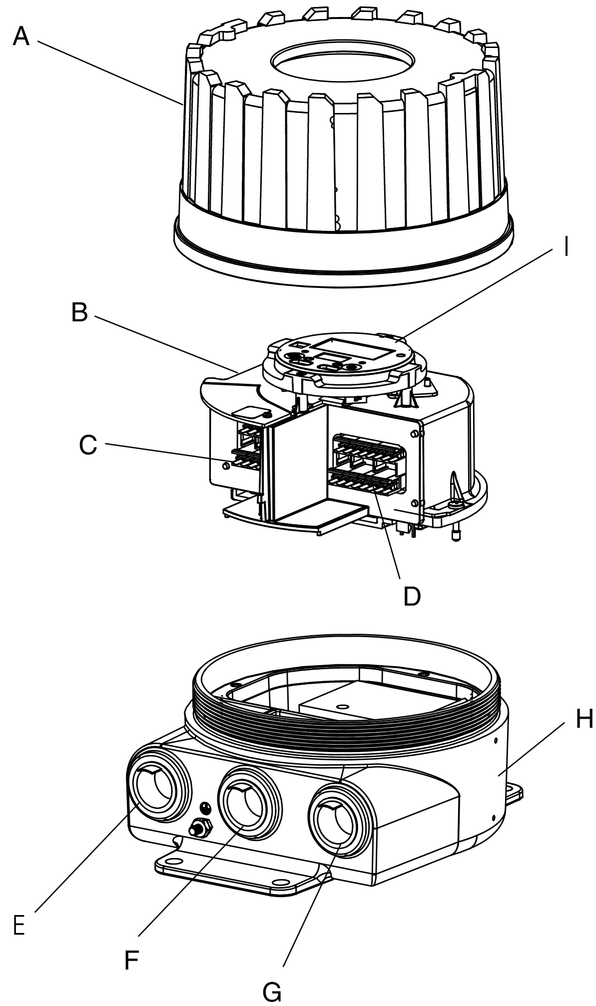
Topics covered in this appendix:

- ♦ Transmitter components
- ♦ Transmitter-to-sensor wiring
- ♦ Power supply terminals
- ♦ Input/output (I/O) terminals

B.1 Transmitter components

You may need to identify the transmitter components for certain operational or troubleshooting tasks. See Figure B-1.

Figure B-1 9739 MVD 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

B.2 Transmitter-to-sensor wiring

⚠ **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.**

You can wire the 9739 MVD 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 (see Table B-1).

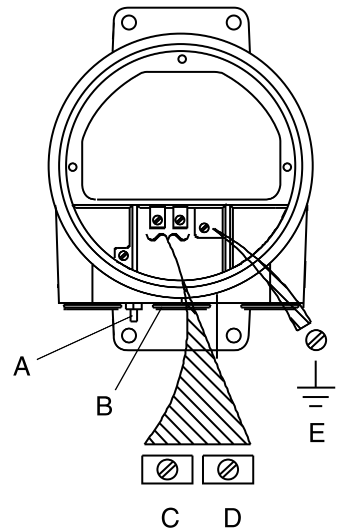
Table B-1 Sensor and transmitter terminal designations

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 −

B.3 Power supply terminals

⚠ **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 B-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

B.4 Input/output (I/O) terminals

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 B-3 I/O terminals

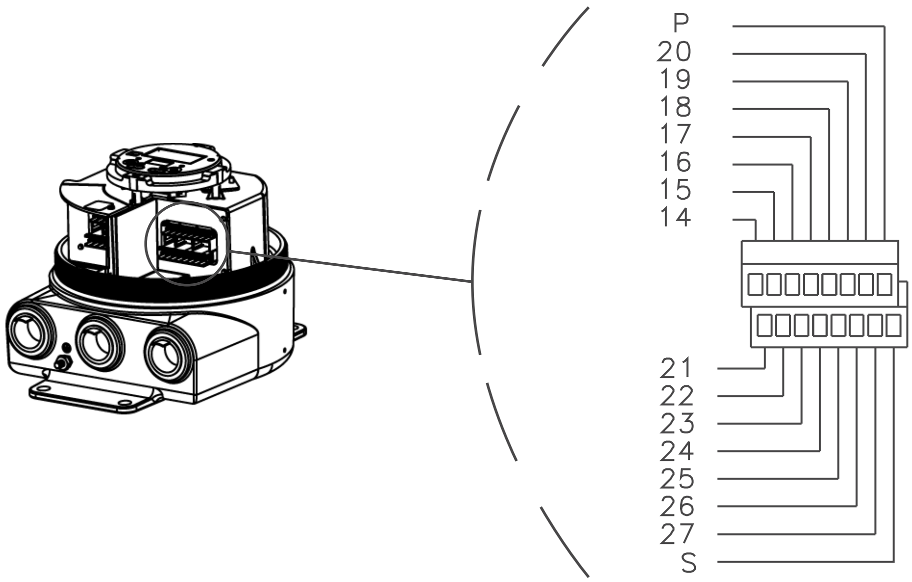


Table B-2 I/O terminals and functions

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

Appendix C

Using the transmitter display

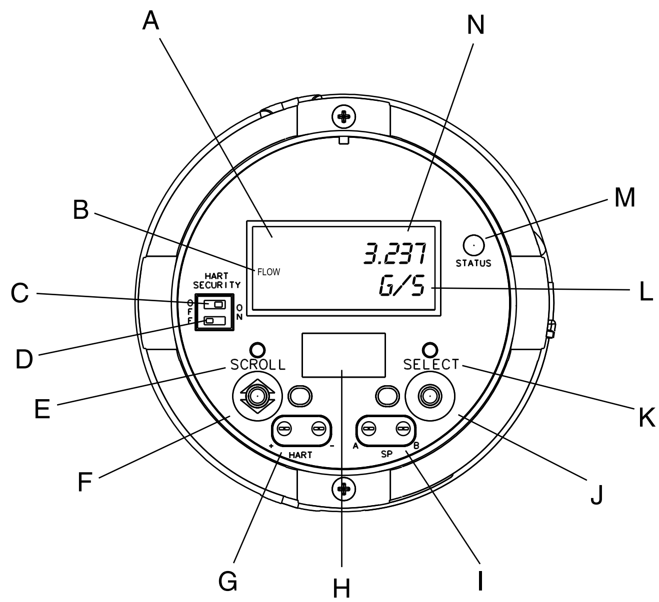
Topics covered in this appendix:

- ♦ Components of the transmitter interface
- ♦ 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

C.1 Components of the transmitter interface

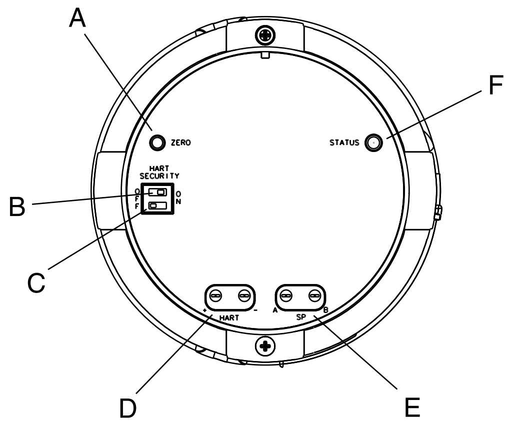
See Figure C-1 to view a transmitter with a display. See Figure C-2 to view a transmitter without a display.

Figure C-1 Transmitter with display



- **A** LCD display
- **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 C-2 Transmitter without display



- **A** Zero button
- **B** HART security switch
- **C** Unused
- **D** HART clips
- **E** Service port clips
- **F** Status LED

C.2 Access and use the display menu system

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.

Tip

The display menu system does not provide complete configuration, administrative, or maintenance functions. For complete transmitter management, you must use another communications tool.

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.
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 protect the display from 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.

C.2.1 Optical switches

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.

⚠ **If you are in a hazardous environment, do not remove the transmitter housing cover. Removing the transmitter housing cover in a hazardous environment can cause an explosion or other damage. You can operate the optical switches through the lens.**

The optical switch indicator lights up when the transmitter senses that an optical switch has been activated. See Table C-1.

Table C-1 Optical switch indicator and optical switch states

Optical switch indicator	State of optical switches
Solid red	Either the Scroll or the Select optical switch is activated.
Flashing red	Both optical switches are activated.

C.2.2 Enter a floating-point value

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 digits 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 four.

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:
  a. 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.
  b. Activate Scroll to change the value of the active digit.
  c. 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:
  a. Activate Select until the decimal point is flashing.
  b. Activate Scroll.

     The decimal point is removed from its current position.
  c. 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.
  d. 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 four-digit mantissa.
- E = The exponent indicator.
- YY = The two-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 four-digit value with a precision of three; i.e., 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.

C.3 Display codes for process variables

Table C-2 lists and defines the codes used for process variables on the display.

Table C-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	
GSV F	Gas standard volume flow	

Table C-2 Display codes for process variables *continued*

Code	Definition	Comment or reference
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)	
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	

C.4 Codes and abbreviations used in display menus

Table C-3 lists and defines the codes and abbreviations used in the display menus.

Table C-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	
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

Table C-3 Codes and abbreviations used in display menus *continued*

Code or abbreviation	Definition	Comment or reference
ENABLE AUTO	Enable Auto Scroll	Enable or disable the Auto Scroll function
ENABLE OFFLN	Enable off-line	Access to off-line menu from display
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	

Table C-3 Codes and abbreviations used in display menus *continued*

Code or abbreviation	Definition	Comment or reference
MFLOW	Mass flow	
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	

C.5 Menu maps for the transmitter display

Figure C-3 Offline menu – top level

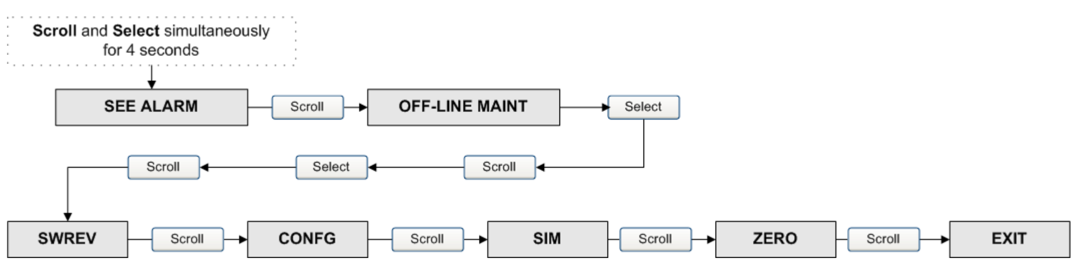


Figure C-4 Offline menu – version information

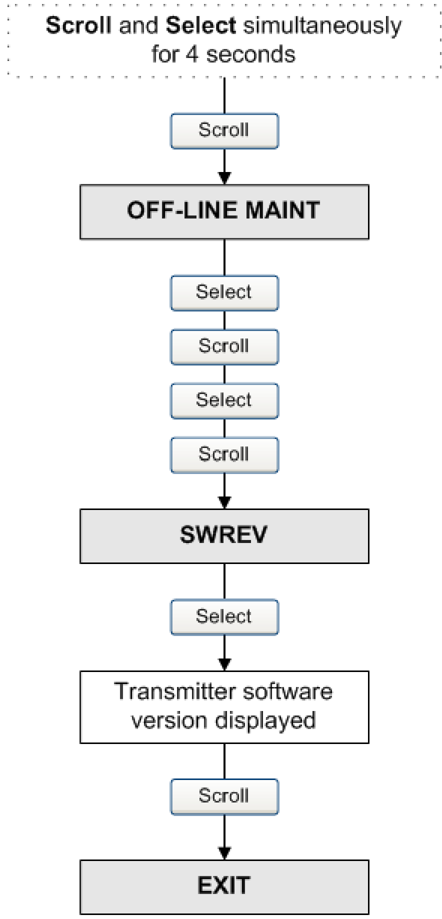


Figure C-5 Offline menu – configuration: units and I/O

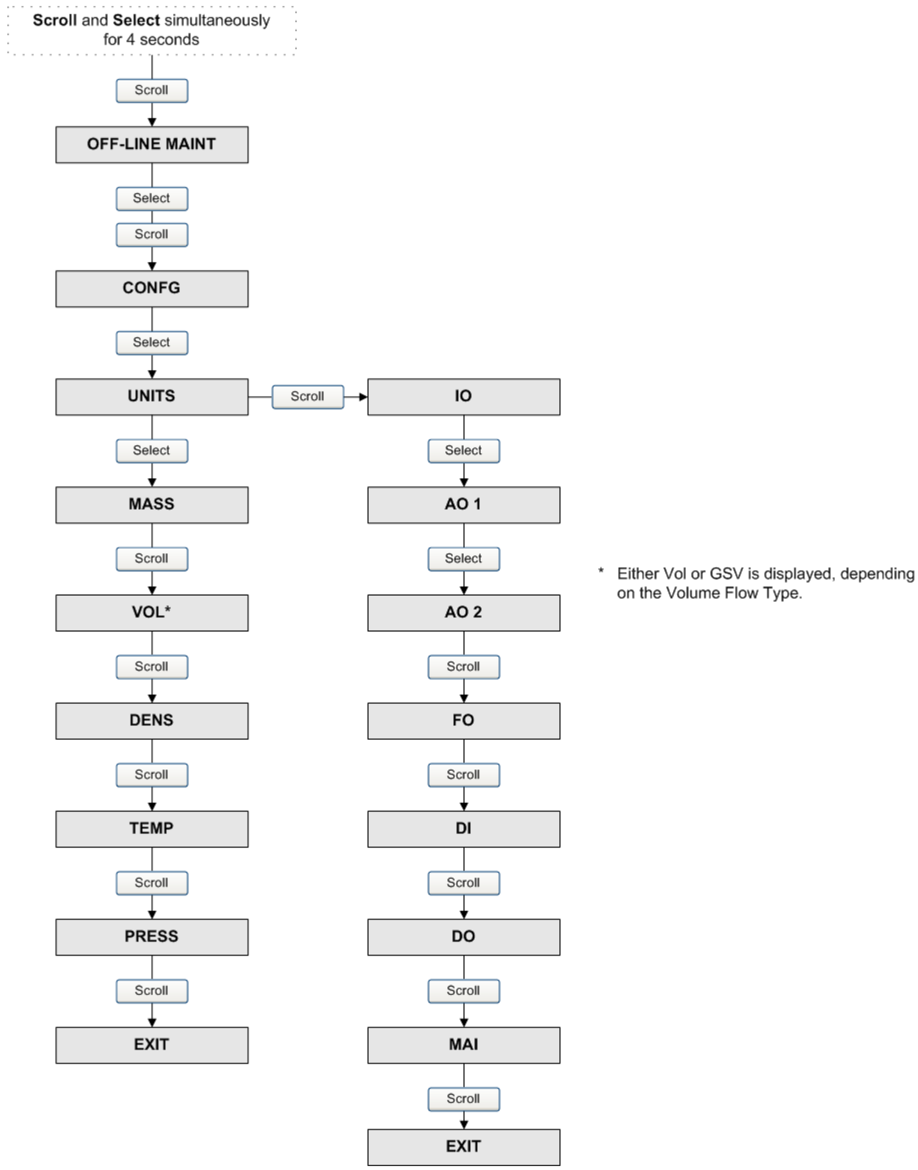


Figure C-6 Offline menu – configuration: meter factors, volume

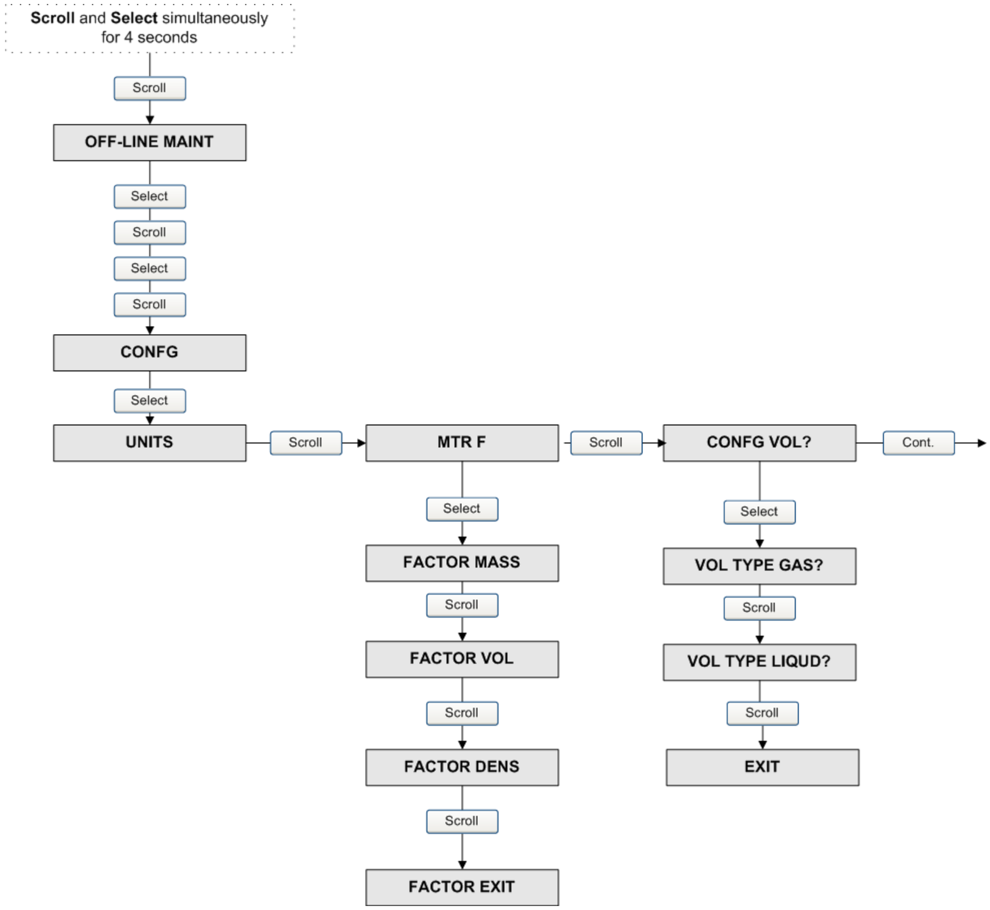
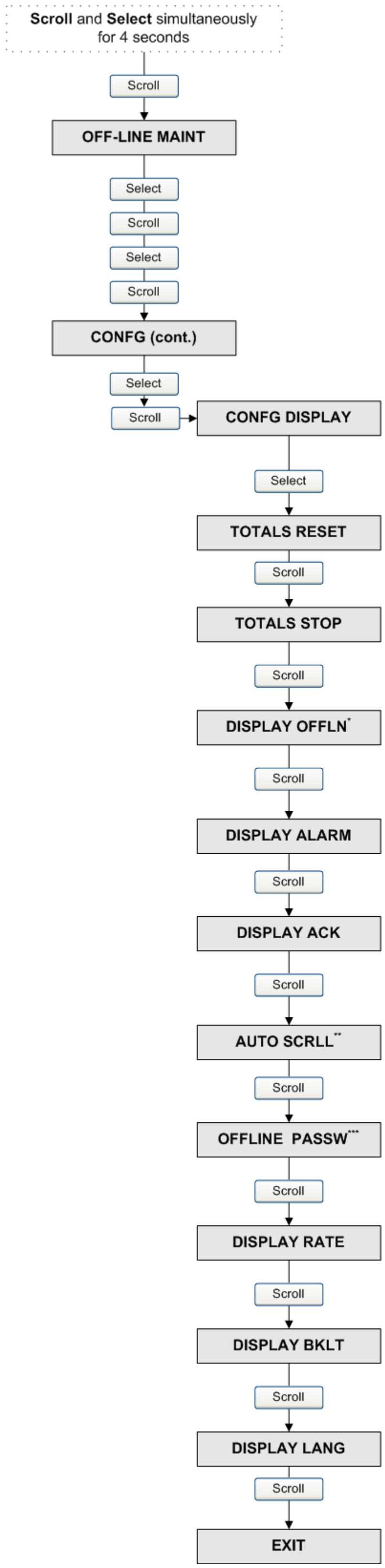


Figure C-7 Offline menu – configuration: display



* 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 C-8 Offline menu – Simulation (loop testing)

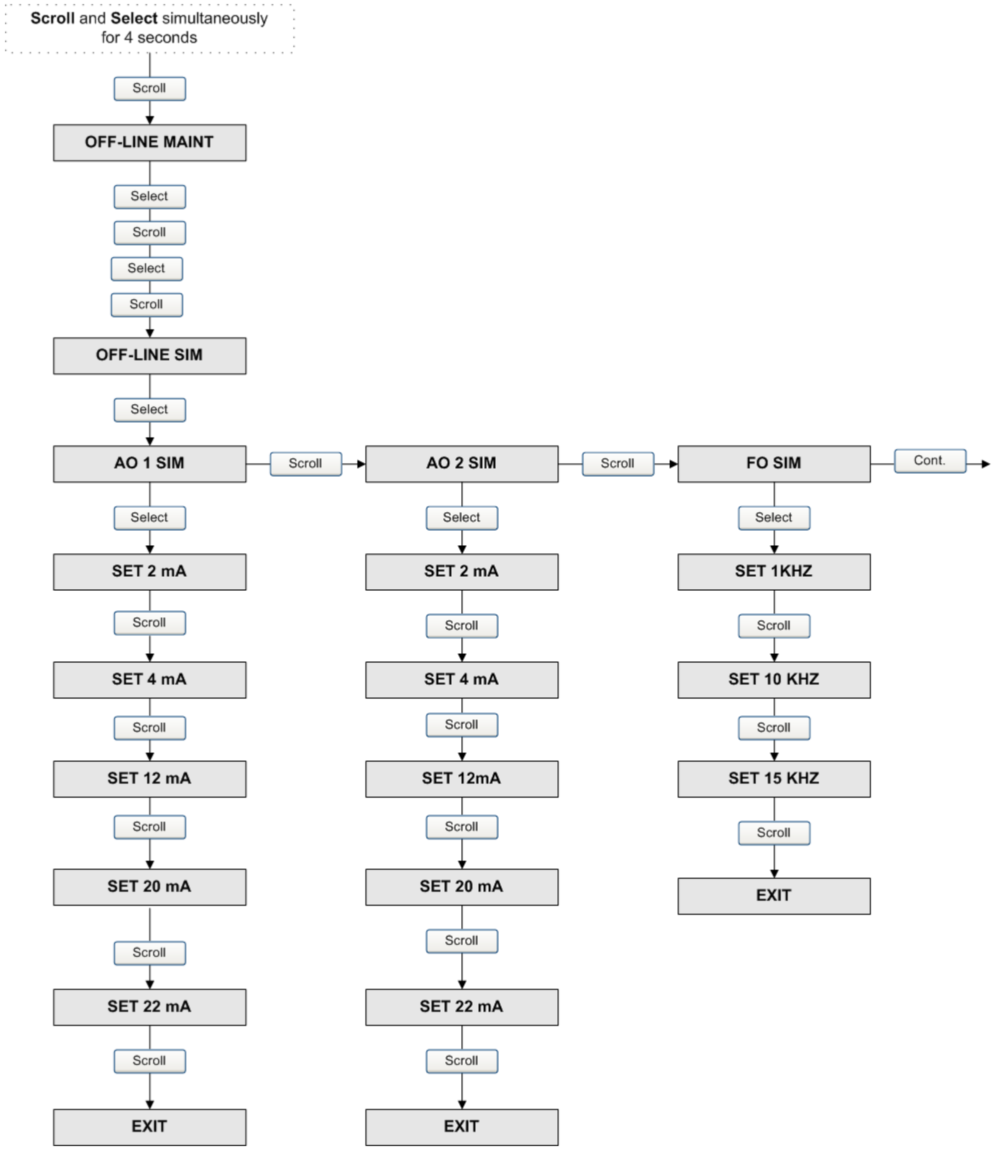


Figure C-9 Offline menu – Simulation: loop testing (continued)

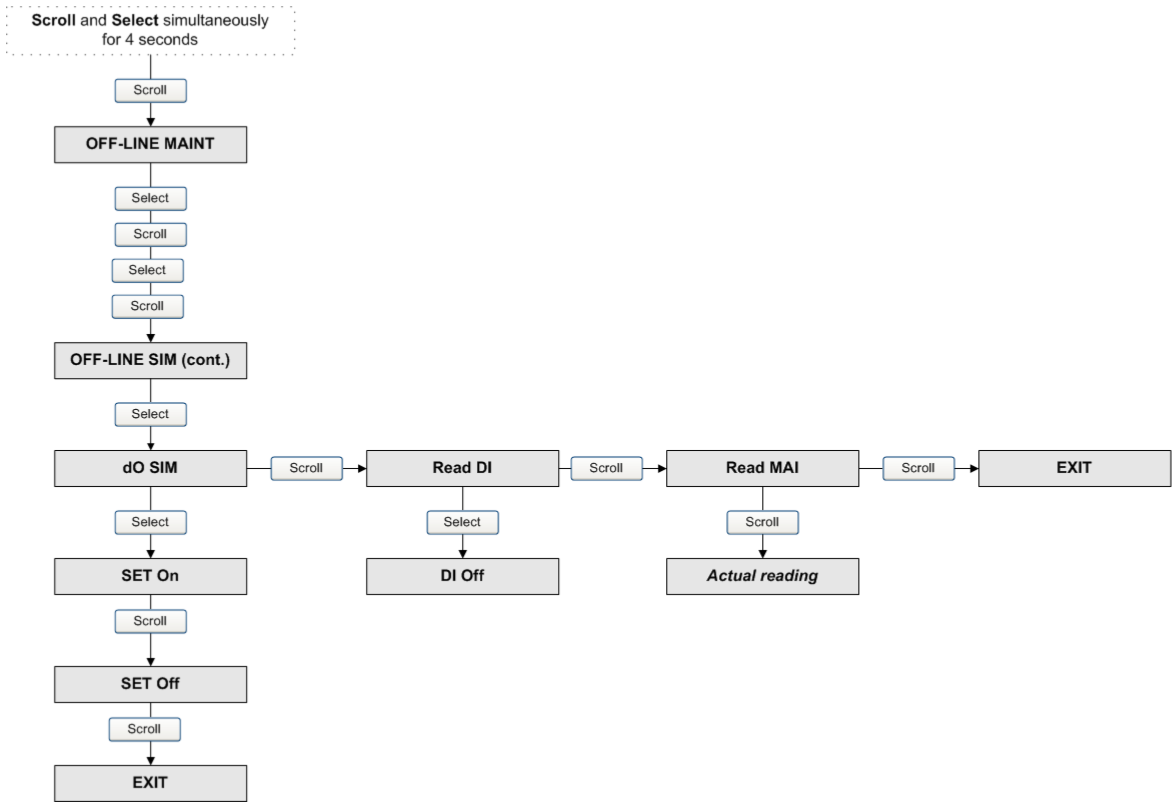
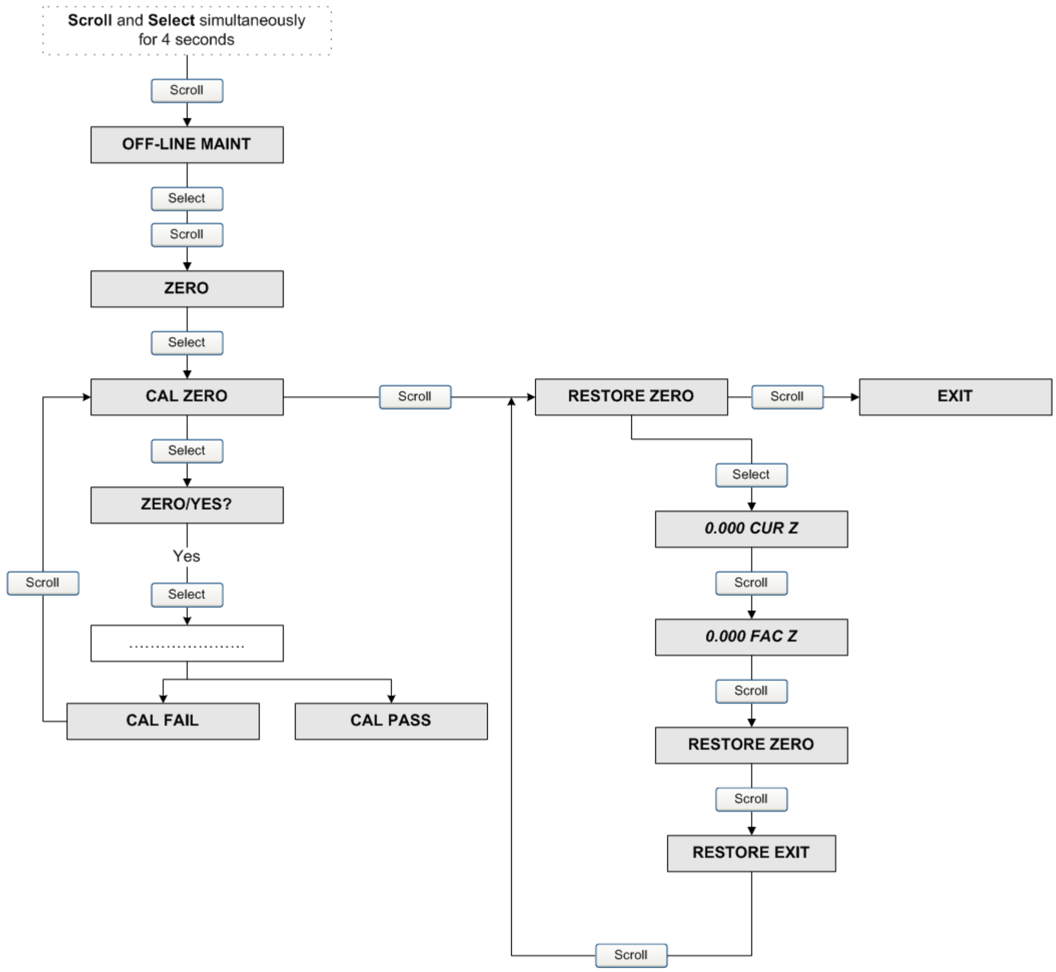


Figure C-10 Offline menu – Zero



Appendix D

Using ProLink II with the 9739 MVD transmitter

Topics covered in this appendix:

D.1 Basic information about the ProLink II software tool

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 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 on than this manual provides, see the ProLink II 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.

ProLink II features

ProLink II offers a number of special features, 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

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.

D.2 Menu maps for ProLink II

Figure D-1 Main menu

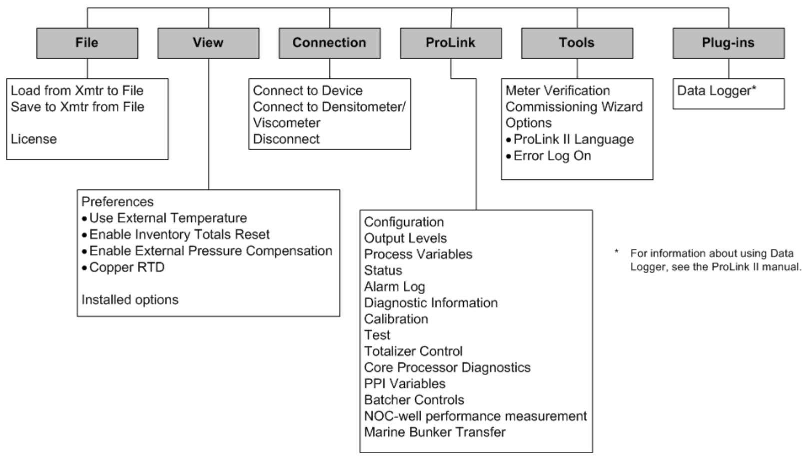


Figure D-2 Configuration menu

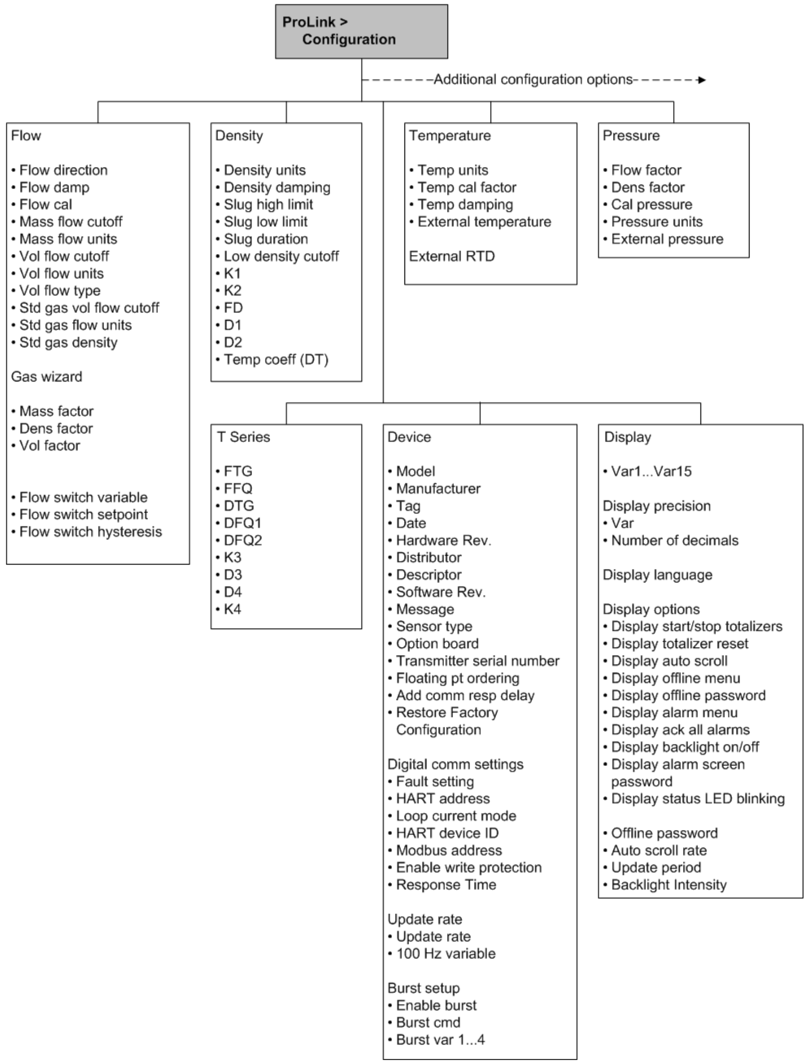


Figure D-3 Configuration menu (continued)

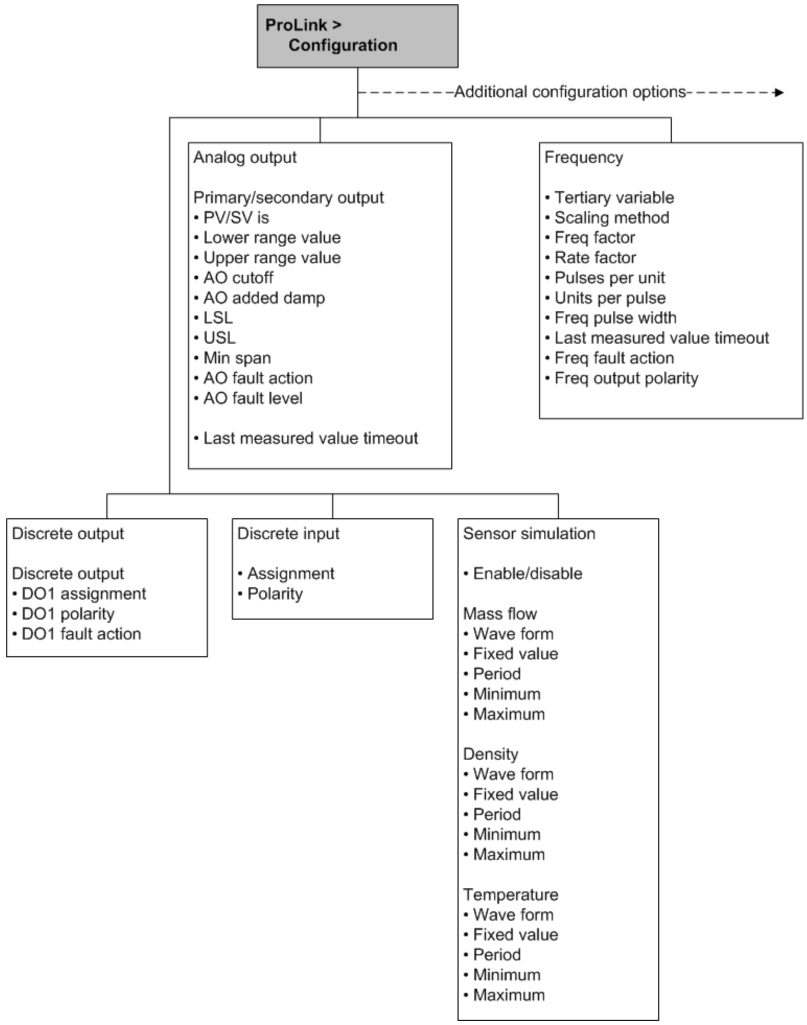
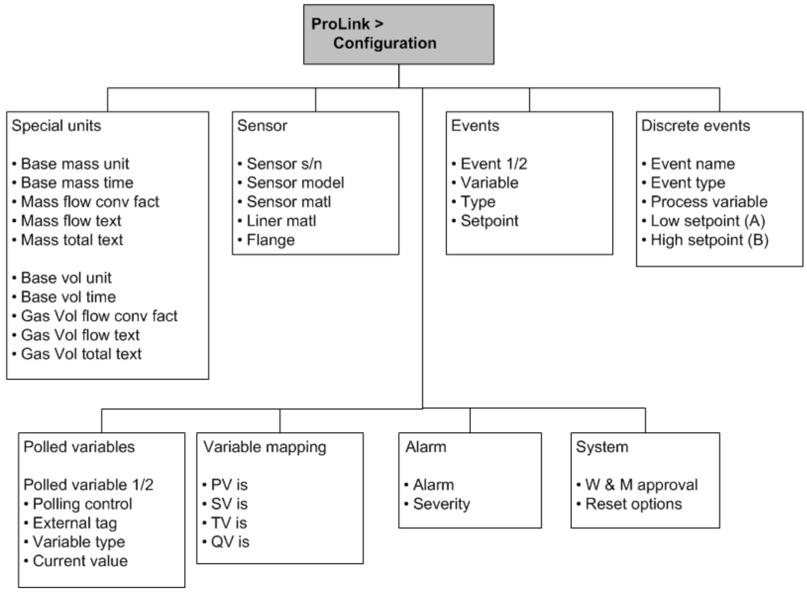


Figure D-4 Configuration menu (continued)



Appendix E

Using the Field Communicator with the 9739 MVD transmitter

Topics covered in this appendix:

- ♦ Basic information about the Field Communicator
- ♦ Menu maps for the Field Communicator

E.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.

Field Communicator 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: DD v2.

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, download the appropriate device description from the Micro Motion web site and upgrade your Field Communicator.

Field Communicator menus and messages

Most 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.

E.2 Menu maps for the Field Communicator

Figure E-1 On-Line menu

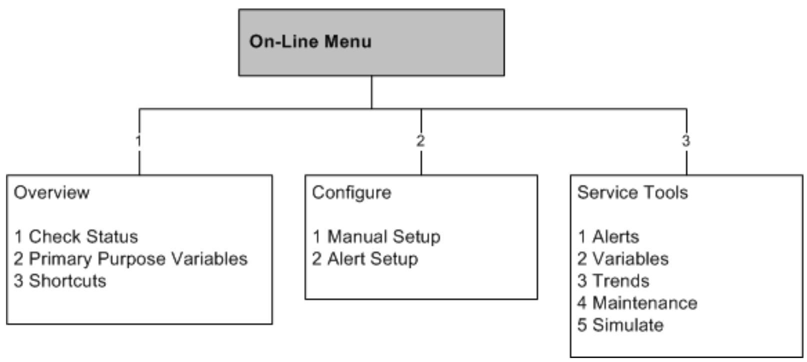


Figure E-2 Overview menu

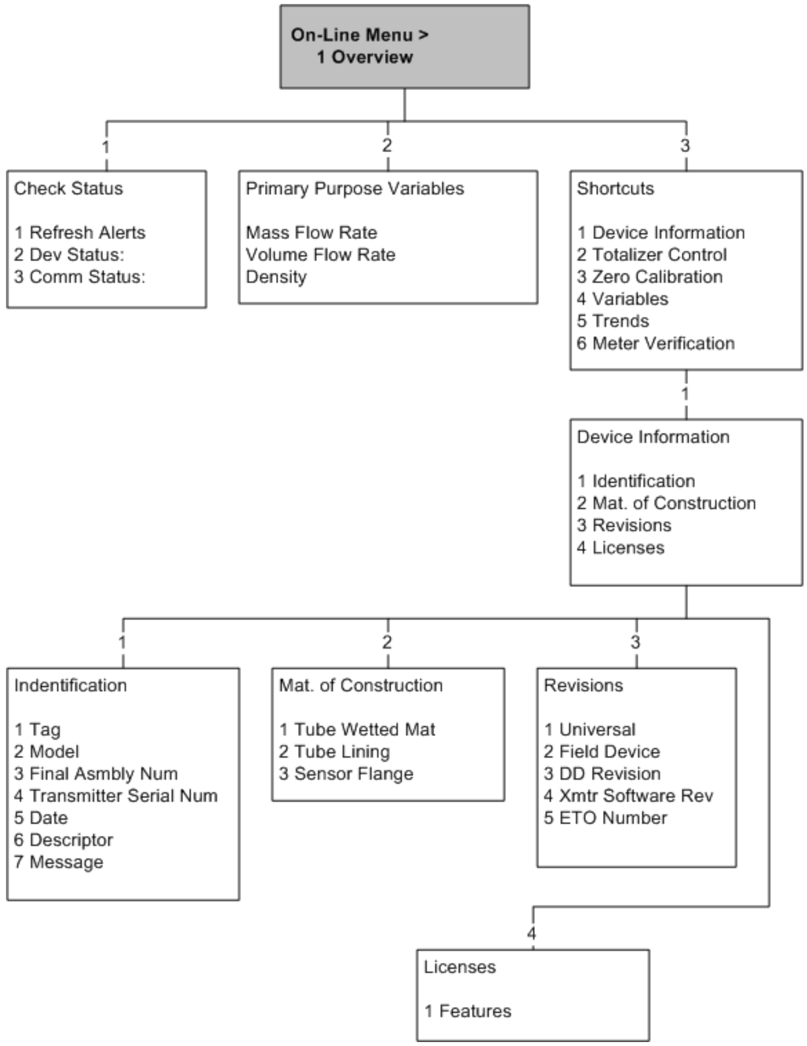


Figure E-3 Configure menu: top level

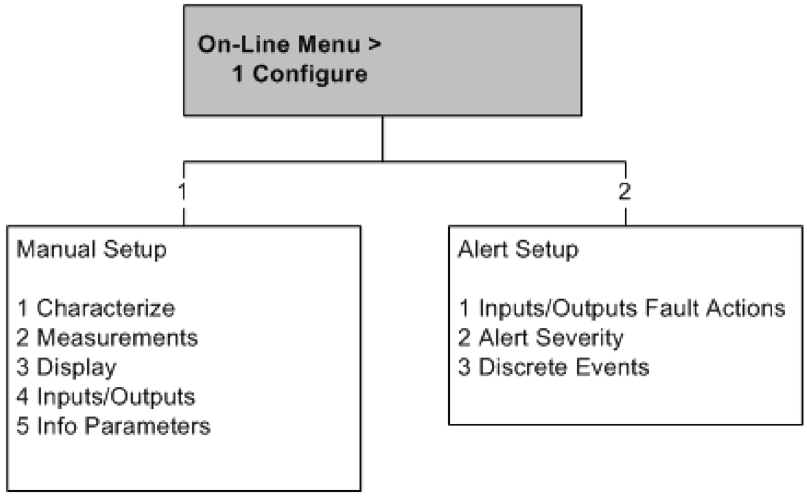


Figure E-4 Configure menu: Manual Setup: Characterize

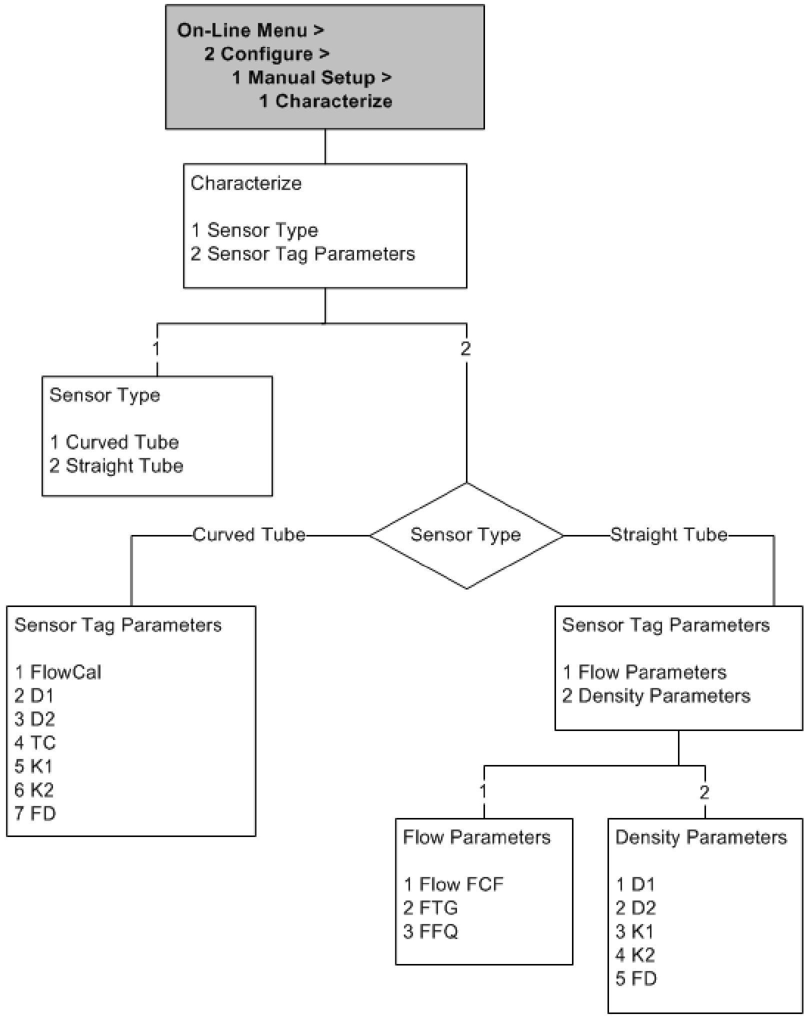


Figure E-5 Configure menu: Manual Setup: Measurements

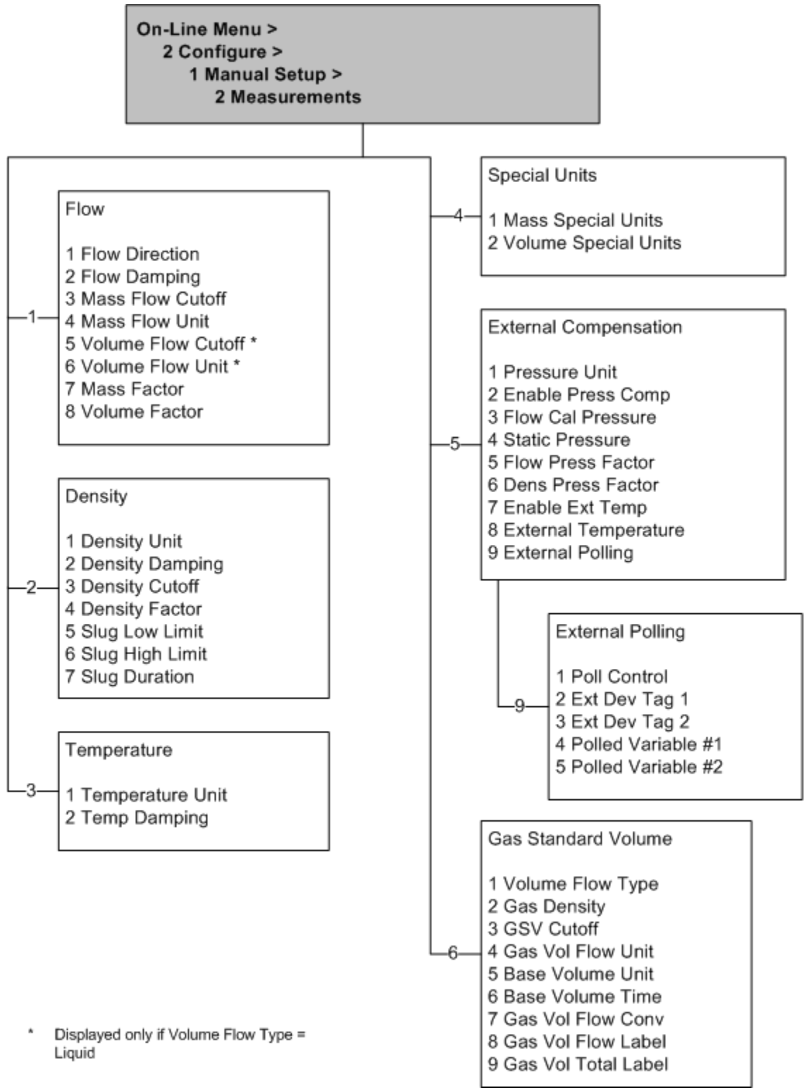


Figure E-6 Configure menu: Manual Setup: Display

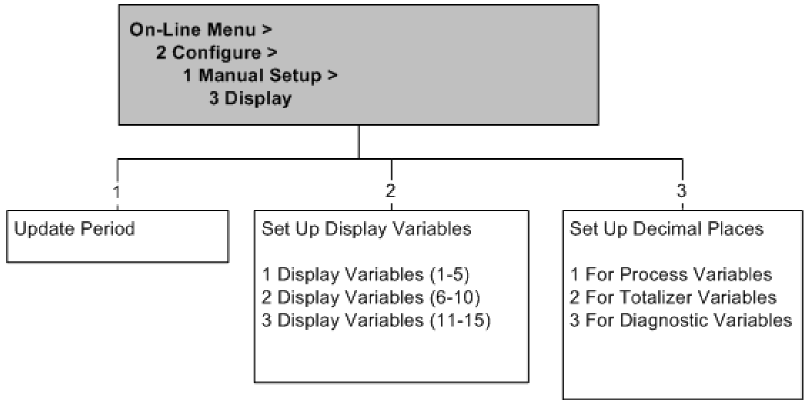


Figure E-7 Configure menu: Manual Setup: Inputs/Outputs

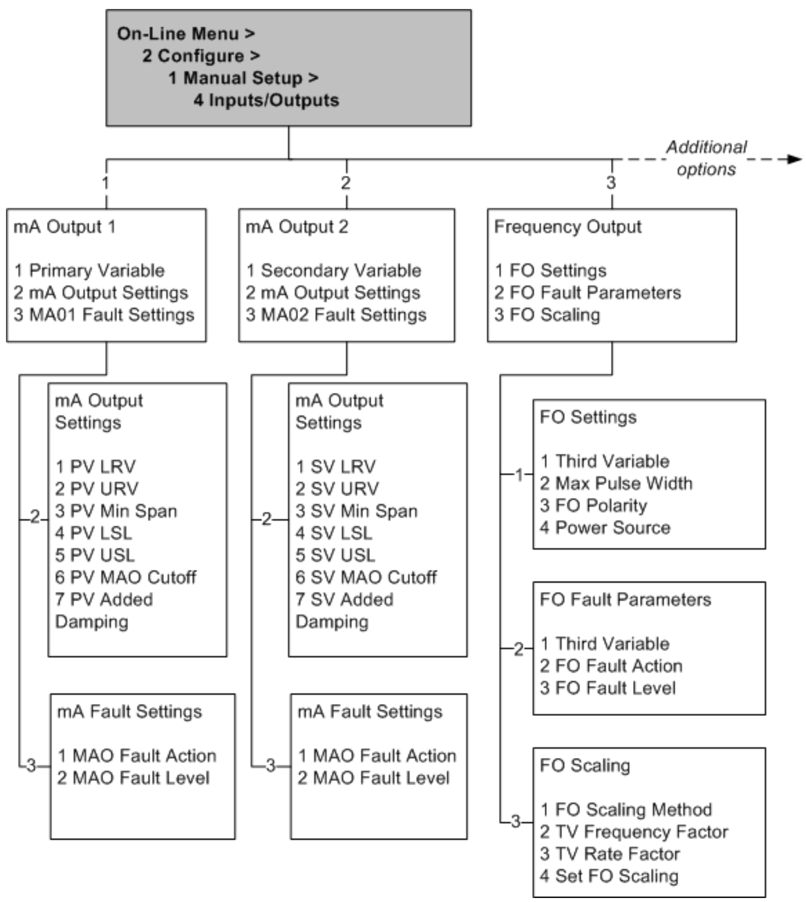


Figure E-8 Configure menu: Manual Setup: Inputs/Outputs (continued)

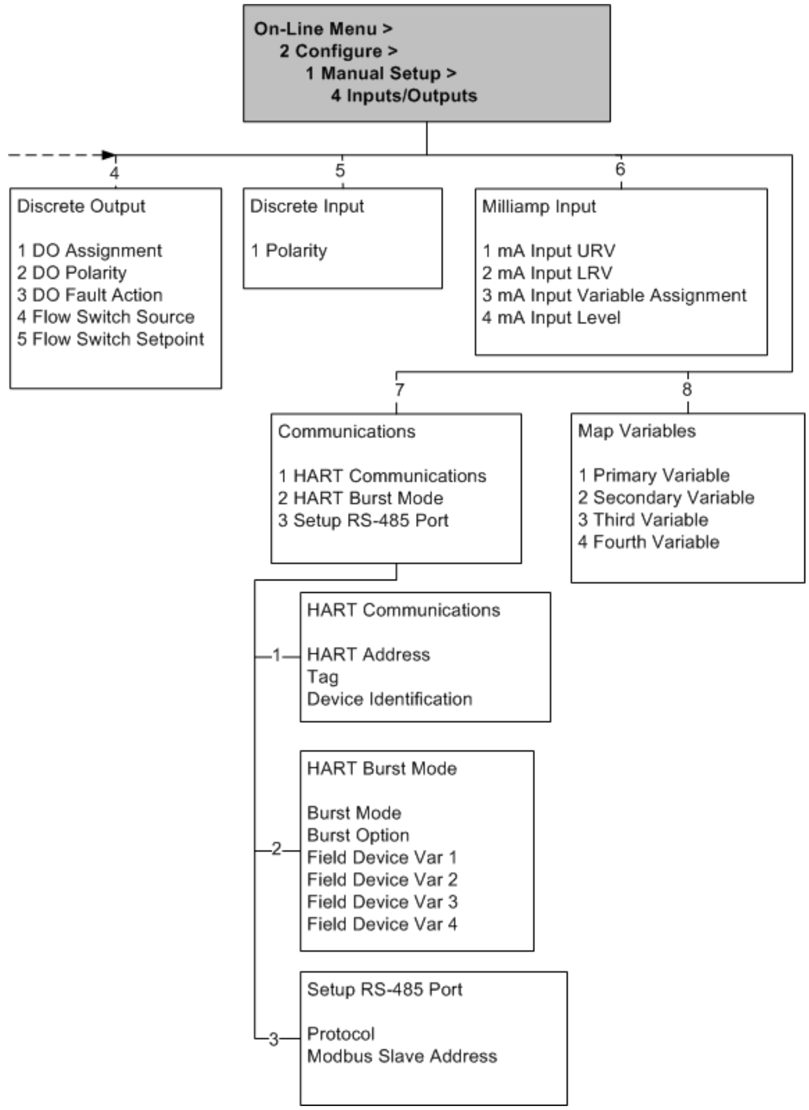


Figure E-9 Configure menu: Alert Setup

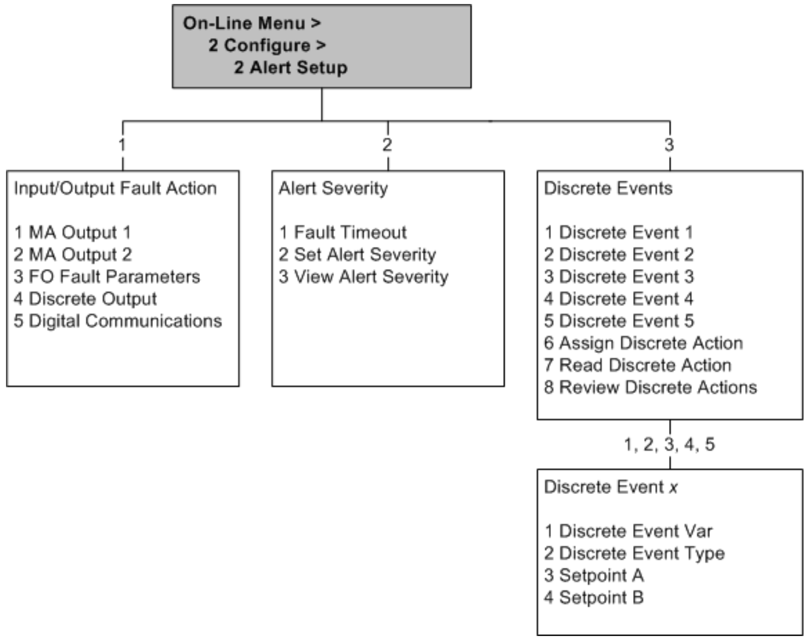


Figure E-10 Service Tools menu: top level

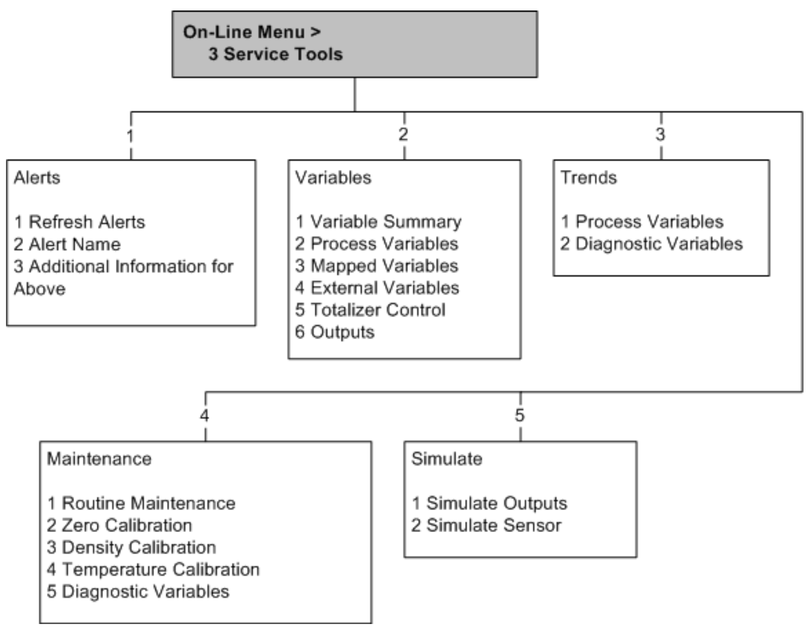


Figure E-11 Service Tools menu: Variables

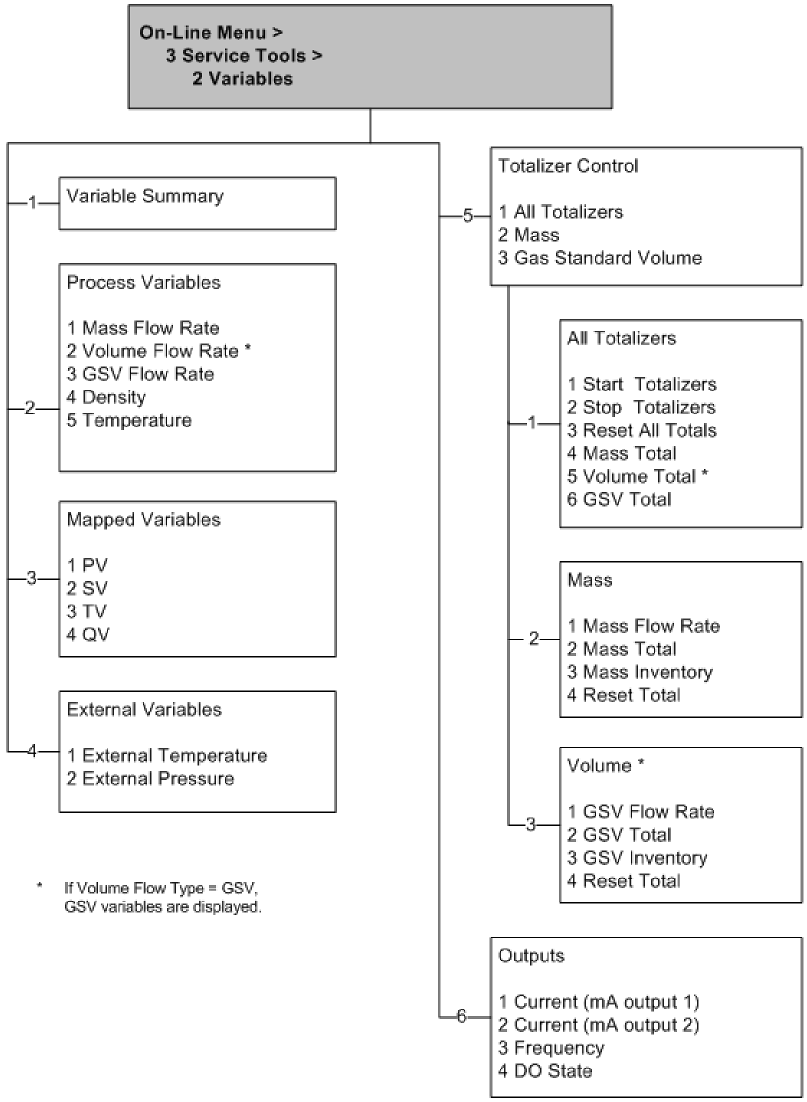


Figure E-12 Service Tools menu: Maintenance

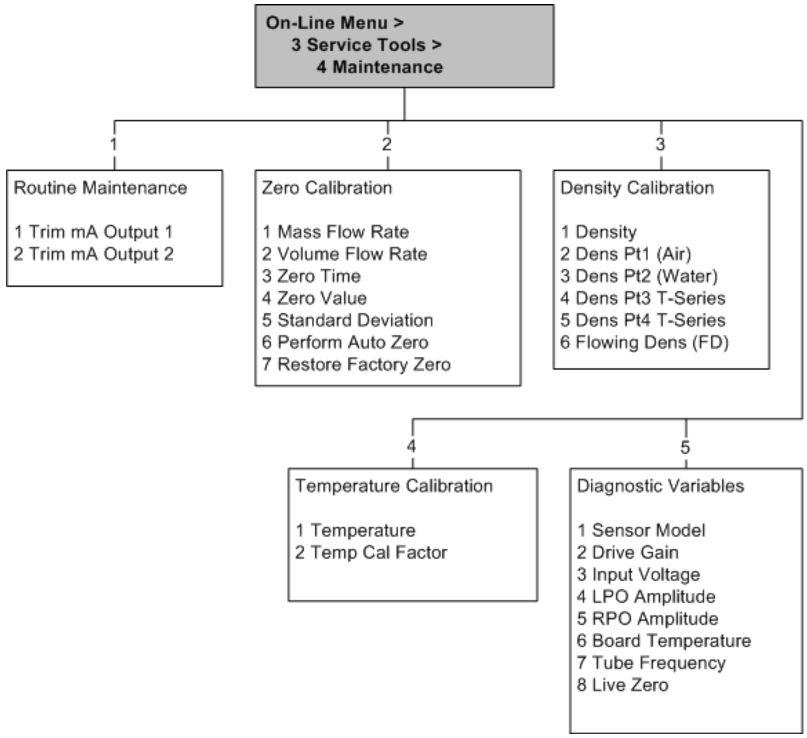
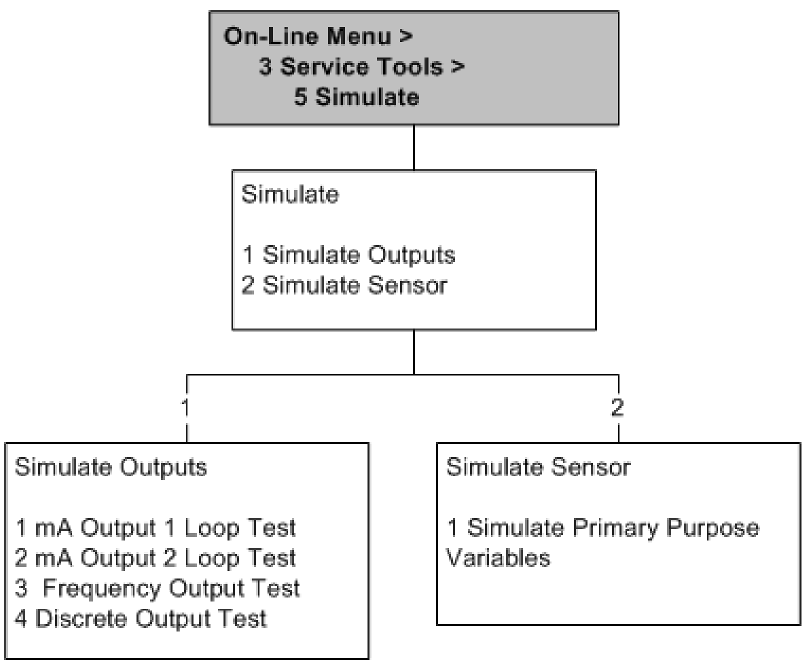


Figure E-13 Service Tools menu: Simulate



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