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Configuration and Use Manual
P/N 20000326, Rev. EB
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Micro Motion® Model 2700 Transmitter with FOUNDATION™ fieldbus

Configuration and Use Manual

Micro Motion

EMERSON
Process Management

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Chapter 1
Before You Begin

1.1 Overview

This chapter provides an orientation to the use of this manual, and includes a configuration worksheet. This manual describes the procedures required to start, configure, use, maintain, and troubleshoot Micro Motion® Model 2700 transmitters with FOUNDATION™ fieldbus.

1.2 Safety

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

1.3 Determining equipment versions

Table 1-1 describes how to obtain version information for the transmitter, core processor, Micro Motion ProLink® III version 1.1, ProLink® II patch 9854, and Field Communicator. Unless otherwise stated, the instructions in this manual assume transmitter firmware version 7.0 or later. In addition, many procedures assume your transmitter is connected to an enhanced core processor. Some procedures may function differently or be unavailable if your transmitter is not connected to an enhanced core processor.

Table 1-1 Obtaining version information

Component	With ProLink II	With a fieldbus host	With the display
Transmitter firmware	View > Installed Options > Software Revision	DEVICE INFO block > Revision Numbers > 2000 Series SW Rev	OFF-LINE MAINT > VER
Core processor firmware	Not available	DEVICE INFO block > Revision Numbers > Core Processor SW Rev	OFF-LINE MAINT > VER
ProLink II	Help > About ProLink II	Not applicable	Not applicable
ProLink III	Help > About ProLink III	Not applicable	Not applicable
Communicator device description	Not applicable	See Section E.2	Not applicable

1.4 Flowmeter documentation

Table 1-2 lists documentation sources for additional information.

Table 1-2 Flowmeter documentation resources

Topic	Document
Installing the sensor	Sensor installation manual
Installing the transmitter	*Micro Motion Model 1700 and Model 2700 Transmitters: Installation Manual*
FOUNDATION fieldbus function block reference documentation	*FOUNDATION Fieldbus Blocks* (available via the Rosemount web site at http://www.rosemount.com)

1.5 Communication tools

Most of the procedures described in this manual require the use of a communication tool. Three communication tools are referred to in this manual:

- *Fieldbus host* – There are a number of available fieldbus hosts. In this manual, the Field Communicator is assumed to be the host. Other hosts, such as DeltaV, provide functionality that is very similar to that of the Communicator. Basic information on the Field Communicator is provided in Appendix E. For more information, refer to the Field Communicator documentation, which is available online (www.fieldcommunicator.com).

  All fieldbus hosts require appropriate device description (DD) files in order to communicate with and configure the transmitter. This manual assumes fieldbus hosts are using DDs for device revision 7.0. DD files are available from the Products section of the Micro Motion web site (www.micromotion.com).

- *ProLink II* – Basic information on ProLink II is provided in Appendix F. For more information, refer to the ProLink II manual, which is available on the Micro Motion web site (www.micromotion.com).

  This manual assumes the use of ProLink III version 1.1, ProLink II v2.91 or later.

- *Display* – Basic information on using the display is provided in Appendix G.

1.6 Out-of-service mode

Fieldbus function blocks may need to be placed in *Out-of-service* (O/S) mode before you modify their parameters. The procedures in this manual assume that, if necessary, function blocks have been put in O/S mode prior to starting the procedure, and that they will be placed back in service (i.e., *Auto* mode) after the procedure is complete.

ProLink II automatically handles function block modes.

1.7 Planning the configuration

The ISA configuration worksheet at the end of this chapter provides a place to record information about your flowmeter (transmitter and sensor) and your application. This information will affect your configuration options as you work through this manual. Fill out the configuration worksheet and refer to it during configuration. You may need to consult with transmitter installation or application process personnel to obtain the required information.

1.8 Micro Motion customer service

For customer service, phone the support center nearest you:

- In the U.S.A., phone **800-522-MASS** (800-522-6277) (toll-free)
- In Canada and Latin America, phone +1 303-527-5200
- In Asia:
  - In Japan, phone 3 5769-6803
  - In other locations, phone +65 6777-8211 (Singapore)
- In Europe:
  - In the U.K., phone 0870 240 1978 (toll-free)
  - In other locations, phone +31 (0) 318 495 555 (The Netherlands)

Customers outside the U.S.A. can also email Micro Motion customer service at *flow.support@emerson.com*.

	FIELDBUS INSTRUMENT DATA SHEET				SHEET		OF
					SPEC. NO.		REV.
	NO	BY	DATE	REVISION			
					CONTRACT		DATE
					REQ. - P.O.		
					BY	CHK'D	APPR.

	1	Meter Tag No.						
	2	Service						
	3	Location						
OPERATING CONDITIONS	4	FLUID	Calibrated Flow Range, Units					
	5		Max Velocity, Units					
	6		Min. Flow	Max. Flow			Operating Flow	
	7		Min. Pressure	Max. Pressure			Operating Press.	
	8		Min. Temp.	Max. Temp.			Operating Temp.	
	9		Spec. Gravity or Density (max)					
	10		Velocity (max)					
	11							
	12	PIPE DATA	Pipe Material					
	13		Pipe Size Upstream/Dnstream					
	14		Schedule					
	15		Special Insulator					
	16	FLOW SENSOR	Process Connections					
	17		Approval					
	18		Wetted Parts					
	19		Mass Flow Accuracy @ Max					
	20		Density Accuracy @ All Rates					
	21		Pressure Drop @ Max Flow					
	22		Calibration Type					
	23		Cal. Rate	Cal. Units				
	24		Custom Calibration Points					
	25		Dens. for Vol.to Mass Conv.					
	26		Spec. Unit Text	Totalizer Text				
	27		Base Flow Unit	Base Time Unit				
	28		Conversion Factor					
	29		Warning					
	30	TRANS.	Instrument Tag Number					
	31		Transmitter Style					
	32		Mass Unit	Volume Unit				
	33		Dens. Unit	Temp. Unit				
	34		Display					
	35		Safety					
	36		Conduit Adapters					
	37		Type		Electronic microprocessor based			
	38		Input Signal		FOUNDATION fieldbus™ H1 ISA.50.02 IEC-61158			
	39		Baud Rate		31.25 Kbps			
	40		Physical Media		Twisted pair wires, (H1) compliant			
	41		Power Supply		9–32 VDC, bus powered, 4 wires			
	42		Power Cons. on FF Bus		11.5 milliamps maximum			
	43		Input Voltage		Model 2700: 18–100 VDC or 85–265 VAC			
	44		Device Class		Link master	ITK 4.60 minimum		
	45		Min. VCRs		20			
	46		Electrical Class		FISCO	Other		
FUNCTION BLOCKS	47	Device Function Block Fixed Type			FOUNDATION fieldbus™ FF-891/FF-892 compliant			
	48	Resource Block (RB)						
	49	Transducer Block (TB)						
	50	Analog Input Block (AI)			Exec. time	18 ms		
	51	Analog Output Block (AO)			Exec. time	18 ms		
	52	Discrete Input Block			Exec. time	16 ms		
	53	Discrete output Block			Exec. time	16 ms		
	54	PID Block (PID)			Exec. time	20 ms		
	55	Integrator Block (INT)			Exec. time	18 ms		
	56	Instantiable Function Blocks			Model 2700: DO/DI			
	57	Transducer Block Type			Measurement TB		Calibration TB	
					Local Display TB		Device Information TB	
					Enhanced Density TB		API TB	
DIAGNOSTICS	58	Diagnostic TB						

NOTES:
1 – The vendor must provide the Device Description according with the firmware revision of the field device.
2 – It is mandatory to provide the Capability Format File for each type of device.
3 – All devices must show FOUNDATION™ logo.

FOR REFERENCE ONLY. NOT FOR ISSUE.

Chapter 2
Startup

2.1 Overview

This chapter describes the procedures you should perform the first time you start up the flowmeter. You do not need to use these procedures every time you cycle power to the flowmeter.

The procedures in this section will enable you to:

- Apply power to the flowmeter (Section 2.2)
- Check the analog input (AI) function blocks channels and change if required (Section 2.3)
- Check the integrator (INT) function block mode and configure if required (Section 2.4)
- Configure pressure compensation (optional) (Section 2.5)
- Configure temperature compensation (optional) (Section 2.6)
- Zero the flowmeter (optional) (Section 2.7)
- 1. Check the Analog Output (AO) function Block channels and change if required - (Section 2.3)
- 2. Check the Discrete Input (DI) Function Block channels and change if required - (Section 2.3)
- 3. Check the Discrete Output (DO) Function Block channels and change if required - (Section 2.3)

Note: All procedures provided in this chapter assume that you have established communication with the transmitter and that you are complying with all applicable safety requirements. See Appendices E and F.

2.2 Applying power

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

⚠ WARNING

Operating the flowmeter without covers in place creates electrical hazards that can cause death, injury, or property damage.

Make sure safety barrier partition and covers for the field-wiring, circuit board compartments, electronics module, and housing are in place before applying power to the transmitter.

Turn on the electrical power at the power supply. The flowmeter will automatically perform diagnostic routines. If the transmitter has a display, the status LED will turn green and begin to flash when the transmitter has finished its startup diagnostics.

Note: If this is the initial startup, or if power has been off long enough to allow components to reach ambient temperature, the flowmeter is ready to receive process fluid approximately one minute after power-up. However, it may take up to ten minutes for the electronics in the flowmeter to reach thermal equilibrium. During this warm-up period, you may observe minor measurement instability or inaccuracy.

2.3 Assigning function block channels

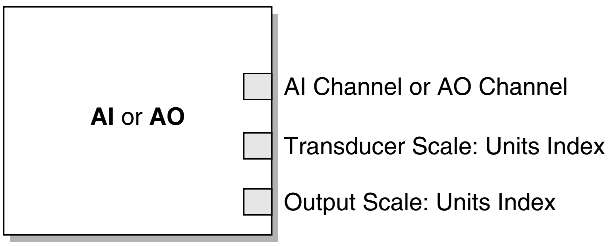
The four AI function blocks and the AO function block may be assigned to one transducer block channel each. The default channel configuration for each block is shown in Table 2-1.

Table 2-1 Default channel configuration

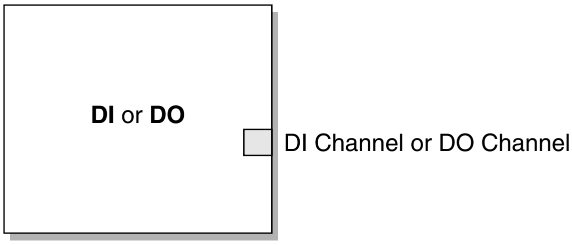
Block	Default channel	Units
AI 1	1 (mass flow)	g/s
AI 2	2 (temperature)	°C
AI 3	3 (density)	g/cm^3
AI 4	4 (volume flow)	l/s
AO	6 (pressure)	psi
AO	7 (Temperature)	°C
DO	8 (Start Sensor Zero)	
DI	9 (Forward/Reverse Indication)	

If you need to change the channel configuration you must use a fieldbus host. Refer to Figure 2-1 and Table 2-2.

Figure 2-1 Assigning function block channels – Fieldbus host



AI Channel	– Set to the transducer block channel this block should report.
AO Channel	– Set to the transducer block channel this block should report.
Transducer Scale: Units Index	– Change the units (if necessary).
Output Scale: Units Index	– If you change the units for Transducer Scale: Units Index, then change the units here as well to match.



DI Channel	– Set to the transducer block channel this block should report.
DO Channel	– Set to the transducer block channel this block should report.

Table 2-2 Available transducer block channels

Channel number	Process variable	Function block
1	Mass Flow	Analog Input
2	Temperature	Analog Input
3	Density	Analog Input
4	Volume Flow	Analog Input
5	Drive Gain	Analog Input
6	Pressure	Analog Output
7(1)	API Corr Density	Analog Input
8(1)	API Corr Volume Flow	Analog Input
9(1)	API Avg Corr Density	Analog Input
10(1)	API Avg Corr Temp	Analog Input
11(1)	API CTL	Analog Input
12(2)	ED Ref Density	Analog Input
13(2)	ED Specific Gravity	Analog Input
14(2)	ED Std Vol Flow	Analog Input
15(2)	ED Net Mass Flow	Analog Input
16(2)	ED Net Vol Flow	Analog Input
17(2)	ED Conc	Analog Input
18(2)	ED Baume	Analog Input
19(3)	Std Gas Volume Flow	Analog Input
20	Temperature	Analog Output
21	SNS Actual Flow Direction	Discrete Input
22	SNS ZeroInProgress	Discrete Input
23	SYS AnalogOutputFault	Discrete Input
24	SNS MVFailed	Discrete Input
25	Start Sensor Zero	Discrete Output
26	Reset Mass Total	Discrete Output
27	Reset Volume Total	Discrete Output
28	Reset API Reference (Standard) Volume Total	Discrete Output
29	Reset All Process Totals (not Inv)	Discrete Output
30	Reset ED Reference Volume Total	Discrete Output
31	Reset ED Net Mass Total	Discrete Output
32	Reset ED Net Volume Total	Discrete Output
33	Start/Stop All Totals (includes Inv)	Discrete Output
34	Increment ED Curve	Discrete Output
35	Reset Gas Standard Volume Total	Discrete Output
36	Start Meter Verification in Continuous Measurement Mode	Discrete Output

(1) Channels 7 through 11 are not selectable unless the petroleum measurement application is enabled.
(2) Channels 12 through 18 are not selectable unless the concentration measurement application is enabled.
(3) Channel 19 is selectable only if gas standard volume measurement is enabled (see Section 4.3).

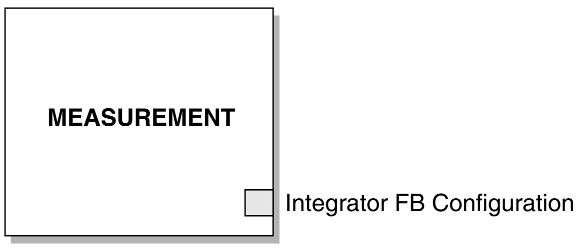
2.4 Configuring the integrator function block

The behavior of the INT function block can be configured in two ways:

- *Mode* – The INT function block mode can be configured as:
  - Standard, which provides standard fieldbus INT function block behavior
  - Any of the values in Table 2-3, which cause the INT function block to pass through the specified totalizer value from the MEASUREMENT transducer block
- *Resetting* – The INT function block can be configured for manual or automatic resetting when a setpoint is reached.

You can only configure the INT function block using a fieldbus host (Figures 2-2 and 2-3).

Figure 2-2 Configuring INT function block mode – Fieldbus host



Integrator FB Configuration – Set to the desired INT function block mode (see Table 2-3).

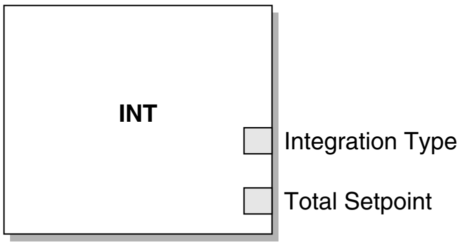
Table 2-3 INT function block modes

	Reports the value of this parameter:	
This mode:	**Transducer block**	**Parameter**
Standard	None	None — standard FOUNDATION fieldbus INT block behavior
Internal mass total	MEASUREMENT	Mass Total: Value
Internal volume total	MEASUREMENT	Volume Total: Value
Internal mass inventory	MEASUREMENT	Mass Inventory: Value
Internal volume inventory	MEASUREMENT	Volume Inventory: Value
Internal gas volume total	MEASUREMENT	Gas Volume Total: Value
Internal gas volume inventory	MEASUREMENT	Gas Vol Inventory: Value
Internal API volume total	PETROLEUM MEASUREMENT	API Corr Volume Total: Value
Internal API volume inventory	PETROLEUM MEASUREMENT	API Corr Vol Inventory: Value
Internal CM standard volume total	CONCENTRATION MEASUREMENT	CM Std Volume Total: Value
Internal CM standard volume inventory	CONCENTRATION MEASUREMENT	CM Std Vol Inventory: Value
Internal CM net mass total	CONCENTRATION MEASUREMENT	CM Net Mass Total: Value

Table 2-3 INT function block modes

This mode:	Reports the value of this parameter: Transducer block	Parameter
Internal CM net mass inventory	CONCENTRATION MEASUREMENT	CM Net Mass Inventory: Value
Internal CM net volume total	CONCENTRATION MEASUREMENT	CM Net Volume Total: Value
Internal CM net volume inventory	CONCENTRATION MEASUREMENT	CM Net Vol Inventory: Value

Figure 2-3 Configuring manual or automatic resetting – Fieldbus host



Integration Type – Set to manual or automatic resetting.

Total Setpoint – For automatic resetting, the value at which the totalizer will be reset.

2.5 Configuring pressure compensation

Due to process pressure change away from calibration pressure, there can be a change in sensor flow and density sensitivity. This change is called *pressure effect*. Pressure compensation corrects for these changes.

Not all sensors and applications require pressure compensation. Contact Micro Motion Customer Service before you configure pressure compensation.

Configuring pressure compensation requires three steps:

1. Determining pressure compensation values (Section 2.5.1)
2. Enabling pressure compensation (Section 2.5.2)
3. Selecting a pressure source (Section 2.5.3)

2.5.1 Pressure compensation values

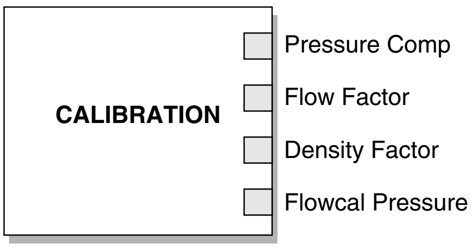
There are three values involved in pressure compensation:

- *Flow factor* — The flow factor is the percent change in flow rate per psi. Consult the product data sheet for your sensor for this value. You will need to reverse the sign of the flow factor. For example, if the flow factor in the product data sheet is –0.001% per psi, the pressure compensation flow factor would be +0.001% per psi.
- *Density factor* — The density factor is the change in fluid density, in g/cm^3 per psi. Consult the product data sheet for your sensor for this value. You will need to reverse the sign of the density factor. For example, if the density factor in the product data sheet is –0.00004 g/cm^3 per psi, the pressure compensation flow factor would be +0.00004 g/cm^3 per psi.
- *Flow calibration pressure* — The pressure at which the flowmeter was calibrated. Refer to the calibration document shipped with your sensor. If the data is unavailable, use 20 psi (1.4 bar).

2.5.2 Enabling pressure compensation

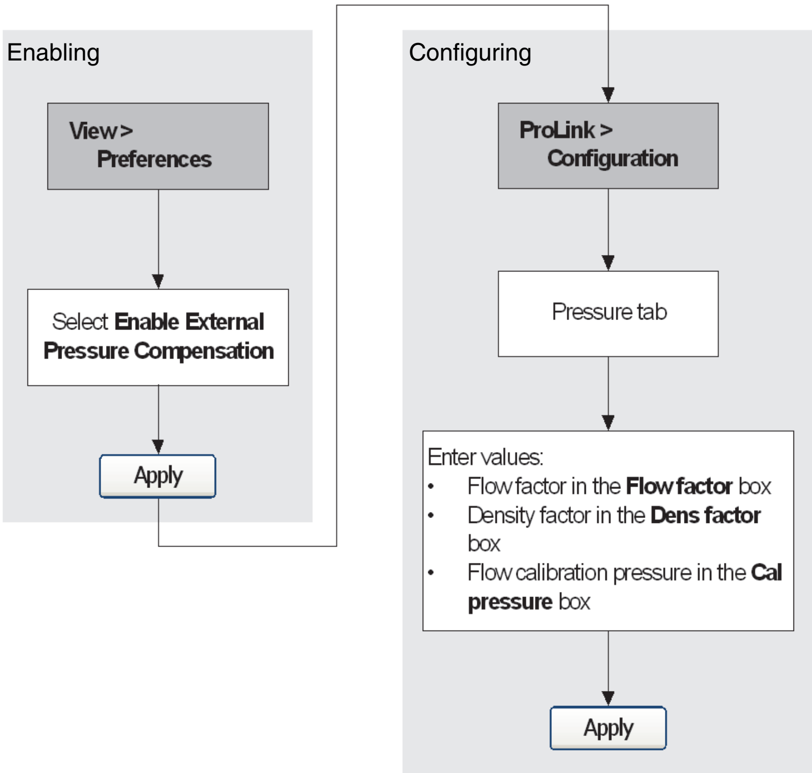
You can enable pressure compensation with a fieldbus host (Figure 2-4) or ProLink II (Figure 2-5). You will need the values of the three pressure compensation values from Section 2.5.1.

Figure 2-4 Pressure compensation – Fieldbus host



Pressure Comp	–	Set to *Enable*.
Flow Factor	–	Set to the specified value (in percent per psi) from the sensor product data sheet (reverse the sign).
Density Factor	–	Set to the specified value (in g/cm^3 per psi) from the sensor product data sheet (reverse the sign).
Flowcal Pressure	–	Set to the pressure at which the sensor was calibrated.

Figure 2-5 **Pressure compensation – ProLink II**



2.5.3 Configuring a pressure source

You will need to choose one of two sources for pressure data:

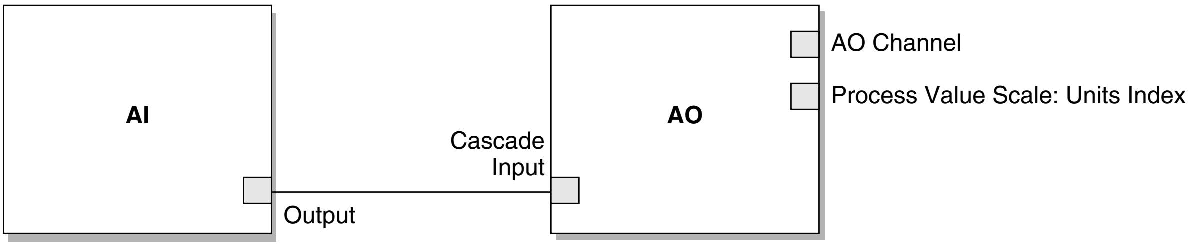
- *Analog Output function block* — This option allows you to poll for pressure data from an external pressure source.
- *Fixed pressure data* — This option uses a known, constant pressure value.

Note: If you configure a fixed pressure value, ensure that it is accurate. If you configure polling for pressure, ensure that the external pressure measurement device is accurate and reliable.

Using the Analog Output function block

You must use a fieldbus host to set up the AO function block. To set up the AO function block as a pressure source, connect the AI block of the pressure measurement device to the AO block of the transmitter (Figure 2-6).

Figure 2-6 **External pressure source – Fieldbus host**



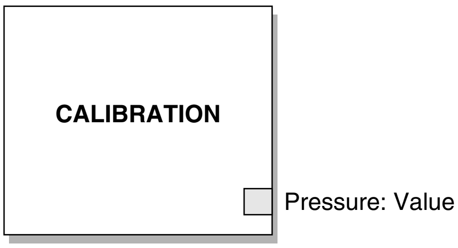
AO Channel – If changed from the default, reset to *Pressure* (value = 6).

Process Value Scale: Units Index – Change the units to match the pressure sensing device.

Using fixed pressure data

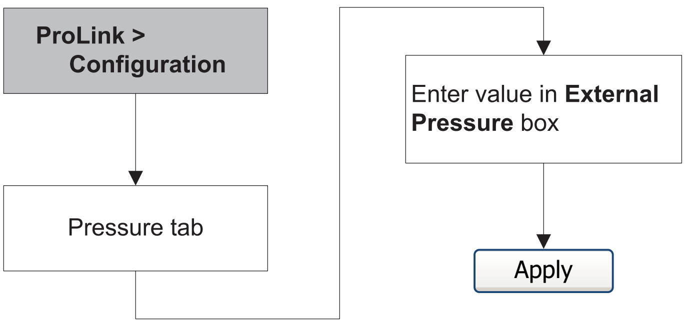
You can set up fixed pressure data with a fieldbus host (Figure 2-7) or ProLink II (Figure 2-8). You must enable external pressure compensation before you can set the fixed pressure value (see Section 2.5.2).

Figure 2-7 **Fixed pressure data – Fieldbus host**



Pressure: Value – Set to the appropriate fixed pressure value.

Figure 2-8 **Fixed pressure data – ProLink II**



2.6 Configuring temperature compensation

External temperature compensation can be used with the petroleum measurement application or the concentration measurement application:

- If external temperature compensation is enabled, an external temperature value (or a fixed temperature value), rather than the temperature value from the Coriolis sensor, is used in petroleum measurement or concentration measurement calculations only. The temperature value from the Coriolis sensor is used for all other calculations.
- If external temperature compensation is disabled, the temperature value from the Coriolis sensor is used in all calculations.

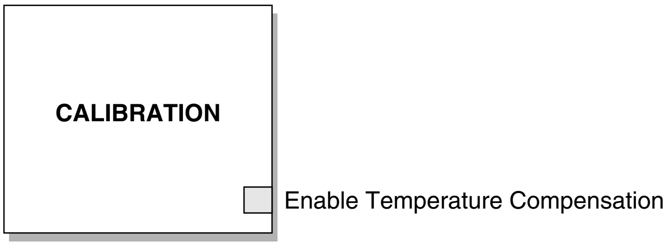
Configuring temperature compensation requires two steps:

1. Enabling external temperature compensation (Section 2.6.1)
2. Configuring a temperature source (Section 2.6.2)

2.6.1 Enabling external temperature compensation

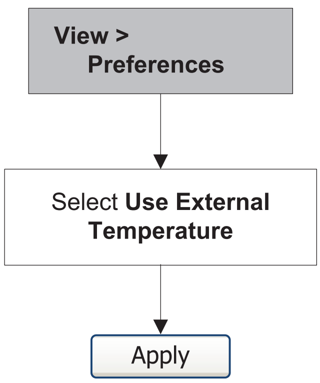
You can enable temperature compensation with a fieldbus host (Figure 2-9) or ProLink II (Figure 2-10).

Figure 2-9 Temperature compensation – Fieldbus host



Enable Temperature Compensation – Set to *Enable*.

Figure 2-10 Temperature compensation – ProLink II



2.6.2 Configuring a temperature source

You will need to choose one of two sources for temperature data:

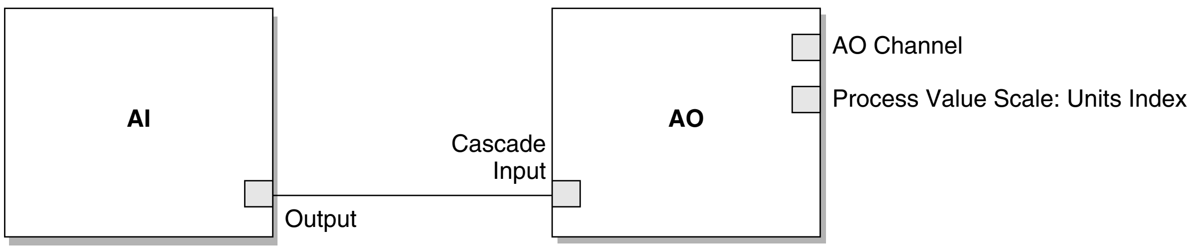
- *Analog Output function block* — This option allows you to poll for temperature data from an external temperature source.
- *Fixed temperature value* — This option uses a known, constant temperature value.

Note: If you configure a fixed temperature value, ensure that it is accurate. If you configure polling for temperature, ensure that the external temperature measurement device is accurate and reliable.

Using the Analog Output function block

You must use a fieldbus host to set up the AO function block. To set up the AO function block as a temperature source, connect the AI block of the temperature measurement device to the AO block of the transmitter (Figure 2-11).

Figure 2-11 External temperature source – Fieldbus host



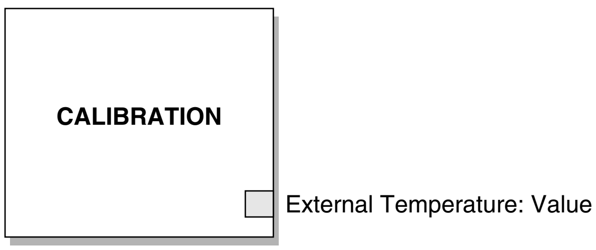
AO Channel – Set to *External Temperature* (value = 20).

Process Value Scale: Units Index – Change the units to match the temperature sensing device.

Using fixed temperature data

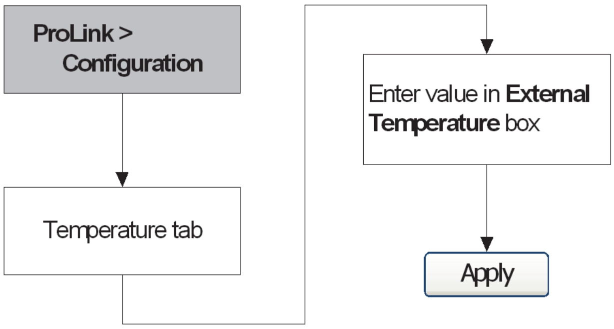
You can set up fixed temperature data with a fieldbus host (Figure 2-12) or ProLink II (Figure 2-13). You must enable external temperature compensation before you can set the fixed temperature value (see Section 2.6.1).

Figure 2-12 Fixed temperature data – Fieldbus host



External Temperature: Value – Set to the appropriate fixed temperature value.

Figure 2-13 Fixed temperature data – ProLink II



2.7 Zeroing the flowmeter

Zeroing the flowmeter establishes the flowmeter's point of reference when there is no flow. The meter was zeroed at the factory, and should not require a field zero. However, you may wish to perform a field zero to meet local requirements or to confirm the factory zero.

When you zero the flowmeter, you may need to adjust the zero time parameter. *Zero time* is the length of time the transmitter takes to determine its zero-flow reference point. The default zero time is 20 seconds.

- A *long* zero time may produce a more accurate zero reference but is more likely to result in 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.

For most applications, the default zero time is appropriate.

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. See Section 5.4 for information about responding to alarms.

2.7.1 Preparing for the zeroing procedure

To prepare for the zeroing procedure:

1. Apply power to the flowmeter. Allow the flowmeter to warm up for approximately 20 minutes.
2. Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
3. Close the shutoff valve downstream from the sensor.
4. Ensure that the sensor is completely filled with fluid and the flow through the sensor has completely stopped.

CAUTION

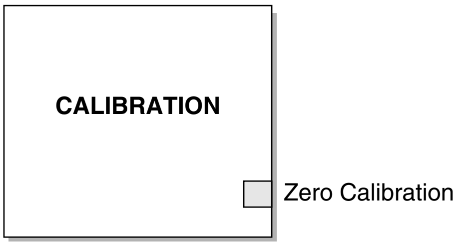
If fluid is flowing through the sensor, the sensor zero calibration may be inaccurate, resulting in inaccurate process measurement.

To improve the sensor zero calibration and measurement accuracy, ensure that process flow through the sensor has completely stopped.

2.7.2 Zero procedure

You can perform the zero procedure with a fieldbus host (Figure 2-14), the display (Figure 2-15), or ProLink II (Figure 2-16). If the zero procedure fails, see Section 6.6 for troubleshooting information.

Figure 2-14 **Zeroing – Fieldbus host**



Zero Calibration – Method parameter that initiates the procedure below.

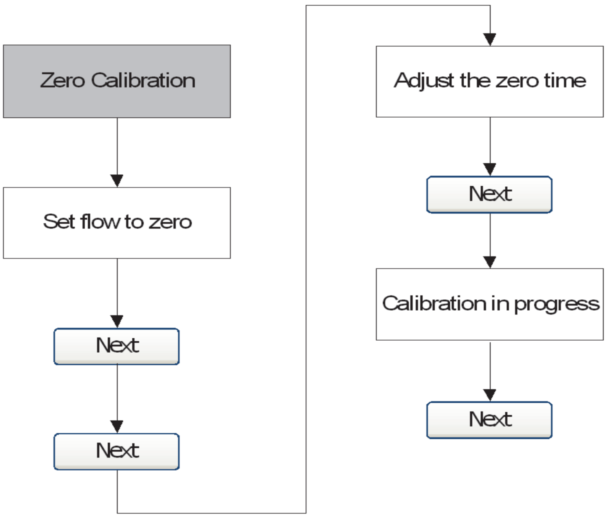
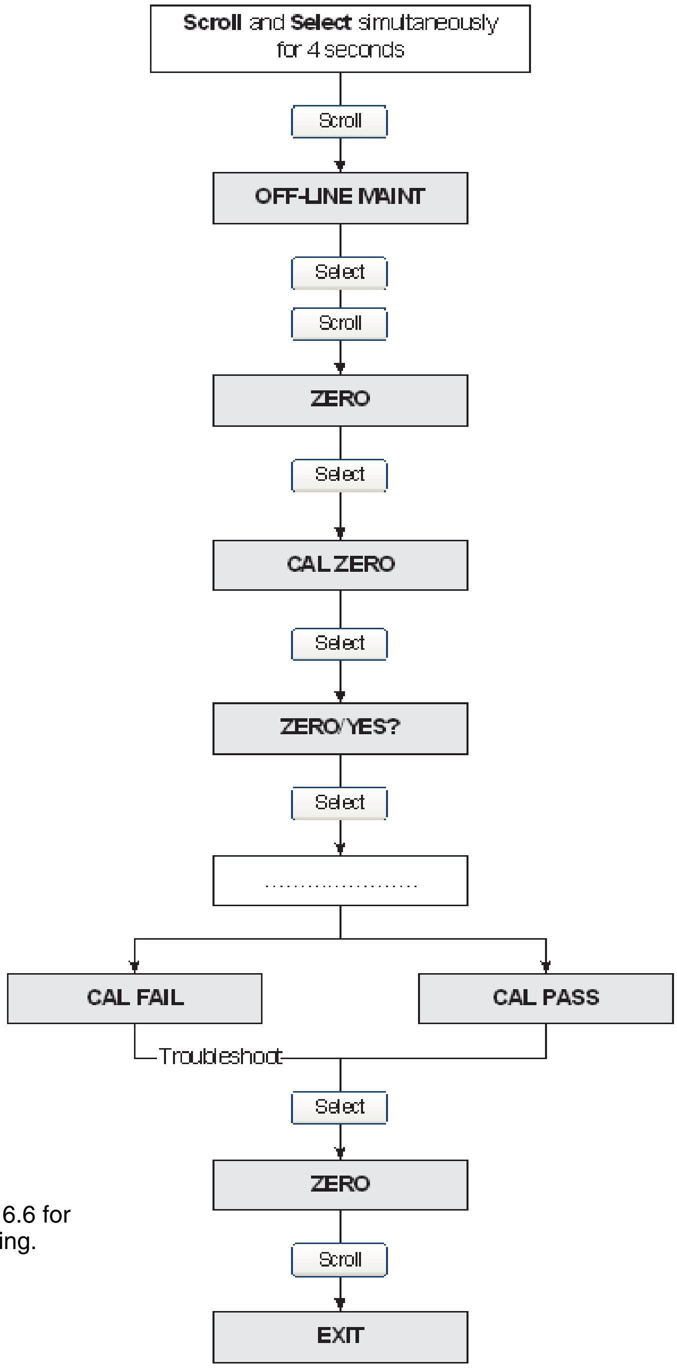
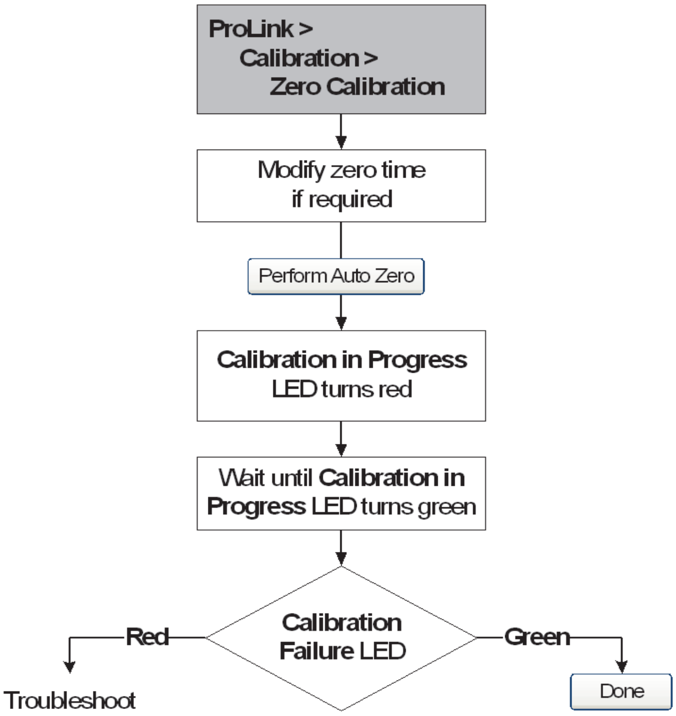


Figure 2-15 **Zeroing – Display**



- See Section 6.6 for troubleshooting.

Figure 2-16 **Zeroing – ProLink II**



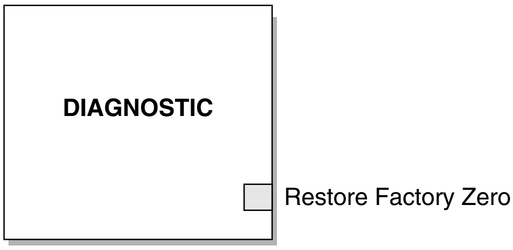
- See Section 6.6 for troubleshooting.
- As long as you do not disconnect ProLink II from the transmitter, you can restore the prior zero result.

2.7.3 Restoring zero values

ProLink II has the ability to restore a prior zero result as long as you have not exited the zeroing screen.

In addition, if the transmitter is connected to an enhanced core processor, you will be able to restore the factory zero. Restoring the factory zero can be accomplished using a fieldbus host (Figure 2-17), ProLink II (Figure 2-18), or the display (Figure 2-19).

Figure 2-17 Restoring factory zero – Fieldbus host



Restore Factory Zero – Set this parameter to *Restore*.

Figure 2-18 Restoring factory zero – ProLink II

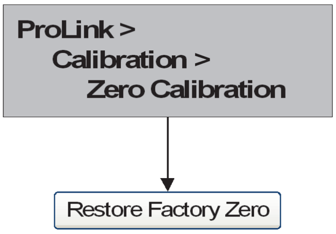
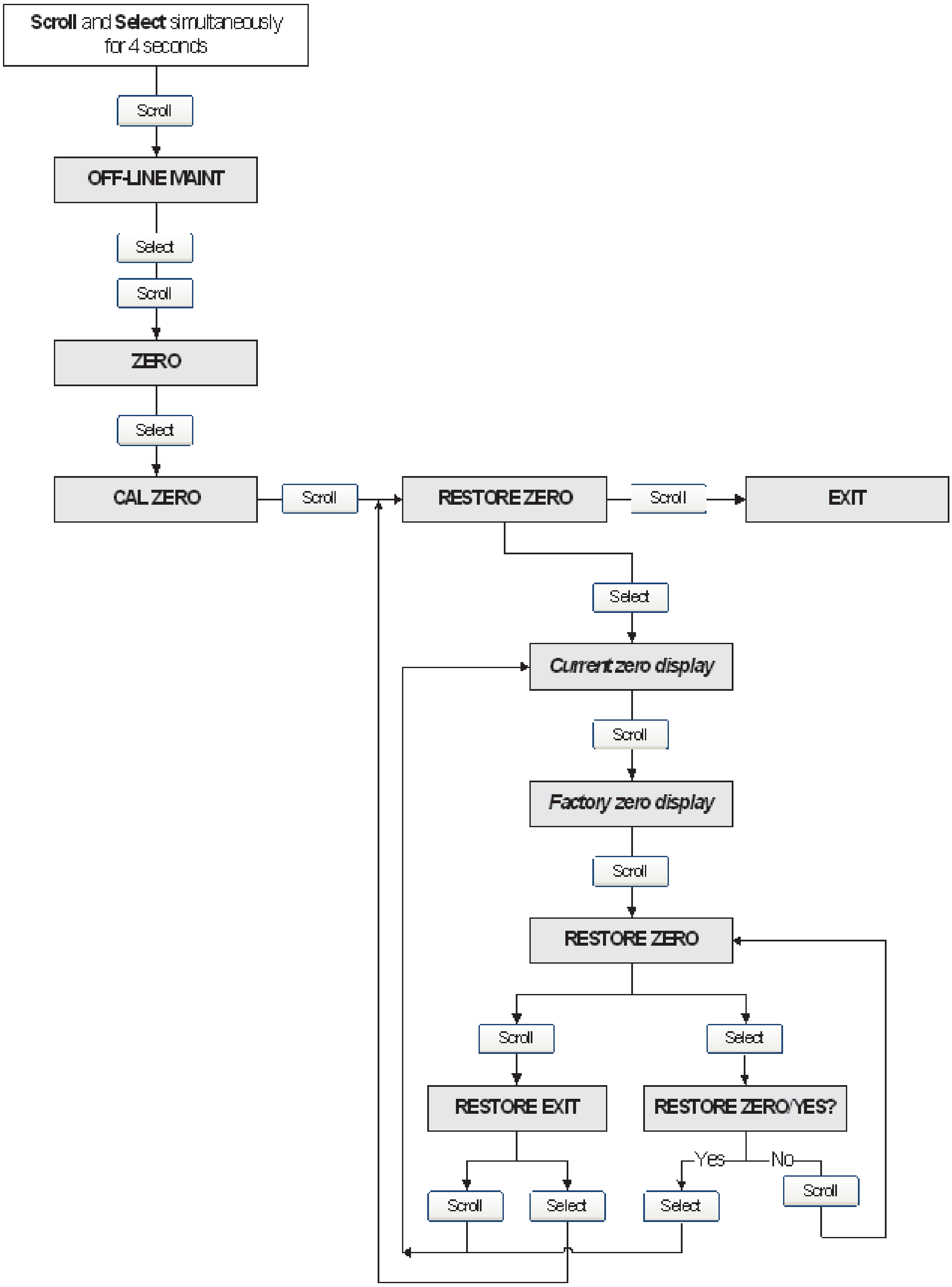


Figure 2-19 Restoring factory zero – Display



Chapter 3
Calibration

3.1 Overview

This chapter describes the following procedures:

- Characterization (Section 3.3)
- Smart Meter Verification (Section 3.4)
- Meter validation and adjusting meter factors (Section 3.5)
- Density calibration (Section 3.6)
- Temperature calibration (Section 3.7)

Note: All procedures provided in this chapter assume that you have established communication with the transmitter and that you are complying with all applicable safety requirements. See Appendices E and F.

3.2 Characterization, Smart Meter Verification, meter validation, and calibration

There are four procedures:

- *Characterization*—adjusts the transmitter to compensate for the unique traits of the sensor with which it is paired
- *Smart Meter Verification*—establishing confidence in the sensor's performance by analyzing secondary variables that are highly correlated with flow and density calibration factors
- *Meter validation*—confirming performance by comparing the sensor's measurements to a primary standard
- *Calibration*—establishing the relationship between a process variable (flow, density, or temperature) and the signal produced by the sensor

Meter validation, characterization, and calibration are available on all Model 2700 transmitters. Smart Meter Verification is available only if the Smart Meter Verification option was ordered with the transmitter.

These four procedures are discussed and compared in Sections 3.2.1 through 3.2.5. Before performing any of these procedures, review these sections to ensure that you will be performing the appropriate procedure for your purposes.

3.2.1 Characterization

Characterizing the flowmeter adjusts the transmitter to compensate for the unique traits of the sensor it is paired with. Characterization parameters (sometimes called "calibration factors") describe the sensor's sensitivity to flow, density, and temperature.

If the transmitter and the sensor were ordered together as a Coriolis flowmeter, then the flowmeter has already been characterized. Under some circumstances (typically when pairing a sensor and transmitter together for the first time), you may need to re-enter characterization data. If you are unsure about whether you should characterize your flowmeter, contact Micro Motion Customer Service.

3.2.2 Smart Meter Verification

Smart Meter Verification evaluates the structural integrity of the sensor tubes by comparing current tube stiffness to the stiffness measured at the factory. Stiffness is defined as the load per unit deflection, or force divided by displacement. Because a change in structural integrity changes the sensor's response to mass and density, this value can be used as an indicator of measurement performance. Changes in tube stiffness are typically caused by erosion, corrosion, or tube damage.

Smart Meter Verification does not affect measurement in any way. Micro Motion recommends performing Smart Meter Verification at regular intervals.

3.2.3 Meter validation and meter factors

Meter validation compares a measurement value reported by the transmitter with an external measurement standard. Meter validation requires one data point.

Note: For meter validation to be useful, the external measurement standard must be more accurate than the sensor. See the sensor's product data sheet for its accuracy specification.

If the transmitter's mass flow, volume flow, or density measurement is significantly different from the external measurement standard, you may want to adjust the corresponding meter factor. A meter factor is the value by which the transmitter multiplies the process variable value. The default meter factors are **1.0**, resulting in no difference between the data retrieved from the sensor and the data reported externally.

Meter factors are typically used for proving the flowmeter against a weights and measures standard. You may need to calculate and adjust meter factors periodically to comply with regulations.

3.2.4 Calibration

The flowmeter measures process variables based on fixed points of reference. Calibration adjusts those points of reference. Three types of calibration can be performed:

- Zero (see Section 2.7)
- Density calibration
- Temperature calibration

Density and temperature calibration require two data points (low and high) and an external measurement for each. Calibration produces a change in the offset and/or the slope of the line that represents the relationship between process density and the reported density value, or the relationship between process temperature and the reported temperature value.

Note: For density or temperature calibration to be useful, the external measurements must be accurate.

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 your flowmeter.

Note: 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.

3.2.5 Comparison and recommendations

When choosing among Smart Meter Verification, meter validation, and calibration, consider the following factors:

- Process and measurement interruption
  - Smart Meter Verification provides an option that allows process measurement to continue during the test.
  - Meter validation for density does not interrupt the process. However, meter validation for mass flow or volume flow requires process down-time for the length of the test.
  - Calibration requires process down-time. In addition, density and temperature calibration require replacing the process fluid with low-density and high density fluids, or low-temperature and high-temperature fluids. Zero calibration requires stopping flow through the sensor.
- External measurement requirements
  - Smart Meter Verification does not require external measurements.
  - Zero calibration does not require external measurements.
  - Density calibration, temperature calibration, and meter validation require external measurements. For good results, the external measurement must be highly accurate.
- Measurement adjustment
  - Smart Meter Verification is an indicator of sensor condition, but does not change flowmeter internal measurement in any way.
  - Meter validation does not change flowmeter internal measurement in any way. If you decide to adjust a meter factor as a result of a meter validation procedure, only the reported measurement is changed—the base measurement is not changed. You can always reverse the change by returning the meter factor to its previous value.
  - Calibration changes the transmitter’s interpretation of process data, and accordingly changes the base measurement. If you perform a zero calibration, you can return to the factory zero (or, if using ProLink II, the previous zero). However, if you perform a density calibration or a temperature calibration, you cannot return to the previous calibration factors unless you have manually recorded them.

Micro Motion recommends obtaining the Smart Meter Verification transmitter option and performing Smart Meter Verification on a regular basis.

3.3 Performing a characterization

Characterizing a flowmeter involves entering parameters that are printed on the sensor tag.

3.3.1 Characterization parameters

The characterization parameters that must be entered depend on the sensor type: “T-Series” or “Other,” as listed in Table 3-1. The “Other” category includes all Micro Motion sensors except T-Series.

The characterization parameters are provided on the sensor tag. The format of the sensor tag varies depending on your sensor's date of purchase. See Figures 3-1 and 3-2 for illustrations of newer and older sensor tags.

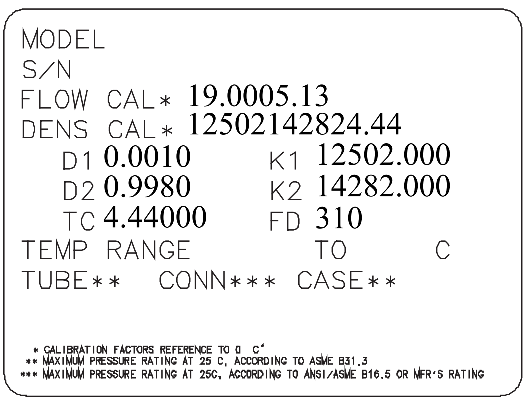
Table 3-1 Sensor calibration parameters

Characterization data	Fieldbus parameter	Sensor type: T-Series	Sensor type: Other
K1	K1	⊠	⊠[1]
K2	K2	⊠	⊠[1]
FD	FD	⊠	⊠[1]
D1	D1	⊠	⊠[1]
D2	D2	⊠	⊠[1]
Temp coeff (DT)[2]	Temperature Coefficient	⊠	⊠[1]
Flow cal	Flow Calibration Factor		⊠[3]
FCF	Flow Calibration Factor	⊠	
FT	Temperature Coefficient for Flow	⊠	
FTG	T-Series Flow TG Coeff	⊠	
FFQ	T-Series Flow FQ Coeff	⊠	
DTG	T-Series Density TG Coeff	⊠	
DFQ1	T-Series Density FQ Coeff 1	⊠	
DFQ2	T-Series Density FQ Coeff 2	⊠	

(1) See the section entitled "Density calibration factors."
(2) On some sensor tags, shown as TC.
(3) See the section entitled "Flow calibration values."

Figure 3-1 Sample calibration tags – All sensors except T-Series

Newer tag



Older tag

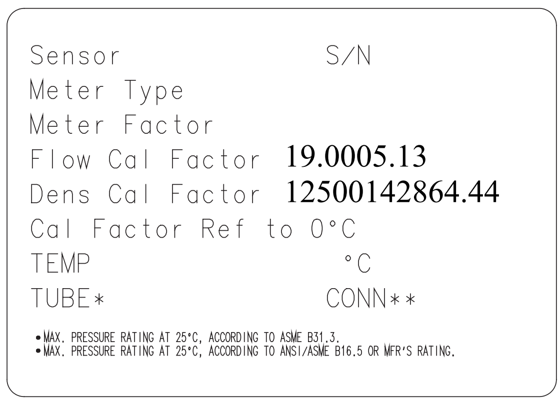
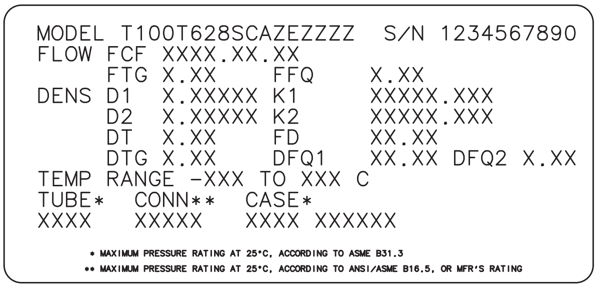
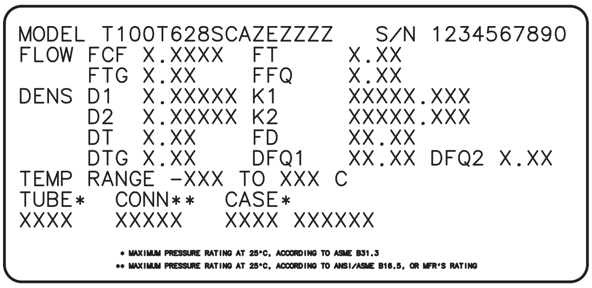


Figure 3-2 Sample calibration tags – T-Series sensors

Newer tag



Older tag



Density calibration factors

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.
- 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 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 3-1, this value is shown as 12500.
- For K2, enter the second 5 digits of the density calibration factor. In the sample tag in Figure 3-1, this value is shown as 14286.

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

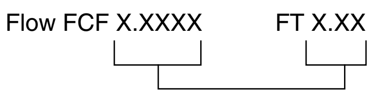
If your sensor tag does not show a DT or TC value, enter the last 3 digits of the density calibration factor. In the sample tag in Figure 3-1, this value is shown as 4.44.

Flow calibration values

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. In ProLink II, this value is called the Flowcal parameter; in the Communicator, it is called the FCF for T-Series sensors, and Flowcal for other sensors.

To obtain the required value:

- For older T-Series sensors, concatenate the FCF value and the FT value from the sensor tag, as shown below.



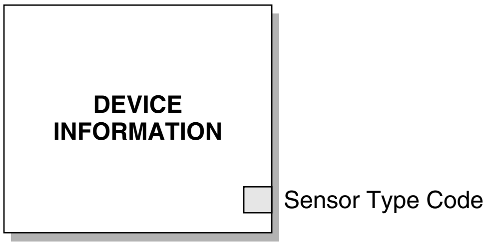
- For newer T-Series sensors, the 10-character string is represented on the sensor tag as the FCF value. The value should be entered exactly as shown, including the decimal points. No concatenation is required.
- For all other sensors, the 10-character string is represented on the sensor tag as the Flow Cal value. The value should be entered exactly as shown, including the decimal points. No concatenation is required.

3.3.2 How to characterize

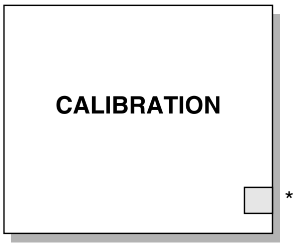
To characterize the flowmeter, enter data from the sensor's calibration tag into the transmitter memory. You can characterize the transmitter with a fieldbus host (Figure 3-3) or ProLink II software (Figure 3-4).

Note: You must configure the sensor type before you enter the characterization parameters.

Figure 3-3 Characterization – Fieldbus host

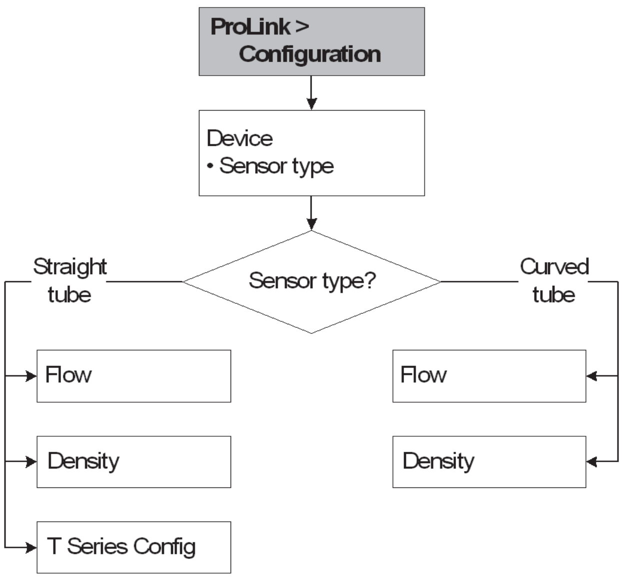


Sensor Type Code – Set to Curved Tube or Straight Tube to match sensor type.



* – Set each of the fieldbus parameters shown in Table 3-1 to the value of the associated sensor data printed on the sensor's calibration tag.

Figure 3-4 Characterization – ProLink II



3.4 Performing Smart Meter Verification

Note: To use Smart Meter Verification, the transmitter must be paired with an enhanced core processor, and the Smart Meter Verification option must be purchased for the transmitter.

3.4.1 Preparing for the Smart Meter Verification test

The Smart Meter Verification procedure can be performed on any process fluid. It is not necessary to match factory conditions.

During the test, process conditions must be stable. To maximize stability:

- Maintain a constant temperature and pressure.
- Avoid changes to fluid composition (e.g., two-phase flow, settling, etc.).
- Maintain a constant flow. For higher test certainty, stop flow.

If stability varies outside test limits, the Smart Meter Verification procedure will be aborted. Verify the stability of the process and retry the test.

Transmitter configuration

Smart Meter Verification is not affected by any parameters configured for flow, density, or temperature. It is not necessary to change the transmitter configuration.

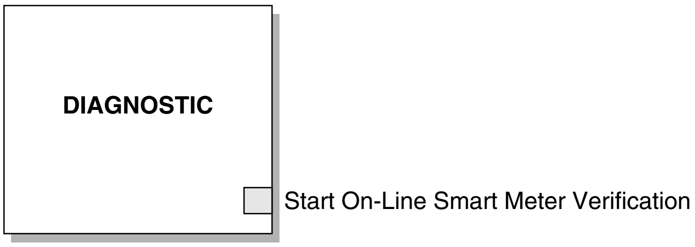
Control loops and process measurement

If the transmitter outputs will be set to Last Measured Value or Fault during the test, the outputs will be fixed for two minutes. Disable all control loops for the duration of the test, and ensure that any data reported during this period is handled appropriately.

3.4.2 Running the Smart Meter Verification test

To run a Smart Meter Verification test, refer to the procedures shown in Figures 3-5, 3-6, 3-7, and 3-8.

Figure 3-5 Smart Meter Verification – Fieldbus host



Start On-Line Smart Meter Verification – Method parameter that initiates the procedure below.

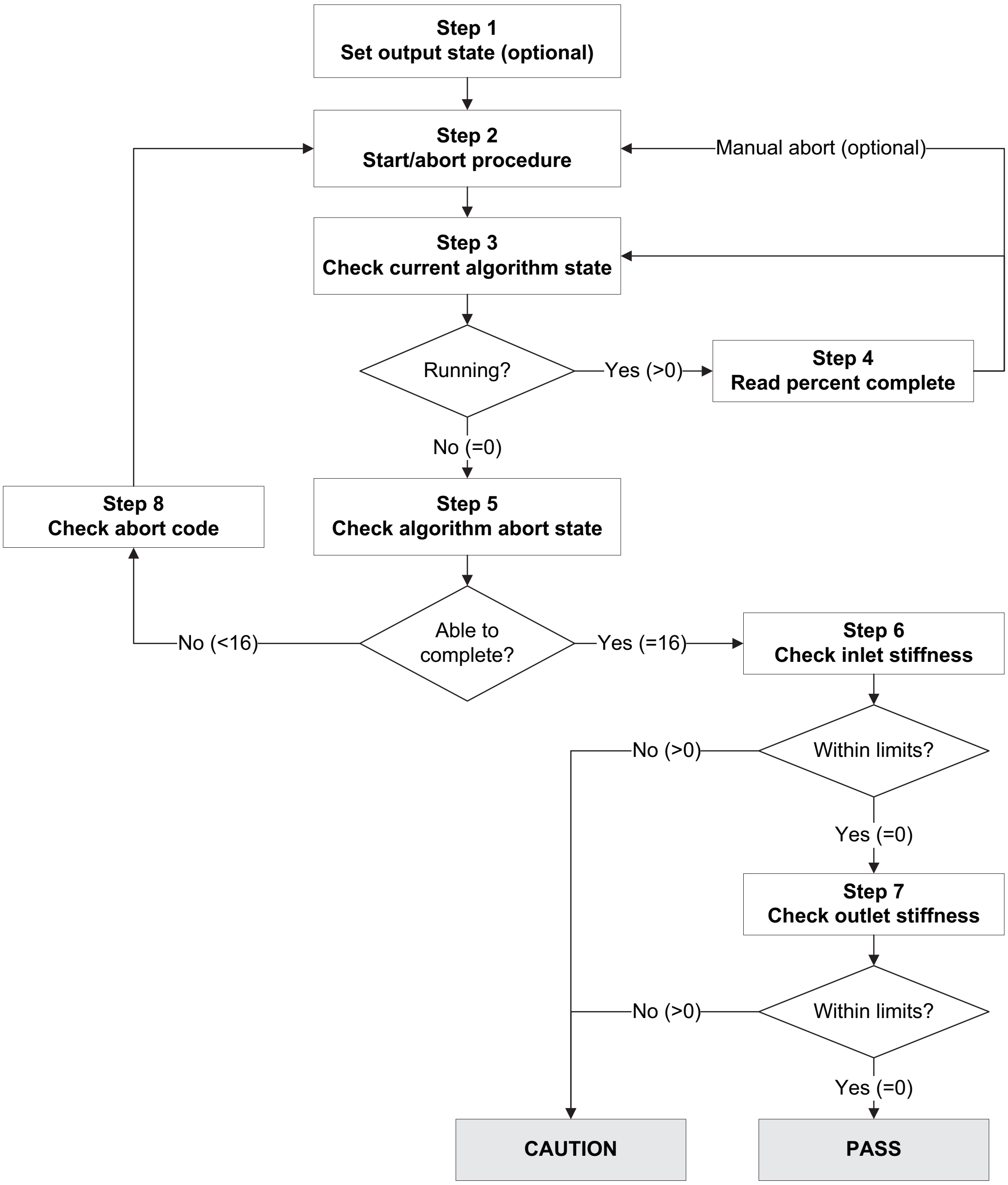


Table 3-2 Fieldbus host interface for Smart Meter Verification

Step number	Step description	Parameters
1	Set output state	Block: Diagnostic Index: 55 Value: • 0: Last measured value (default) • 1: Fault
2	Start/abort procedure	Block: Diagnostic Index: 54 (Start/Stop Meter Verification) • 0: Abort • 1: Start • 6: Start in Continue Measurement mode(1)
3	Check current algorithm state	Block: Diagnostic Index: 57
4	Read percent complete	Block: Diagnostic Index: 60 (Progress)
5	Check algorithm abort state	Block: Diagnostic Index: 59
6	Check inlet stiffness	Block: Diagnostic Index: 61 • 0: Within uncertainty limit • 1: Outside uncertainty limit
7	Check outlet stiffness	Block: Diagnostic Index: 62 • 0: Within uncertainty limit • 1: Outside uncertainty limit
8	Read abort code	Block: Diagnostic Index: 58 Codes: See Table 3-3

(1) Setting Index 85 (Start On-Line Smart Meter Verification) to 1 is equivalent to setting Index 54 to 6.

Figure 3-6 **Smart Meter Verification – ProLink II**

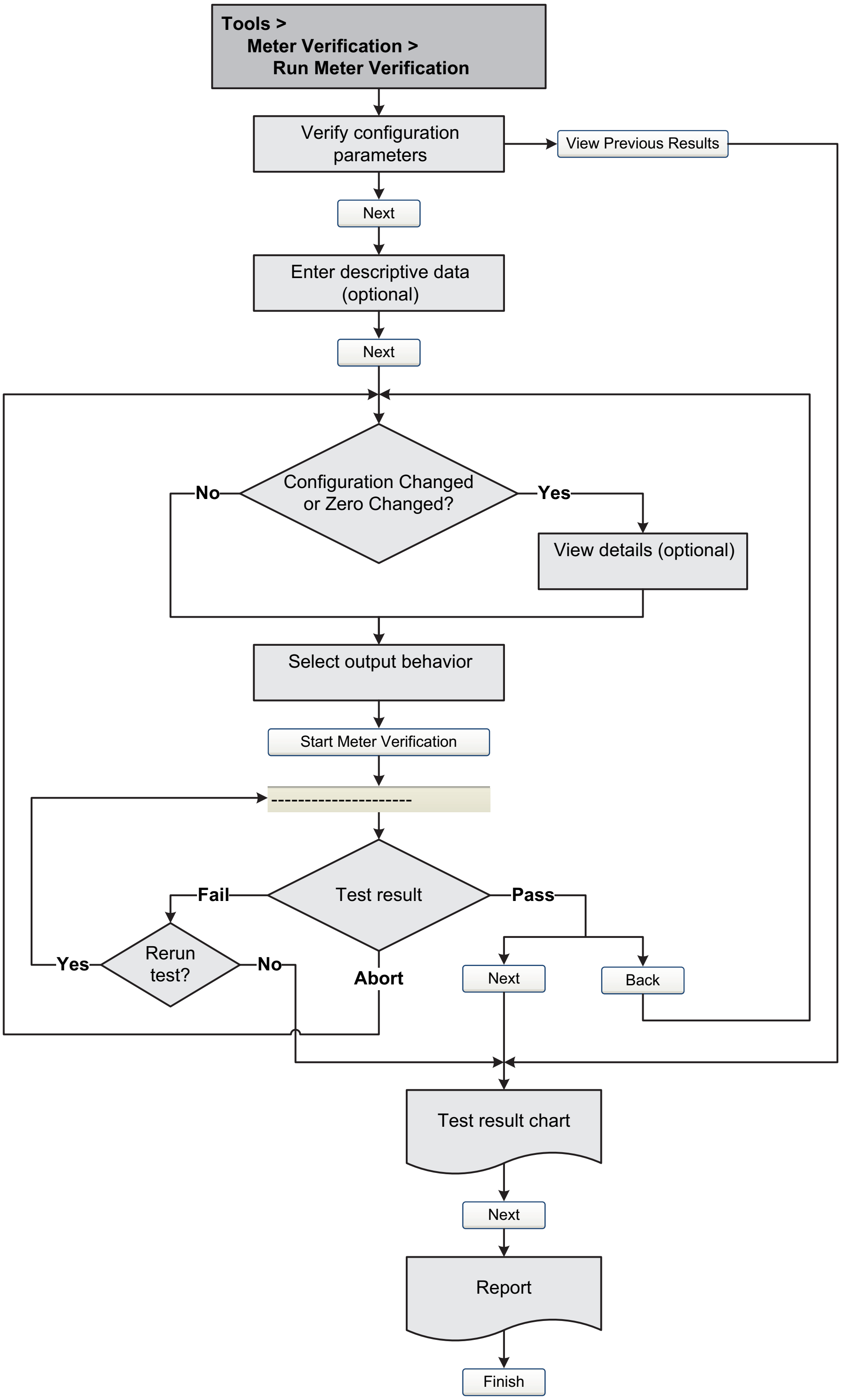


Figure 3-7 **Smart Meter Verification – Display**

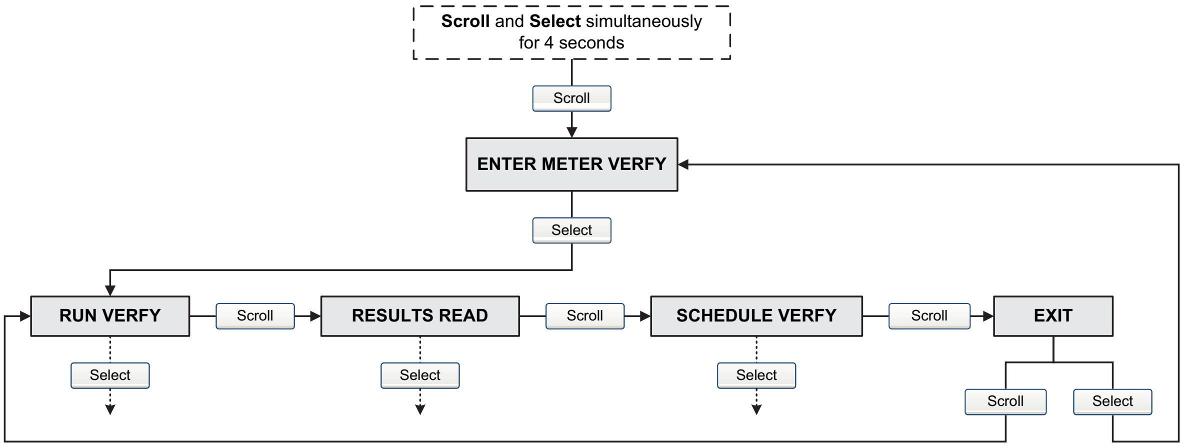
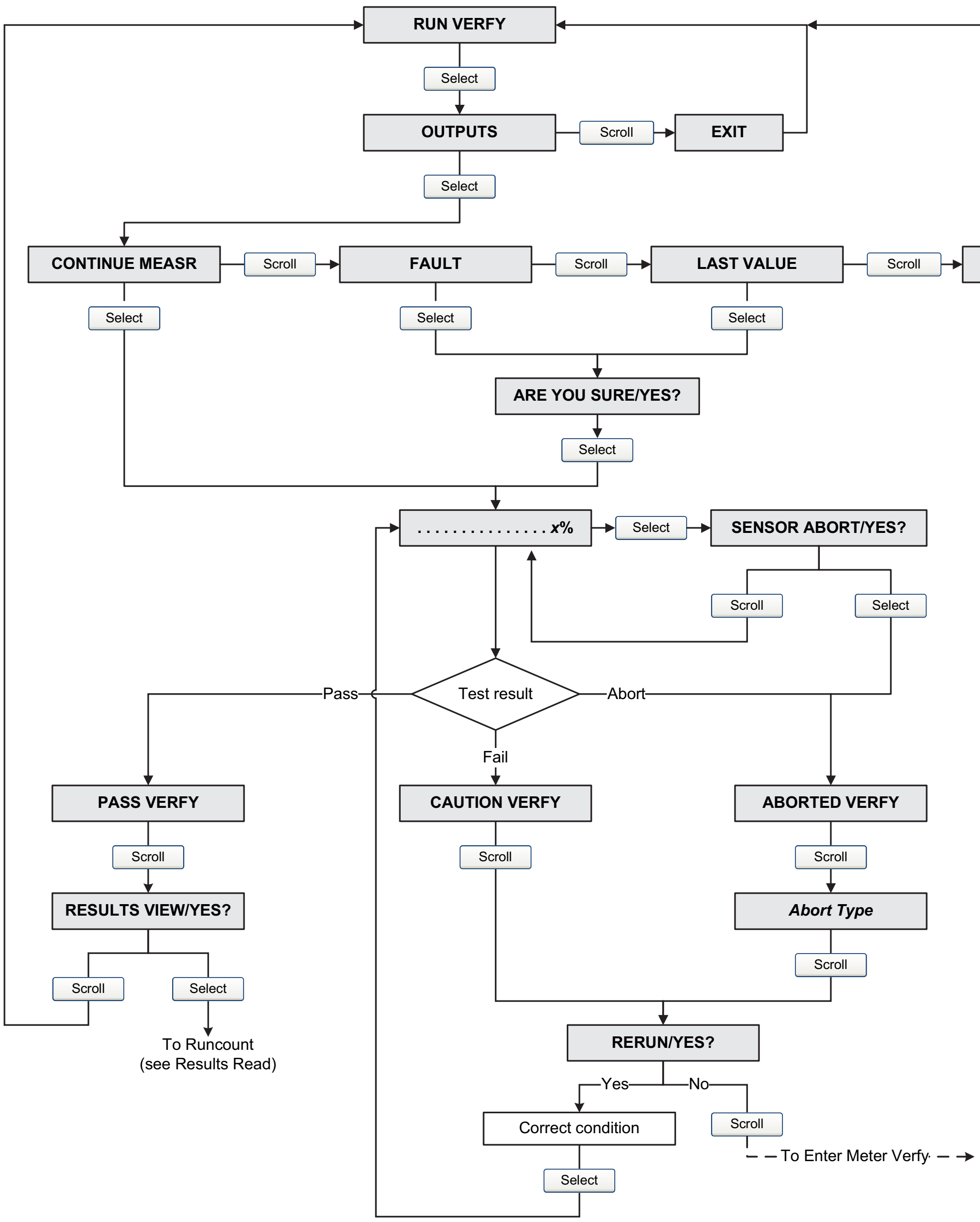


Figure 3-8 Smart Meter Verification – Display



3.4.3 Reading and interpreting Smart Meter Verification test results

Pass/Fail/Abort

When the Smart Meter Verification test is completed, the result will be reported as Pass, Fail/Caution (depending on the tool you are using), or Abort:

- *Pass* – The test result is within the specification uncertainty limit. In other words, the stiffness of the left and right pickoffs match the factory values plus or minus the specification uncertainty limit. If transmitter zero and configuration match factory values, the sensor will meet factory specifications for flow and density measurement. It is expected that meters will pass Smart Meter Verification every time the test is run.
- *Fail/Caution* – The test result is not within the specification uncertainty limit. Micro Motion recommends that you immediately repeat the Smart Meter Verification test. If you previously set outputs to Continue Measurement, change the setting to Last Measured Value or Fault.
  - If the meter passes the second test, the first Fail/Caution result can be ignored.
  - If the meter fails the second test, the flow tubes may be damaged. Use your process knowledge to determine the possibilities for damage and the appropriate actions for each. These actions might include removing the meter from service and physically inspecting the tubes. At minimum, you should perform a flow validation and a density calibration.
- *Abort* – A problem occurred with the Smart Meter Verification test (e.g., process instability). Abort codes are listed in Table 3-3, and suggested actions are provided for each code.

Table 3-3 Smart Meter Verification abort codes

Abort code	Description	Suggested action
1	User-initiated abort	None required. Wait for 15 seconds before starting another test.
3	Frequency drift	Ensure that temperature, flow, and density are stable, and rerun the test.
5	High drive gain	Ensure that flow is stable, minimize entrained gas, and rerun the test.
8	Unstable flow	Review the suggestions for stable flow in Section 3.4.1 and rerun the test.
13	No factory reference data for Smart Meter Verification test performed on air	Contact Micro Motion customer service and provide the abort code.
14	No factory reference data for Smart Meter Verification test performed on water	Contact Micro Motion customer service and provide the abort code.
15	No configuration data for Smart Meter Verification	Contact Micro Motion customer service and provide the abort code.
Other	General abort	Repeat the test. If the test aborts again, contact Micro Motion customer service and provide the abort code.

Detailed test data with ProLink II

For each test, the following data is stored on the transmitter:

- Powered-on seconds at the time of the test
- Test result
- Stiffness of the left and right pickoffs, shown as percentage variation from the factory value. If the test aborted, 0 is stored for these values.
- Abort code, if applicable

ProLink II stores additional descriptive information for each test in a database on the local PC, including:

- Timestamp from the PC clock
- Current flowmeter identification data
- Current flow and density configuration parameters
- Current zero values
- Current process values for mass flow rate, volume flow rate, density, temperature, and external pressure
- (Optional) User-entered customer and test descriptions

If you run a Smart Meter Verification test from ProLink II, ProLink II first checks for new test results on the transmitter and synchronizes the local database if required. During this step, ProLink II displays the following message:

Synchronizing x out of y
Please wait

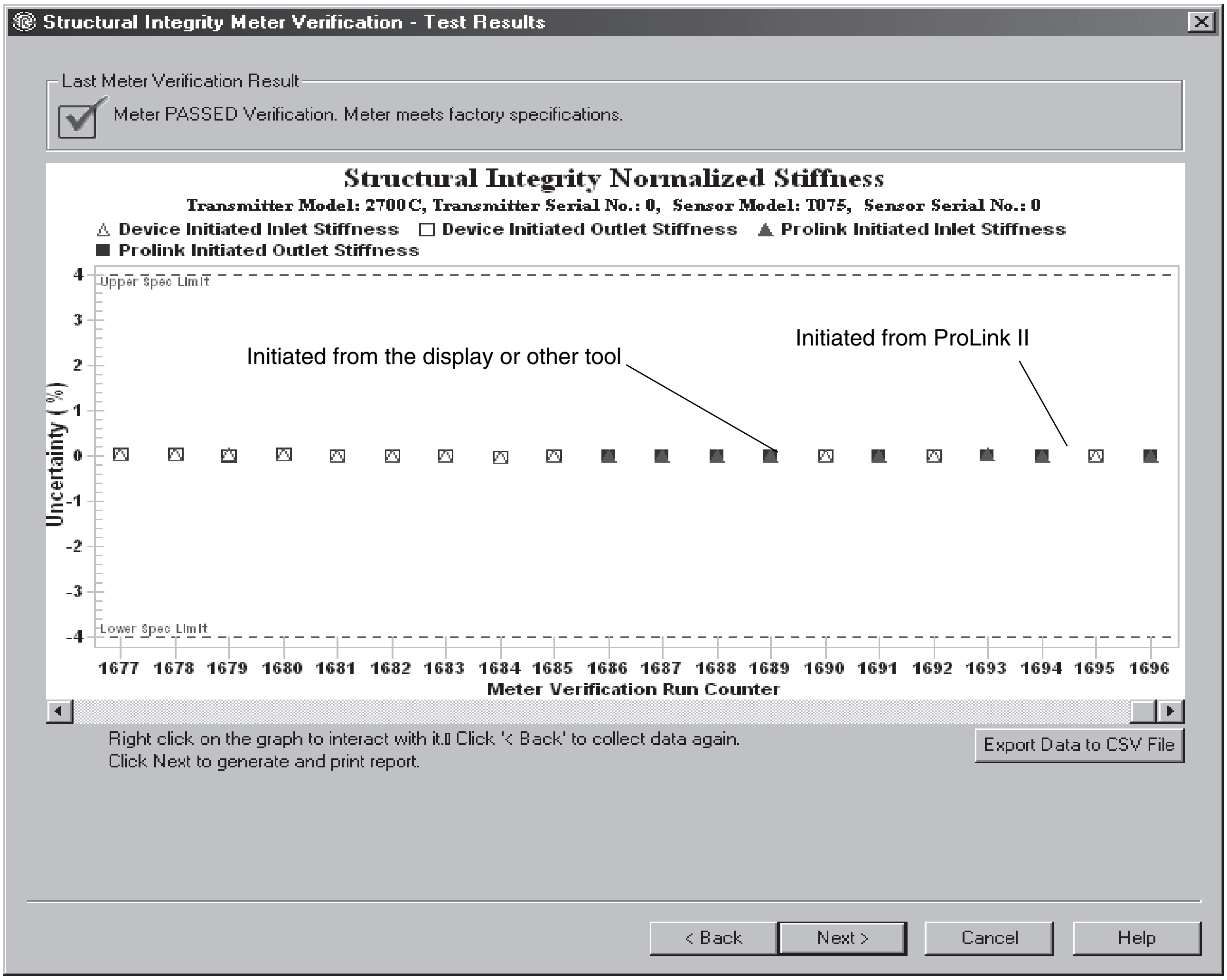
Note: If you request an action while synchronization is in process, ProLink II displays a message asking whether or not you want to complete synchronization. If you choose No, the ProLink II database may not include the latest test results from the transmitter.

Test results are available at the end of each test, in the following forms:

- A test result chart (see Figure 3-9).
- A test report that includes the descriptive information for the current test, the test result chart, and background information about Smart Meter Verification. You can export this report to an HTML file or print it to the default printer.

Note: To view the chart and the report for previous tests without running a test, click View Previous Test Results and Print Report from the first Smart Meter Verification panel. See Figure 3-9. Test reports are available only for tests initiated from ProLink II.

Figure 3-9 Test result chart



The test result chart shows the results for all tests in the ProLink II database, plotted against the specification uncertainty limit. The inlet stiffness and the outlet stiffness are plotted separately. This helps to distinguish between local and uniform changes to the sensor tubes.

This chart supports trend analysis, which can be helpful in detecting meter problems before they become severe.

Note the following:

- The test result chart may not show all test results, and test counters may not be continuous. ProLink II stores information about all tests initiated from ProLink II and all tests available on the transmitter when the test database is synchronized. However, the transmitter stores only the twenty most recent test results. To ensure a complete result set, always use ProLink II to initiate the tests, or synchronize the ProLink II database before overwriting occurs.
- The chart uses different symbols to differentiate between tests initiated from ProLink II and tests initiated using a different tool. A test report is available only for tests that were initiated from ProLink II.
- You can double-click the chart to manipulate the presentation in a variety of ways (change titles, change fonts, colors, borders and gridlines, etc.), and to export the data to additional formats (including “to printer”).
- You can export this chart to a CSV file for use in external applications.

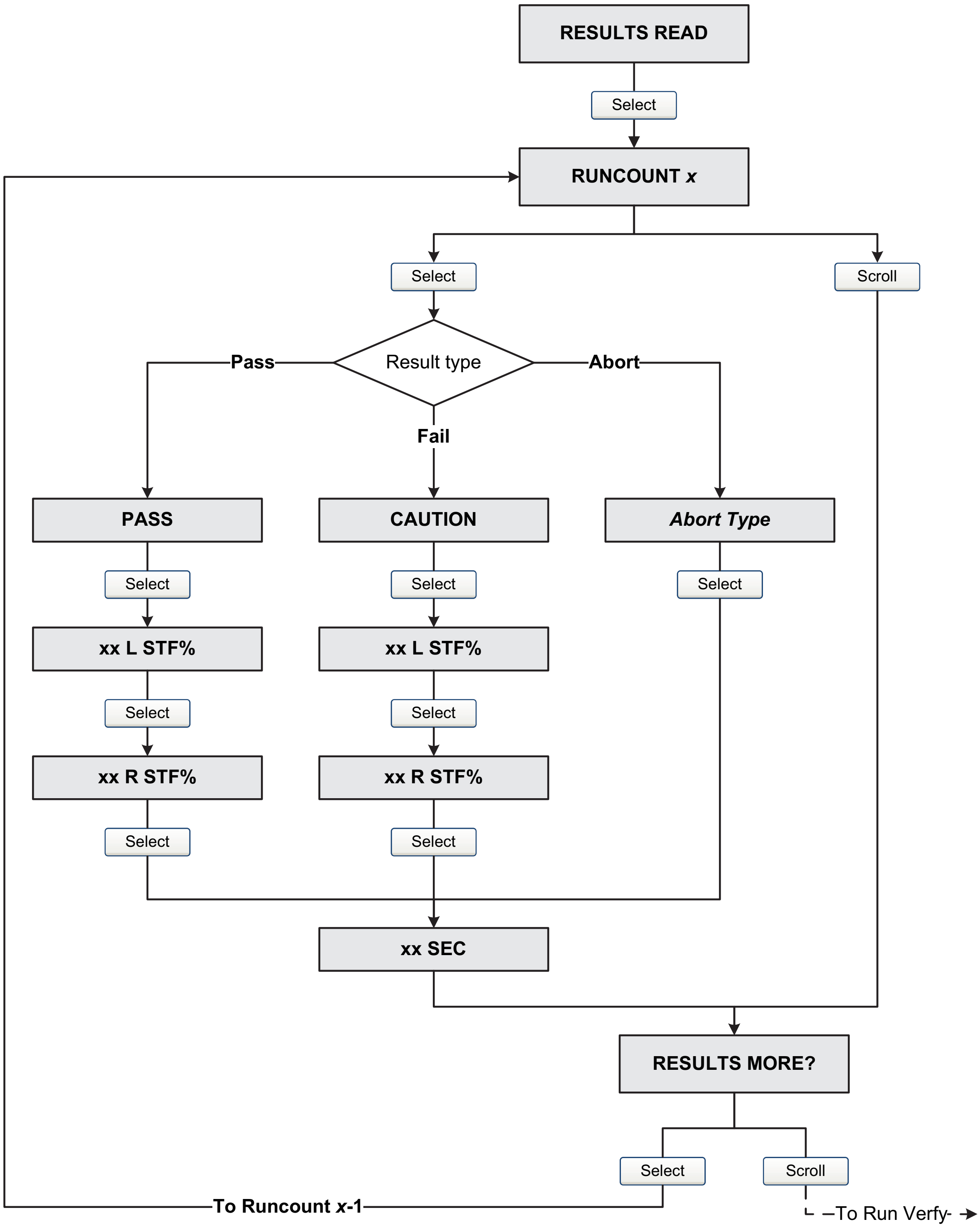
Detailed test data with the display

For each Smart Meter Verification test, the following data is stored on the transmitter:

- Powered-on seconds at the time of the test
- Test result
- Stiffness of the left and right pickoffs, shown as percentage variation from the factory value. If the test aborted, 0 is stored for these values.
- Abort code, if applicable

To view this data, see Figures 3-6 and 3-10.

Figure 3-10 **Smart Meter Verification test data – Display**



3.4.4 Setting up automatic or remote execution of the Smart Meter Verification test

There are two ways to execute a Smart Meter Verification test automatically:

- Set up a one-time automatic execution
- Set up a recurring execution

To set up a one-time automatic execution, set up a recurring execution, view the number of hours until the next scheduled test, or delete a schedule:

- With ProLink II, choose **Tools > Meter Verification > Schedule Meter Verification**.
- With the display, see Figures 3-6 and 3-11.
- With a fieldbus host, Smart Meter Verification scheduling resides in the Diagnostic transducer block. See Figure 3-12.

Note the following:

- If you are setting up a one-time automatic execution, specify the start time as a number of hours from the present time. For example, if the present time is 2:00 and you specify 3.5 hours, the test will be initiated at 5:30.
- If you are setting up a recurring execution, specify the number of hours to elapse between executions. The first test will be initiated when the specified number of hours has elapsed, and testing will be repeated at the same interval until the schedule is deleted. For example, if the present time is 2:00 and you specify 2 hours, the first test will be initiated at 4:00, the next at 6:00, and so on.
- If you delete the schedule, both the one-time execution and the recurring execution settings are deleted.

Figure 3-11 **Smart Meter Verification scheduler – Display**

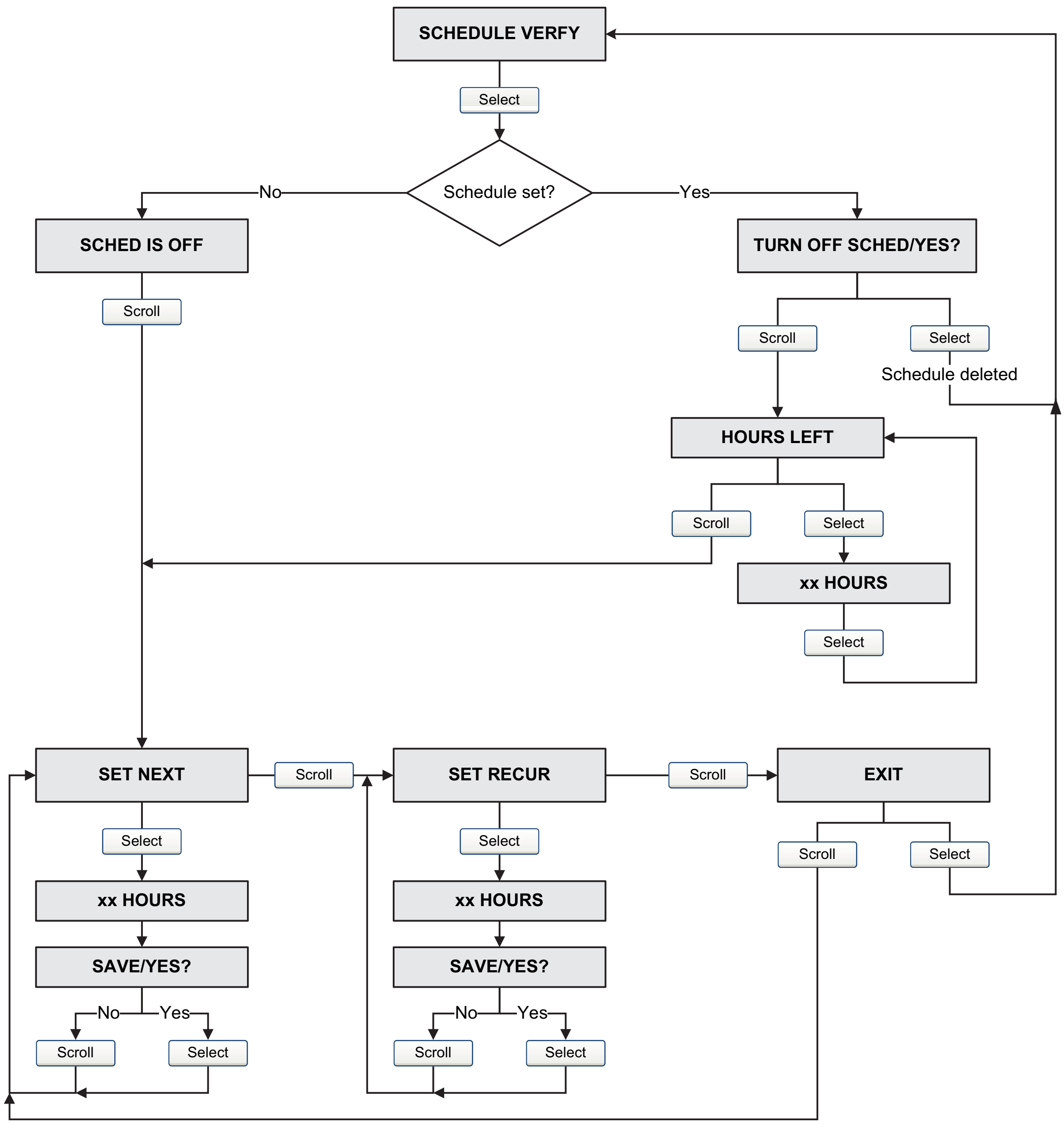
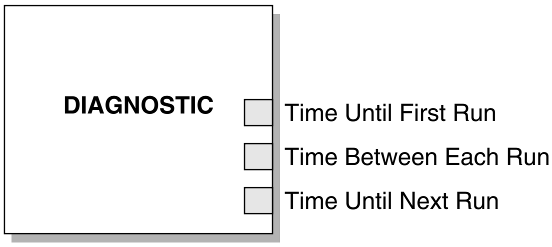


Figure 3-12 Smart Meter Verification scheduler – Fieldbus host



Time Until First Run	–	Number of hours to wait before starting Smart Meter Verification
Time Between Each Run	–	Number of hours to wait between each Smart Meter Verification test, after the first test is completed
Time Until Next Run	–	Number of hours until the next Smart Meter Verification test begins

3.5 Performing meter validation

To perform meter validation, measure a sample of the process fluid and compare the measurement with the flowmeter's reported value.

Use the following formula to calculate a meter factor:

$$\text{NewMeterFactor} = \text{ConfiguredMeterFactor} \times \frac{\text{ExternalStandard}}{\text{ActualTransmitterMeasurement}}$$

Valid values for meter factors range from **0.8** to **1.2**. If the calculated meter factor exceeds these limits, contact Micro Motion customer service.

Example

The flowmeter is installed and proved for the first time. The flowmeter mass measurement is 250.27 lb; the reference device measurement is 250 lb. A mass flow meter factor is determined as follows:

$$\text{MassFlowMeterFactor} = 1 \times \frac{250}{250.27} = 0.9989$$

The first mass flow meter factor is 0.9989.

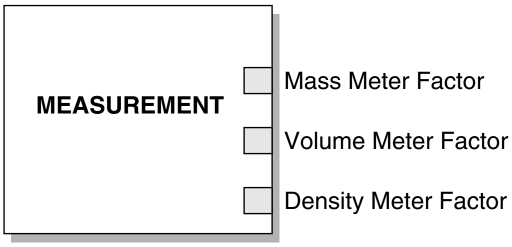
One year later, the flowmeter is proved again. The flowmeter mass measurement is 250.07 lb; the reference device measurement is 250.25 lb. A new mass flow meter factor is determined as follows:

$$\text{MassFlowMeterFactor} = 0.9989 \times \frac{250.25}{250.07} = 0.9996$$

The new mass flow meter factor is 0.9996.

You can adjust meter factors with a fieldbus host (Figure 3-13), ProLink II (Figure 3-14), or the display (Figure 3-15).

Figure 3-13 Meter factors – Fieldbus host



Mass Meter Factor	–	Set to the meter factor for mass flow.
Volume Meter Factor	–	Set to the meter factor for volume flow.
Density Meter Factor	–	Set to the meter factor for density.

Figure 3-14 Meter factors – ProLink II

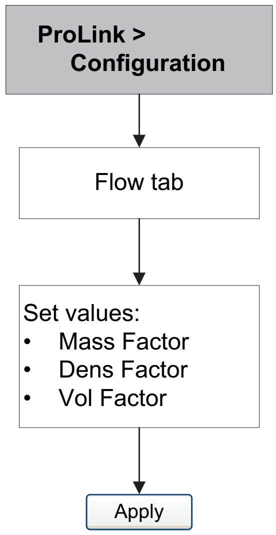
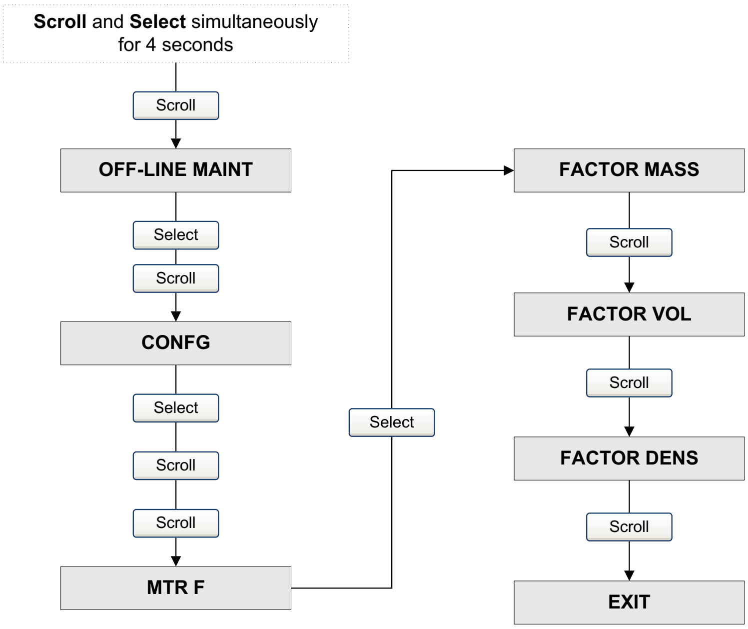


Figure 3-15 **Meter factors – Display**



3.6 Performing a density calibration

Density calibration includes the following calibration points:

- All sensors:
  - D1 calibration (low-density)
  - D2 calibration (high-density)
- T-Series sensors only:
  - D3 calibration (optional)
  - D4 calibration (optional)

For T-Series sensors, the optional D3 and D4 calibrations could improve the accuracy of the density measurement. If you choose to perform the D3 and D4 calibrations:

- Do not perform the D1 or D2 calibrations.
- 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 that you choose must be performed without interruption, in the order listed here.

Note: Before performing the calibration, record your current calibration parameters. If you are using ProLink II, you can do this by saving the current configuration to a file on the PC. If the calibration fails, restore the known values.

3.6.1 Preparing for density calibration

Before beginning density calibration, review the requirements in this section.

Sensor requirements

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.

Density calibration fluids

D1 and D2 density calibration require a D1 (low density) fluid and a D2 (high density) fluid. You may use air and water. If you are calibrating a T-Series sensor, the D1 fluid must be air and the D2 fluid must be water.

> ⚠ **CAUTION**
>
> **For T-Series sensors, the D1 calibration must be performed on air and the D2 calibration must be performed on water.**

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

3.6.2 Density calibration procedures

To perform a D1 and D2 density calibration:

- With a fieldbus host, see Figure 3-16.
- With ProLink II, see Figure 3-17.

Before You Begin
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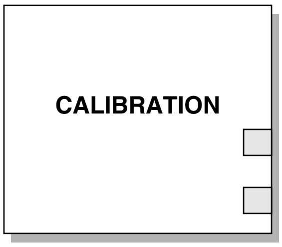
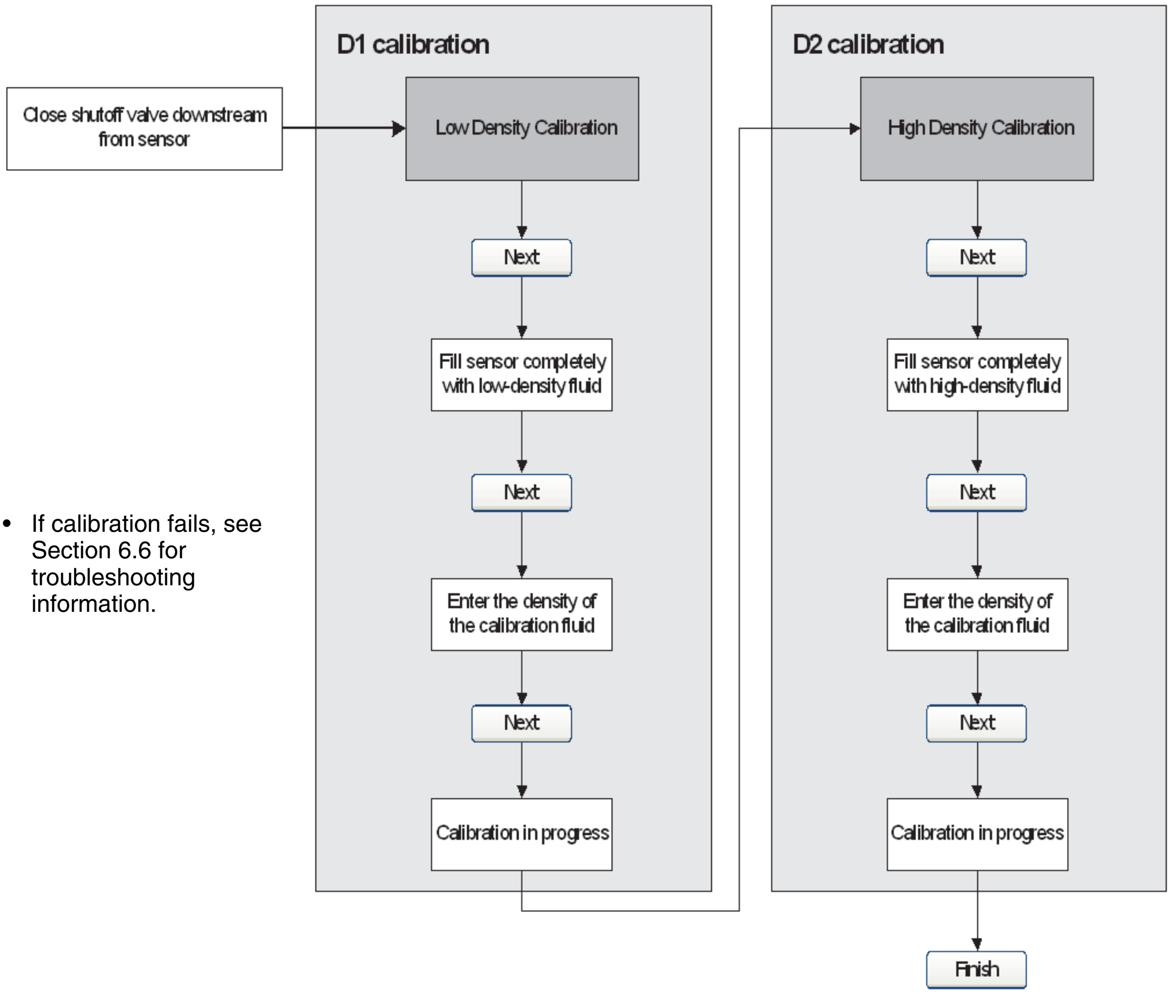
Figure 3-16 D1 and D2 calibration – Fieldbus host



Low Density Calibration – Method parameter that initiates the D1 procedure below.
High Density Calibration Method parameter that initiates the D2 procedure below.



- If calibration fails, see Section 6.6 for troubleshooting information.

Figure 3-17 **D1 and D2 calibration – ProLink II**

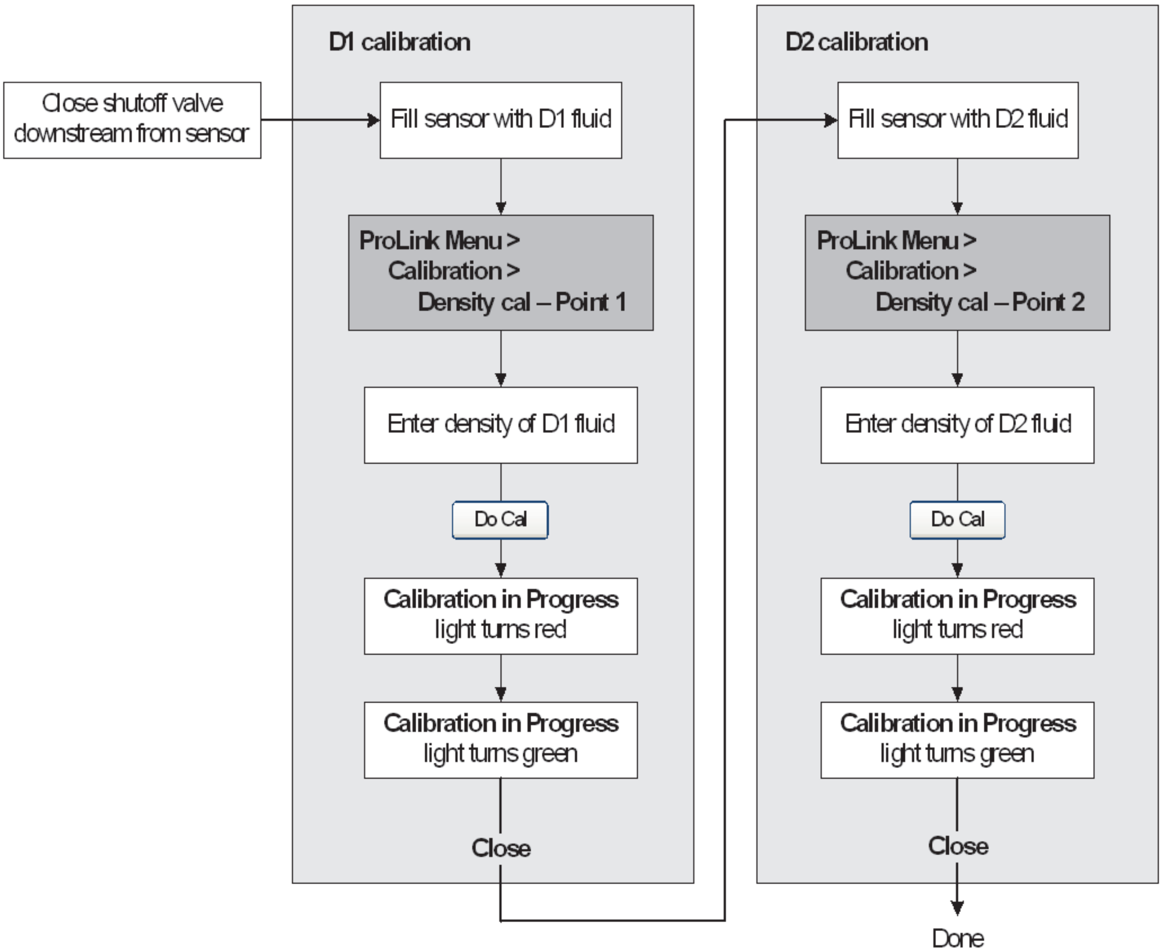
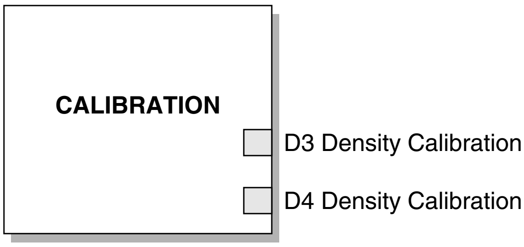
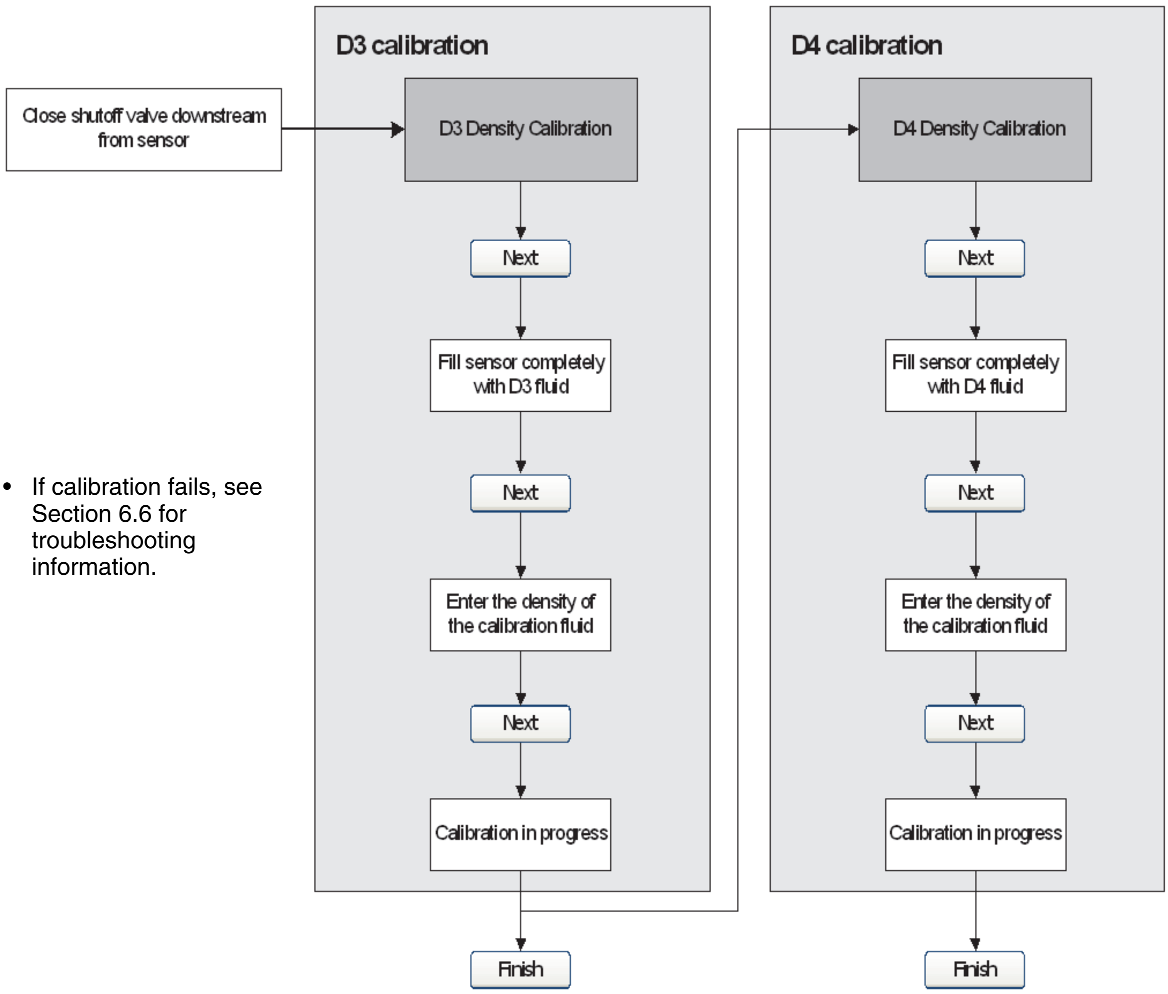


Figure 3-18 D3 (or D3 and D4) calibration (T-Series only) – Fieldbus host

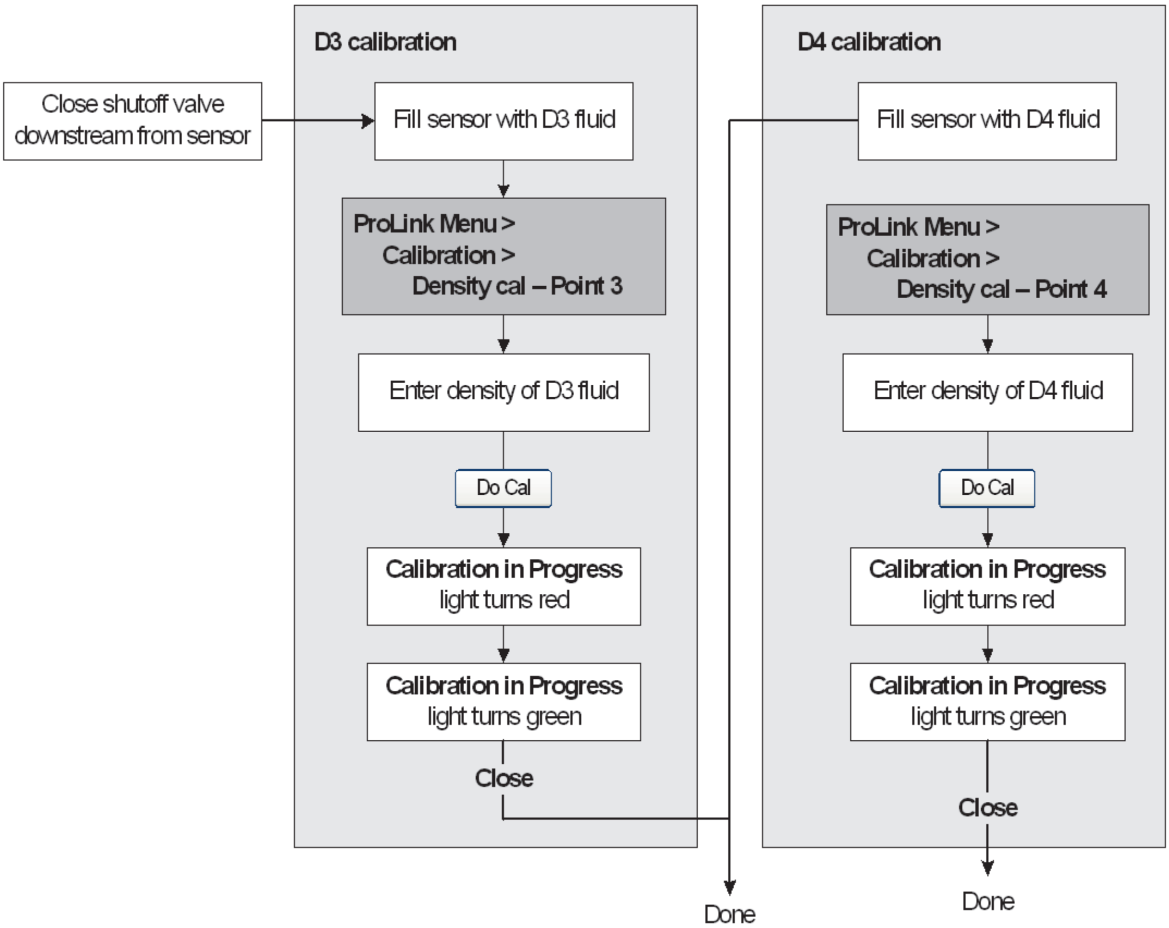


D3 Density Calibration – Method parameter that initiates the D3 procedure below.
D4 Density Calibration Method parameter that initiates the D4 procedure below.



- If calibration fails, see Section 6.6 for troubleshooting information.

Figure 3-19 D3 (or D3 and D4) calibration – ProLink II



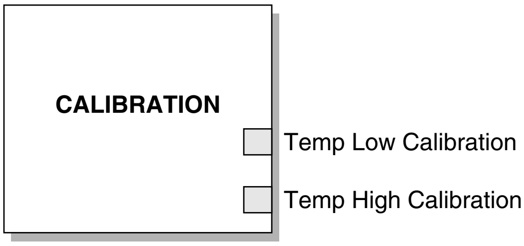
- If calibration fails, see Section 6.6 for troubleshooting information.

3.7 Performing a temperature calibration

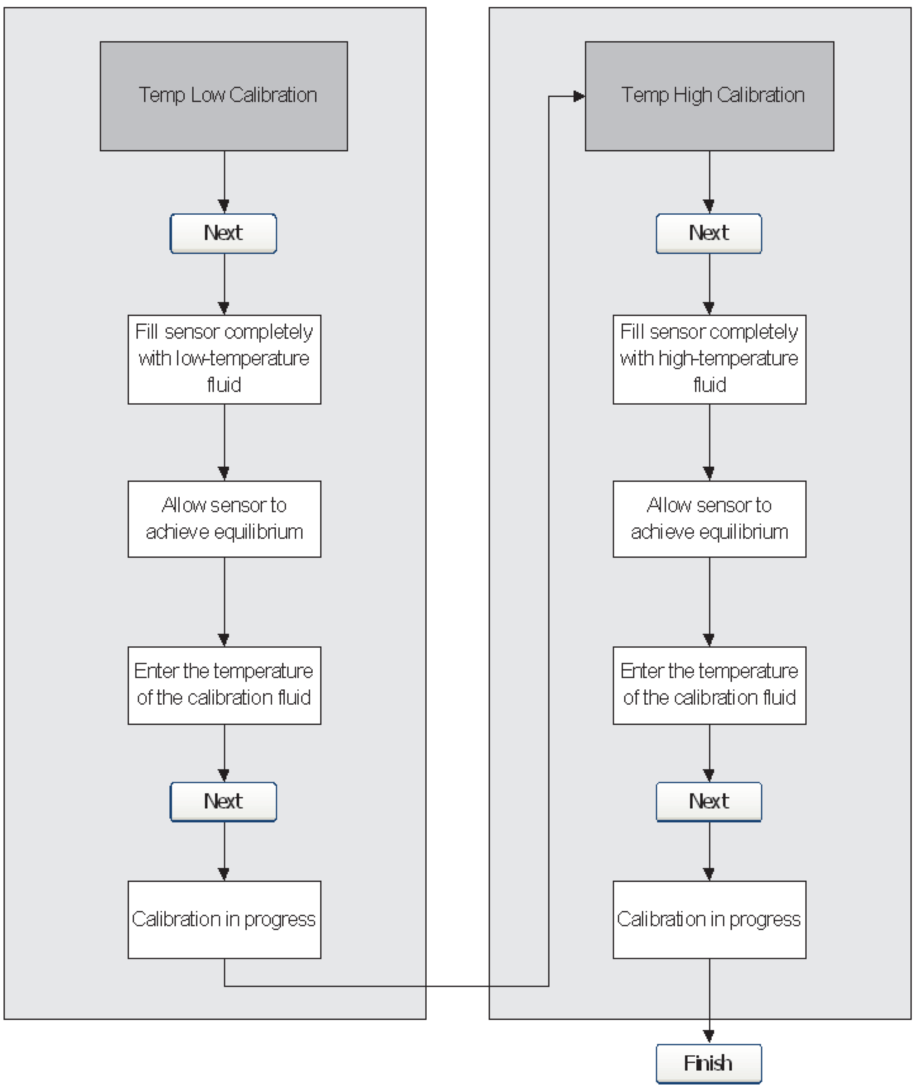
Temperature calibration is a two-point procedure: temperature offset calibration and temperature slope calibration. The entire procedure must be completed without interruption.

You can calibrate for temperature with a fieldbus host or ProLink II.

Figure 3-20 Temperature calibration – Fieldbus host

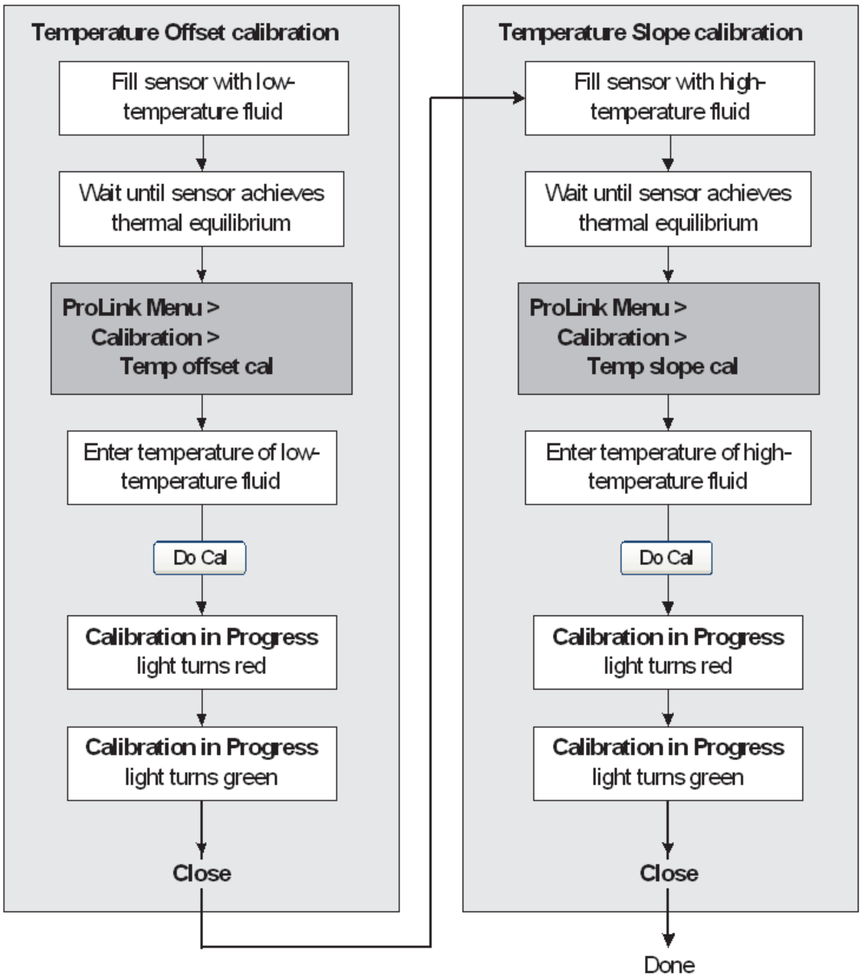


Temp Low Calibration	–	Method parameter that initiates the low-temperature procedure below.
Temp High Calibration		Method parameter that initiates the high-temperature procedure below.



- If calibration fails, see Section 6.6 for troubleshooting information.

Figure 3-21 **Temperature calibration – ProLink II**



- If calibration fails, see Section 6.6 for troubleshooting information.

Chapter 4
Configuration

4.1 Overview

This chapter describes how to change the operating settings of the transmitter.

Note: All procedures provided in this chapter assume that you have established communication with the transmitter and that you are complying with all applicable safety requirements. See Appendices E and F.

4.2 Configuration map

Use the map in Table 4-1 to guide you through a complete or partial configuration of the transmitter.

Table 4-1 Configuration map

	Method			
Topic	**Fieldbus host**	**ProLink II**	**Display**	**Section**
Gas standard volume	✓	✓		4.3
Measurement units	✓	✓	✓	4.4
Special measurement units	✓	✓		4.5
Petroleum measurement application	✓	✓		4.6
Concentration measurement application	✓	✓		4.7
Linearization	✓			4.8
Output scale	✓			4.9
Process alarms	✓			4.10
Alarm severity	✓	✓		4.11
Damping	✓	✓		4.12
Slug flow	✓	✓		4.13
Cutoffs	✓	✓		4.14
Flow direction	✓	✓		4.15
Device settings	✓	✓		4.16
Sensor parameters	✓	✓		4.17
Display functionality	✓	✓	✓	4.18
PlantWeb Alert timeout	✓	✓		4-54
Write-protect mode	✓	✓	✓	4.19
LD Optimization		✓	✓	4.20

4.3 Configuring standard volume flow measurement for gas

Two types of volume flow measurement are available:

- Liquid volume (the default)
- Gas standard volume

Only one type of volume flow measurement can be performed at a time (i.e., if liquid volume flow measurement is enabled, gas standard volume flow measurement is disabled, and vice versa). Different sets of volume flow measurement units are available, depending on which type of volume flow measurement is enabled. If you want to use a gas volume flow unit, additional configuration is required.

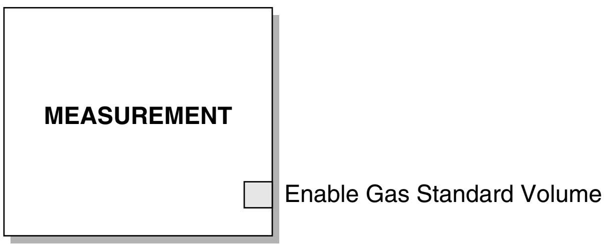
Note: If you will use the petroleum measurement application or the concentration measurement application, liquid volume flow measurement is required.

Gas standard volume flow can be configured with a fieldbus host (Figure 4-1) or ProLink II (Figure 4-2). In either case, you must:

- Enable gas standard volume flow
- Specify the standard density (density at reference conditions) of your gas
- Select the measurement unit to use (see Section 4.4)
- Set the low flow cutoff value (see Section 4.14)

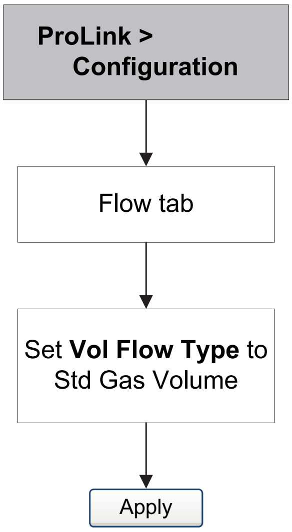
Note: The display will allow you to select a volume measurement unit from the set available for the configured volume flow type, but it will not allow you to configure gas standard volume flow.

Figure 4-1 GSV – Fieldbus host



Enable Gas Standard Volume – Set to *Enable* to set volume flow to use gas standard volume. Set to *Disable* to use liquid volume flow.

Figure 4-2 **GSV – ProLink II**

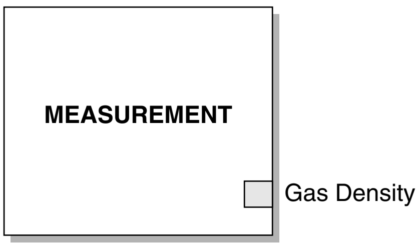


4.3.1 Configuring gas density

You have two choices for entering the standard density of the gas you are going to measure (i.e., the density of the gas at reference conditions):

- If you know the standard density, you can enter that value into the transmitter. For optimal standard volume measurement accuracy, be sure the standard density you enter is correct and fluid composition is stable. You can enter the gas density with a fieldbus host (Figure 4-3) or ProLink II (Figure 4-4).
- If you do not know the standard density of the gas, and you are using ProLink II, you can use the Gas Wizard (Figure 4-5). The Gas Wizard can calculate the standard density of the gas that you are measuring.

Figure 4-3 **Gas density – Fieldbus host**



Gas Density – Set to the standard density of the gas you are going to measure.

Figure 4-4 **Gas density – ProLink II**

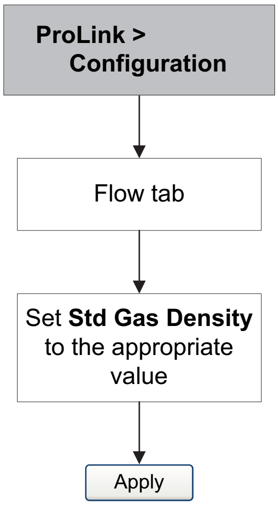
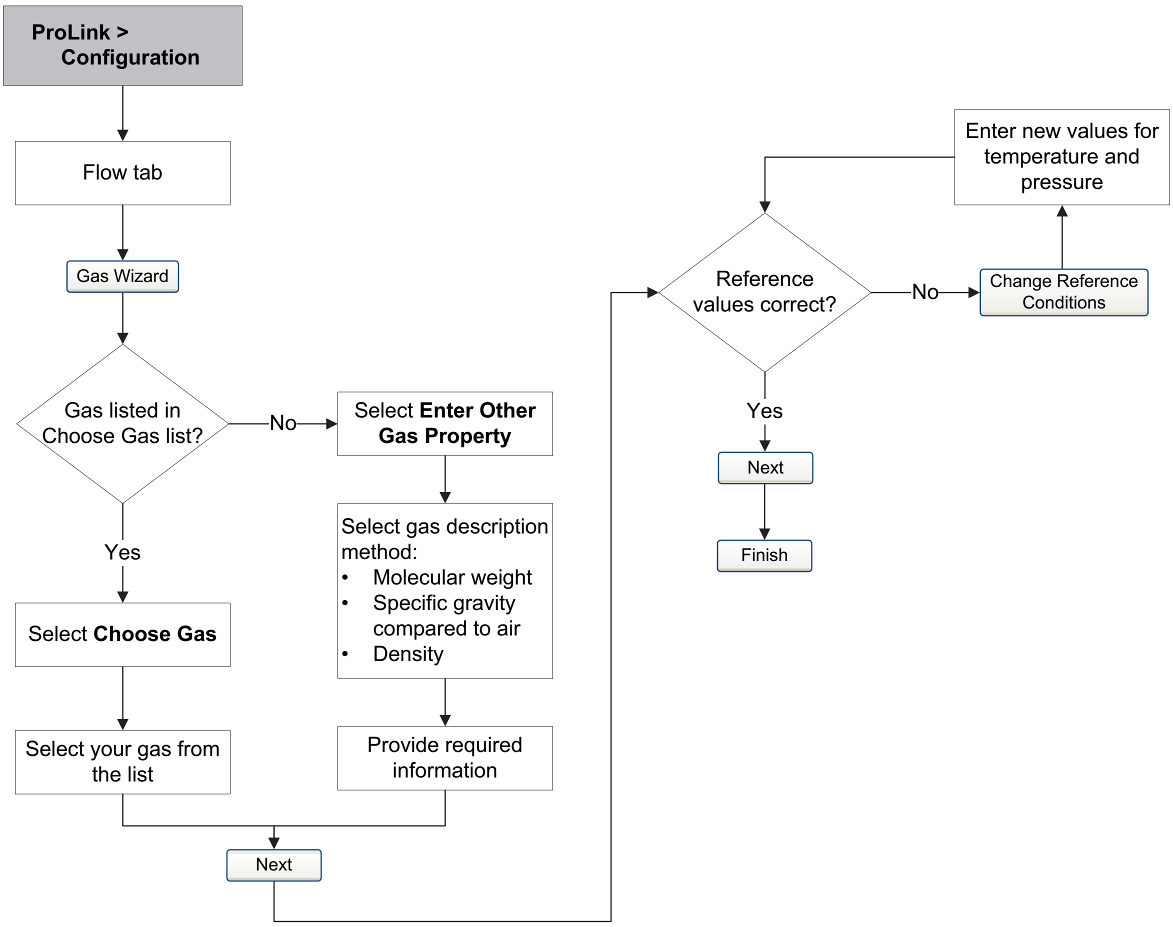


Figure 4-5 **Gas Wizard – ProLink II**



4.4 Changing the measurement units

The transmitter stores measurement units in three different places: the MEASUREMENT transducer block, the AI blocks, and the AO block. If you configure the measurement units in the AI or AO blocks, the MEASUREMENT block will be automatically updated. However, if you configure the units only in the MEASUREMENT block, the AI and AO blocks will *not* be updated. This results in the following behaviors:

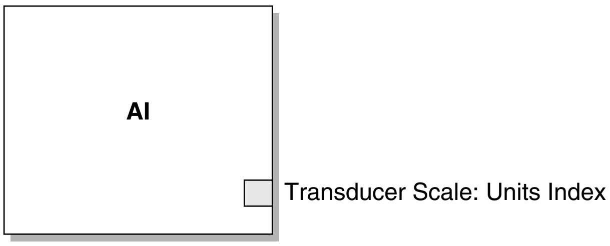
- Because ProLink II and the display store and retrieve the units stored in the MEASUREMENT block, configuring units using ProLink II or the display will *not* update the AI and AO blocks. Affected AI and AO blocks will get a configuration error if units are changed in the MEASUREMENT block but not in the AI or AO block.
- Configuring the units in the MEASUREMENT block with a fieldbus host will produce the same results as if the units had been changed using ProLink II or the display (i.e., the related AI or AO blocks will get a configuration error unless their units are also changed).
- Configuring the units in an AI or AO block using a fieldbus host will cause the units in ProLink II and on the display to be updated correctly.

Measurement units can be changed with a fieldbus host (Figure 4-6), ProLink II (Figure 4-7), and the display (Figure 4-8). Refer to Tables 4-2 through 4-7 for complete lists of the units you can set for each process variable.

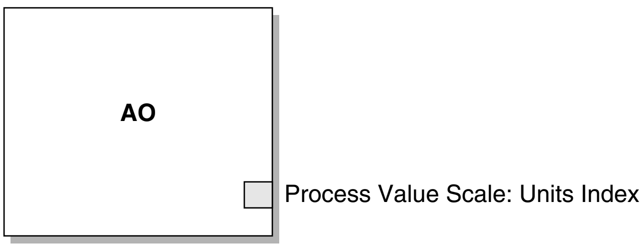
Note: When the transmitter is configured for liquid volume flow, only liquid volume units are available (Table 4-3). When the transmitter is configured for gas volume flow, only gas volume units are available (Table 4-4).

Note: Changing the measurement units for a process variable automatically changes the associated totalizer units as well. For example, setting the mass flow units to g/s will automatically set the mass totalizer unit to grams.

Figure 4-6 Changing measurement units – Fieldbus host

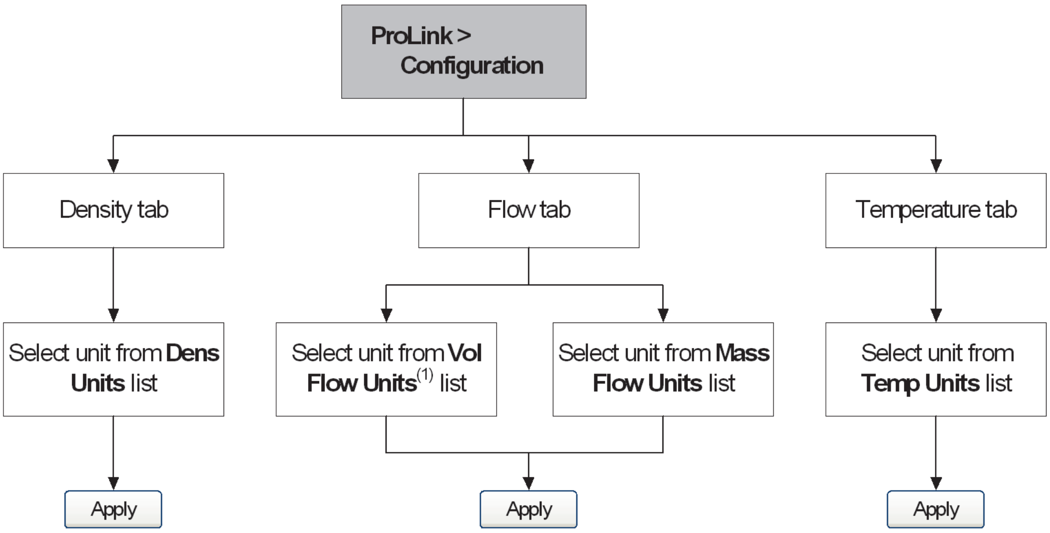


Transducer Scale: Units Index – Set to the desired measurement units.



Process Value Scale: Units Index – Set to the desired measurement units.

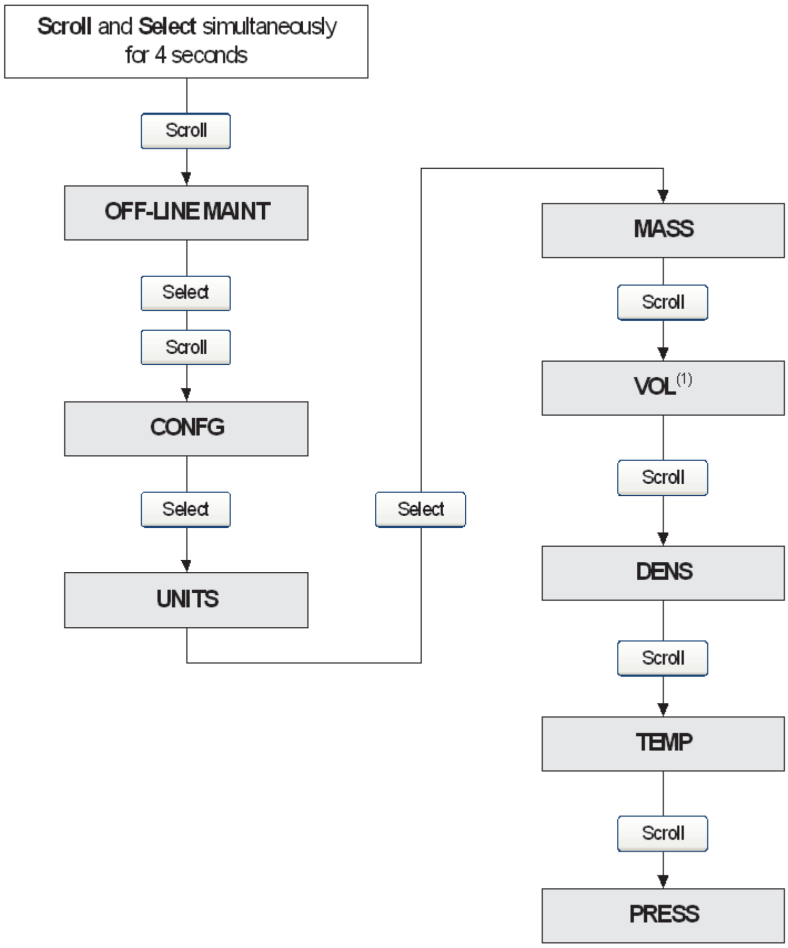
Figure 4-7 Changing measurement units – ProLink II



(1) If volume flow type is configured to gas standard volume, this list will appear as Std gas vol flow units.

Note: You must also change the units in the appropriate AI block. Failure to do so will cause the AI block to get a configuration error.

Figure 4-8 Changing measurement units – Display



(1) If volume flow type is configured to gas standard volume, this list will appear as GSV.

Note: You must also change the units in the appropriate AI block. Failure to do so will cause the AI block to get a configuration error.

Table 4-2 Mass flow measurement units

Mass flow unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
g/s	g/s	G/S	Grams per second
g/min	g/min	G/MIN	Grams per minute
g/h	g/hr	G/H	Grams per hour
kg/s	kg/s	KG/S	Kilograms per second
kg/min	kg/min	KG/MIN	Kilograms per minute
kg/h	kg/hr	KG/H	Kilograms per hour
kg/d	kg/day	KG/D	Kilograms per day
t/min	mTon/min	T/MIN	Metric tons per minute
t/h	mTon/hr	T/H	Metric tons per hour

Table 4-2 Mass flow measurement units (continued)

Mass flow unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
t/d	mTon/day	T/D	Metric tons per day
lb/s	lbs/s	LB/S	Pounds per second
lb/min	lbs/min	LB/MIN	Pounds per minute
lb/h	lbs/hr	LB/H	Pounds per hour
lb/d	lbs/day	LB/D	Pounds per day
STon/min	sTon/min	ST/MIN	Short tons (2000 pounds) per minute
STon/h	sTon/hr	ST/H	Short tons (2000 pounds) per hour
STon/d	sTon/day	ST/D	Short tons (2000 pounds) per day
LTon/h	lTon/hr	LT/H	Long tons (2240 pounds) per hour
LTon/d	lTon/day	LT/D	Long tons (2240 pounds) per day

Table 4-3 Volume flow measurement units – Liquid

Volume flow unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
CFS	ft3/sec	CUFT/S	Cubic feet per second
CFM	ft3/min	CUF/MN	Cubic feet per minute
CFH	ft3/hr	CUFT/H	Cubic feet per hour
ft^3/d	ft3/day	CUFT/D	Cubic feet per day
m^3/s	m3/sec	M3/S	Cubic meters per second
m^3/min	m3/min	M3/MIN	Cubic meters per minute
m^3/h	m3/hr	M3/H	Cubic meters per hour
m^3/d	m3/day	M3/D	Cubic meters per day
gal/s	US gal/sec	USGPS	U.S. gallons per second
GPM	US gal/min	USGPM	U.S. gallons per minute
gal/h	US gal/hr	USGPH	U.S. gallons per hour
gal/d	US gal/d	USGPD	U.S. gallons per day
Mgal/d	mil US gal/day	MILG/D	Million U.S. gallons per day
L/s	l/sec	L/S	Liters per second
L/min	l/min	L/MIN	Liters per minute
L/h	l/hr	L/H	Liters per hour
ML/d	mil l/day	MILL/D	Million liters per day
ImpGal/s	Imp gal/sec	UKGPS	Imperial gallons per second
ImpGal/min	Imp gal/min	UKGPM	Imperial gallons per minute
ImpGal/h	Imp gal/hr	UKGPH	Imperial gallons per hour
ImpGal/d	Imp gal/day	UKGPD	Imperial gallons per day
bbl/s	barrels/sec	BBL/S	Barrels per second(1)
bbl/min	barrels/min	BBL/MN	Barrels per minute(1)
bbl/h	barrels/hr	BBL/H	Barrels per hour(1)

Table 4-3 Volume flow measurement units – Liquid (continued)

Volume flow unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
bbl/d	barrels/day	BBL/D	Barrels per day(1)
Bbl (US Beer)/d	Beer barrels/sec	BBBL/S	Beer barrels per second(2)
Bbl (US Beer)/min	Beer barrels/min	BBBL/MN	Beer barrels per minute(2)
Bbl (US Beer)/h	Beer barrels/hr	BBBL/H	Beer barrels per hour(2)
Bbl (US Beer)/d	Beer barrels/day	BBBL/D	Beer barrels per day(2)

(1) Unit based on oil barrels (42 U.S. gallons).
(2) Unit based on U.S. beer barrels (31 U.S. gallons).

Table 4-4 Volume flow measurement units – Gas

Volume flow unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
Nm^3/s	Nm3/sec	NM3/S	Normal cubic meters per second
Nm^3/min	Nm3/min	NM3/MN	Normal cubic meters per minute
Nm^3/h	Nm3/hr	NM3/H	Normal cubic meters per hour
Nm^3/d	Nm3/day	NM3/D	Normal cubic meters per day
NL/s	NLPS	NLPS	Normal liter per second
NL/min	NLPM	NLPM	Normal liter per minute
NL/h	NLPH	NLPH	Normal liter per hour
NL/d	NLPD	NLPD	Normal liter per day
SCFM	SCFM	SCFM	Standard cubic feet per minute
SCFH	SCFH	SCFH	Standard cubic feet per hour
Sm^3/s	Sm3/S	SM3/S	Standard cubic meters per second
Sm^3/min	Sm3/min	SM3/MN	Standard cubic meters per minute
Sm^3/h	Sm3/hr	SM3/H	Standard cubic meters per hour
Sm^3/d	Sm3/day	SM3/D	Standard cubic meters per day
SL/s	SLPS	SLPS	Standard liter per second
SL/min	SLPM	SLPM	Standard liter per minute
SL/h	SLPH	SLPH	Standard liter per hour
SL/d	SLPD	SLPD	Standard liter per day

Table 4-5 Density measurement units

Density unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
g/cm^3	g/cm3	G/CM3	Grams per cubic centimeter
g/L	g/l	G/L	Grams per liter
g/ml	g/ml	G/ML	Grams per milliliter
kg/L	kg/l	KG/L	Kilograms per liter

Table 4-5 Density measurement units (continued)

Density unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
kg/m^3	kg/m3	KG/M3	Kilograms per cubic meter
lb/gal	lbs/Usgal	LB/GAL	Pounds per U.S. gallon
lb/ft^3	lbs/ft3	LB/CUF	Pounds per cubic foot
lb/in^3	lbs/in3	LB/CUI	Pounds per cubic inch
$STon/yd^3$	sT/yd3	ST/CUY	Short ton per cubic yard
degAPI	degAPI	D API	Degrees API
SGU	SGU	SGU	Specific gravity unit (not temperature corrected)

Table 4-6 Temperature measurement units

Temperature unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
°C	°C	°C	Degrees Celsius
°F	°F	°F	Degrees Fahrenheit
°R	°R	°R	Degrees Rankine
K	°K	°K	Kelvin

Although pressure units are listed in Table 4-7, the transmitter does not measure pressure. These units are for configuring external pressure compensation. Refer to Section 2.5.

Table 4-7 Pressure measurement units

Pressure unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
ftH20 (68°F)	Ft Water @ 68°F	FTH2O	Feet water @ 68 °F
inH2O (4°C)	In Water @ 4°C	INW4C	Inches water @ 4 °C
inH20 (68°F)	In Water @ 68°F	INH2O	Inches water @ 68 °F
mmH2O (4°C)	mm Water @ 4°C	mmW4C	Millimeters water @ 4 °C
mmH20 (68°F)	mm Water @ 68°F	mmH2O	Millimeters water @ 68 °F
inHg (0°C)	In Mercury @ 0°C	INHG	Inches mercury @ 0 °C
mmHg (0°C)	mm Mercury @ 0°C	mmHG	Millimeters mercury @ 0 °C
psi	PSI	PSI	Pounds per square inch
bar	bar	BAR	Bar
mbar	millibar	mBAR	Millibar
g/cm^2	g/cm2	G/SCM	Grams per square centimeter
kg/cm^2	kg/cm2	KG/SCM	Kilograms per square centimeter
Pa	pascals	PA	Pascals
MPa	megapascals	MPA	Megapascals

Table 4-7 **Pressure measurement units (continued)**

Pressure unit			
Fieldbus host	**ProLink II**	**Display**	**Unit description**
kPa	Kilopascals	KPA	Kilopascals
torr	Torr @ 0C	TORR	Torr @ 0 °C
atm	atms	ATM	Atmospheres

4.5 Creating special measurement units

If you need to use a non-standard unit of measure, you can create special measurement units. There are two methods available for creating special units:

- Using the special unit features of the MEASUREMENT transducer block. This method is described in this section.
- Using the Transducer Scale, Output Scale, and Linearization parameters of an AI function block. This method is not described in this section. Refer to Sections 4.8 and 4.9, and the *FOUNDATION Fieldbus Blocks* manual, available from the Rosemount web site (www.rosemount.com), for information about creating special units using this method.

The MEASUREMENT transducer block supports one special unit for mass flow, one special measurement unit for liquid volume flow, and one special unit for gas volume flow. Special measurement units consist of:

- *Base unit* — A combination of:
  - *Base mass* or *base volume unit* — A standard measurement unit that the transmitter already recognizes (e.g., kg, m^3)
  - *Base time unit* — A unit of time that the transmitter already recognizes (e.g., seconds, days)
- *Conversion factor* — The number by which the base unit will be divided to convert to the special unit
- *Special unit* — A non-standard volume-flow or mass-flow unit of measure that you want to be reported by the transmitter.

The terms above are related by the following formulae:

$$x[\text{Base units}] = y[\text{Special units}]$$

$$\text{Conversion factor} = \frac{x[\text{Base units}]}{y[\text{Special units}]}$$

To create a special unit, you must:

1. Identify the simplest base volume or mass and base time units for your special unit. For example, to create the special volume flow unit *pints per minute*, the simplest base units are gallons per minute:
   a. Base volume unit: *gallon*
   b. Base time unit: *minute*

2. Calculate the conversion factor:

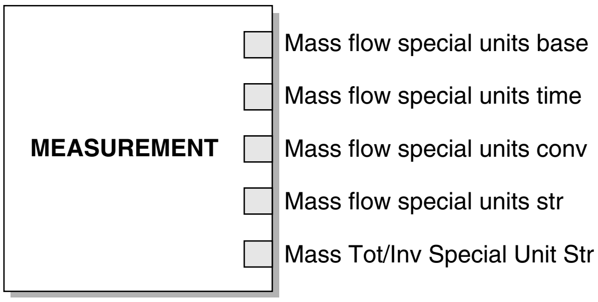
$$\frac{\text{1 gallon per minute}}{\text{8 pints per minute}} = 0.125$$

3. Name the new special mass-flow or volume-flow measurement unit and its corresponding totalizer measurement unit:
   a. Special volume-flow measurement unit name: *pint/min*
   b. Volume totalizer measurement unit name: *pints*

Note: Special measurement unit names can be up to 8 characters long, but only the first 5 characters appear on the display.

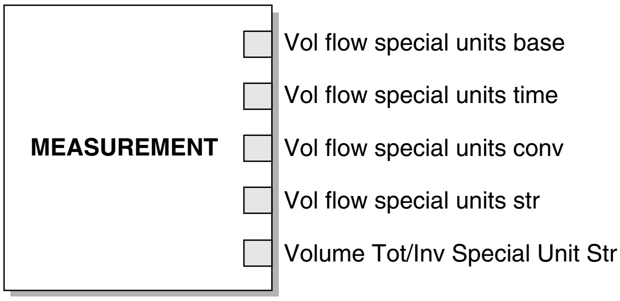
Special units can be created with a fieldbus host (Figures 4-9, 4-10, and 4-11) or with ProLink II (Figure 4-12).

Figure 4-9 Special units for mass flow – Fieldbus host



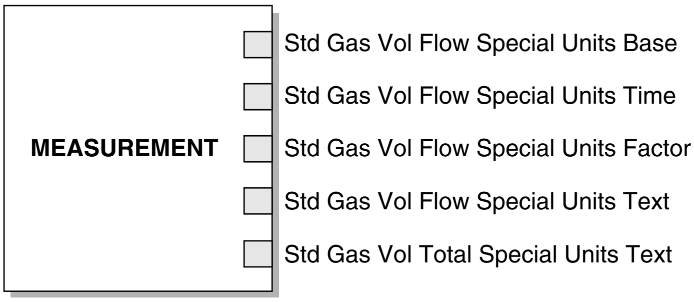
Mass flow special units base	– Set to a mass unit.
Mass flow special units time	– Set to a unit of time.
Mass flow special units conv	– Set to the conversion factor. When this parameter equals 1, the transmitter will use normal mass units. When this parameter is not equal to 1, the transmitter will use special mass units.
Mass flow special units str	– Set to the name of the special unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).
Mass Tot/Inv Special Unit Str	– Set to the name of the special totalizer unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).

Figure 4-10 Special units for liquid volume flow – Fieldbus host



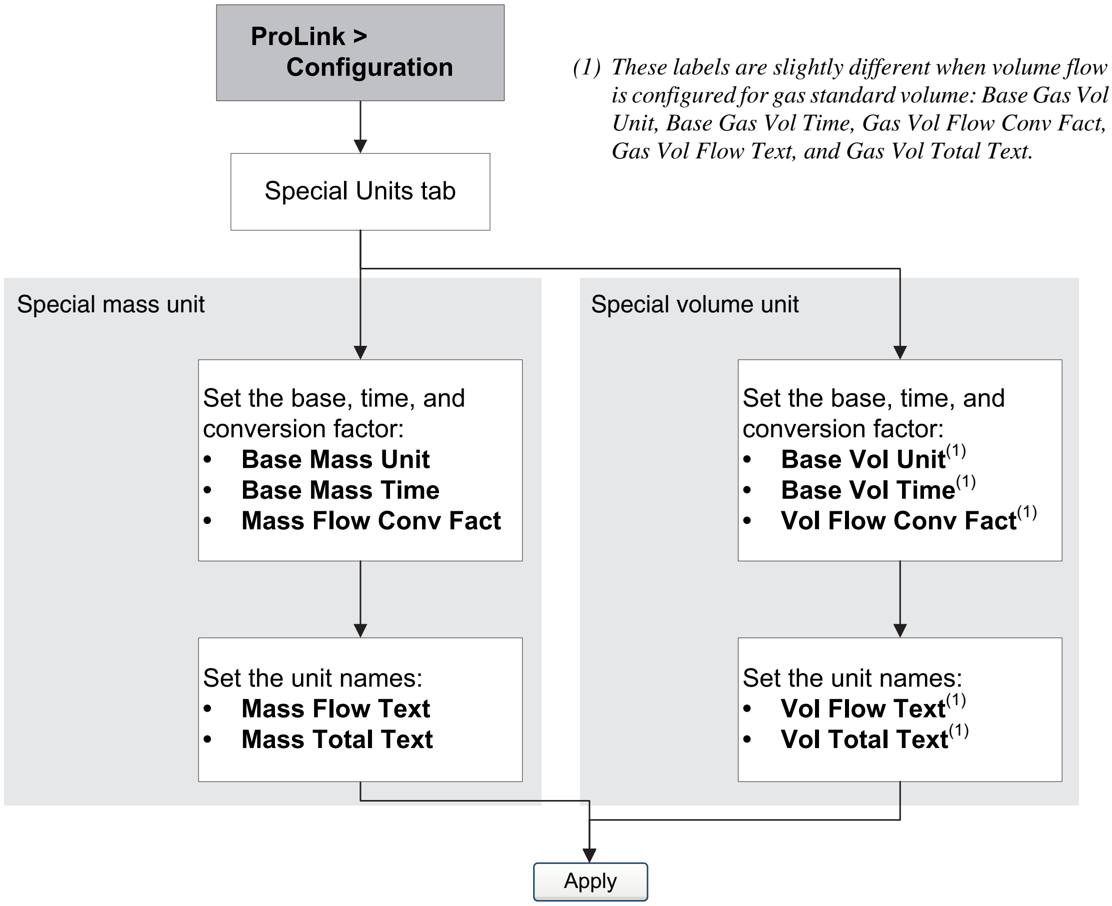
Vol flow special units base	– Set to a liquid volume unit.
Vol flow special units time	– Set to a unit of time.
Vol flow special units conv	– Set to the conversion factor. When this parameter equals 1, the transmitter will use normal liquid volume units. When this parameter is not equal to 1, the transmitter will use special liquid volume units.
Vol flow special units str	– Set to the name of the special unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).
Volume Tot/Inv Special Unit Str	– Set to the name of the special totalizer unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).

Figure 4-11 Special units for gas volume flow – Fieldbus host



Std Gas Vol Flow Special Units Base	– Set to a gas volume unit.
Std Gas Vol Flow Special Units Time	– Set to a unit of time.
Std Gas Vol Flow Special Units Factor	– Set to the conversion factor. When this parameter equals 1, the transmitter will use normal gas volume units. When this parameter is not equal to 1, the transmitter will use special gas volume units.
Std Gas Vol Flow Special Units Text	– Set to the name of the special unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).
Std Gas Vol Total Special Units Text	– Set to the name of the special totalizer unit. Unit names can be up to 8 characters in length (although only the first 5 are displayed).

Figure 4-12 Special mass and volume units – ProLink II



4.6 Configuring the petroleum measurement application (API feature)

The *API parameters* determine the values that will be used in API-related calculations. The API parameters are available only if the petroleum measurement application is enabled on your transmitter.

Note: The petroleum measurement application requires liquid volume measurement units. If you plan to use API process variables, ensure that liquid volume flow measurement is specified. See Section 4.3.

4.6.1 About the petroleum measurement application

Some applications that measure liquid volume flow or liquid density are particularly sensitive to temperature factors, and must comply with American Petroleum Institute (API) standards for measurement. The petroleum measurement application enables *Correction of Temperature on volume of Liquids*, or CTL.

Terms and definitions

The following terms and definitions are relevant to the petroleum measurement application:

- *API* – American Petroleum Institute
- *CTL* – Correction of Temperature on volume of Liquids. The CTL value is used to calculate the VCF value
- *TEC* – Thermal Expansion Coefficient
- *VCF* – Volume Correction Factor. The correction factor to be applied to volume process variables. VCF can be calculated after CTL is derived

CTL derivation methods

There are two derivation methods for CTL:

- Method 1 is based on observed density and observed temperature.
- Method 2 is based on a user-supplied reference density (or thermal expansion coefficient, in some cases) and observed temperature.

Petroleum Measurement reference tables

Reference tables are organized by reference temperature, CTL derivation method, liquid type, and density unit. The table selected here controls all the remaining options.

- Reference temperature:
  - If you specify a 5*x*, 6*x*, 23*x*, or 24*x* table, the default reference temperature is 60 °F, and cannot be changed.
  - If you specify a 53*x* or 54*x* table, the default reference temperature is 15 °C. However, you can change the reference temperature, as recommended in some locations (for example, to 14.0 or 14.5 °C).
- CTL derivation method:
  - If you specify an odd-numbered table (5, 23, or 53), CTL will be derived using method 1 described above.
  - If you specify an even-numbered table (6, 24, or 54), CTL will be derived using method 2 described above.
- The letters *A*, *B*, *C*, or *D* that are used to terminate table names define the type of liquid that the table is designed for:
  - *A* tables are used with generalized crude and JP4 applications.
  - *B* tables are used with generalized products.
  - *C* tables are used with liquids with a constant base density or known thermal expansion coefficient.
  - *D* tables are used with lubricating oils.
- Different tables use different density units:
  - Degrees API
  - Relative density (SG)
  - Base density (kg/m^3)

Table 4-8 summarizes these options.

Table 4-8 Petroleum Measurement reference temperature tables

Table	CTL derivation method	Base temperature	Density unit and range		
			Degrees API	Base density	Relative density
5A	Method 1	60 °F, non-configurable	0 to +100		
5B	Method 1	60 °F, non-configurable	0 to +85		
5D	Method 1	60 °F, non-configurable	–10 to +40		
23A	Method 1	60 °F, non-configurable			0.6110 to 1.0760
23B	Method 1	60 °F, non-configurable			0.6535 to 1.0760
23D	Method 1	60 °F, non-configurable			0.8520 to 1.1640
53A	Method 1	15 °C, configurable		610 to 1075 kg/m^3	
53B	Method 1	15 °C, configurable		653 to 1075 kg/m^3	
53D	Method 1	15 °C, configurable		825 to 1164 kg/m^3	
			Reference temperature		**Supports**
6C	Method 2	60 °F, non-configurable	60 °F		Degrees API
24C	Method 2	60 °F, non-configurable	60 °F		Relative density
54C	Method 2	15 °C, configurable	15 °C		Base density in kg/m^3

4.6.2 Configuration procedure

The PM configuration parameters are listed and defined in Table 4-9.

Table 4-9 Petroleum Measurement parameters

Variable	Description
Table type	Specifies the table that will be used for reference temperature and reference density unit. Select the table that matches your requirements. See *Petroleum Measurement reference tables*.
User defined TEC(1)	Thermal expansion coefficient. Enter the value to be used in CTL calculation.
Temperature units(2)	Read-only. Displays the unit used for reference temperature in the reference table.
Density units	Read-only. Displays the unit used for reference density in the reference table.
Reference temperature	Read-only unless Table Type is set to 53*x* or 54*x*. If configurable: • Specify the reference temperature to be used in CTL calculation. • Enter reference temperature in °C.

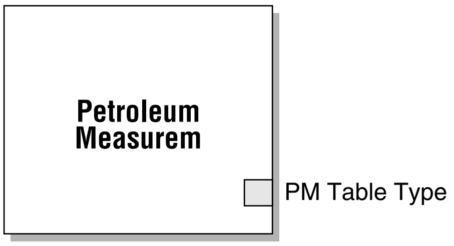
(1) Configurable if Table Type is set to 6C, 24C, or 54C.

(2) In most cases, the temperature unit used by the PM reference table should also be the temperature unit configured for the transmitter to use in general processing. To configure the temperature unit, see Section 4.4.

Setting the table type

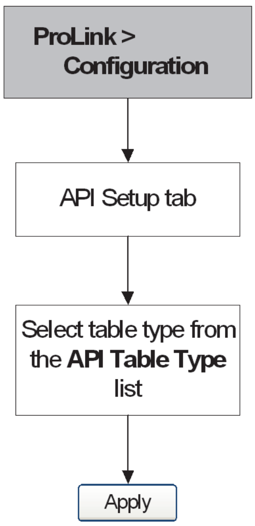
You can set the PM table type with a fieldbus host (Figure 4-13) or ProLink II (Figure 4-14).

Figure 4-13 Petroleum Measurement table type – Fieldbus host



PM Table Type – Set to the desired table type.

Figure 4-14 Petroleum Measurement table type – ProLink II



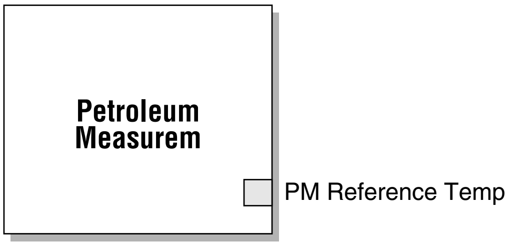
Setting the reference temperature

For the temperature value to be used in CTL calculation, you can use the temperature data from the sensor, or you can configure external temperature compensation to use either a static temperature value or temperature data from an external temperature device.

- To use temperature data from the sensor, no action is required.
- To configure external temperature compensation, see Section 2.6.

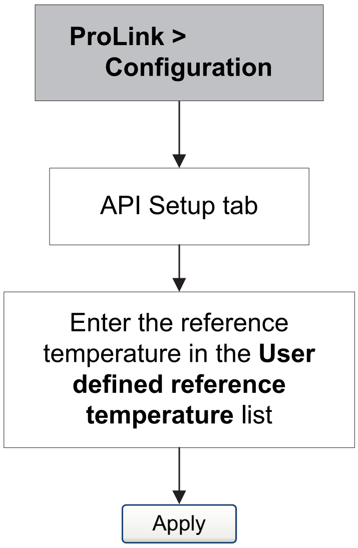
You can set the reference temperature using a fieldbus host (Figure 4-15) or ProLink II (Figure 4-16).

Figure 4-15 Petroleum Measurement reference temperature – Fieldbus host



PM Reference Temp – Set to the desired temperature (in the currently-configured temperature units).

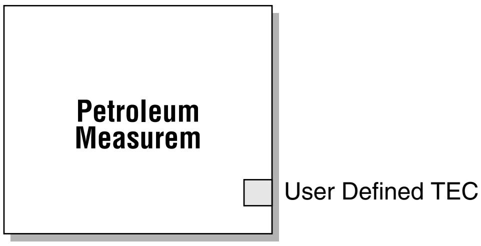
Figure 4-16 Petroleum Measurement reference temperature – ProLink II



Setting the thermal expansion coefficient

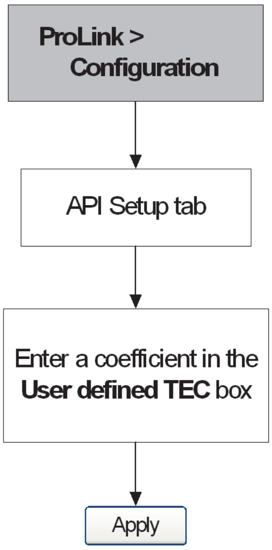
If the CTL derivation method for the API table type is method 2, you need to set the thermal expansion coefficient (TEC). You can set a user-defined TEC with a fieldbus host (Figure 4-17) or ProLink II (Figure 4-18).

Figure 4-17 TEC – Fieldbus host



User Defined TEC – Set to the desired thermal expansion coefficient.

Figure 4-18 **Petroleum Measurement – ProLink II**



4.7 Configuring the concentration measurement application

Micro Motion sensors provide direct measurements of density, but not of concentration. The concentration measurement application calculates concentration measurement process variables, such as concentration or density at reference temperature, from density process data, appropriately corrected for temperature.

Note: For a detailed description of the concentration measurement application, see the manual entitled Micro Motion Enhanced Density Application: Theory, Configuration, and Use*.*

Note: The concentration measurement application requires liquid volume measurement units. If you plan to use concentration measurement process variables, ensure that liquid volume flow measurement is specified. See Section 4.3.

4.7.1 About the concentration measurement application

The concentration measurement calculation requires a concentration measurement curve, which specifies the relationship between temperature, concentration, and density for the process fluid being measured. Micro Motion supplies a set of six standard concentration measurement curves (see Table 4-10). If none of these curves is appropriate for your process fluid, you can configure a custom curve or purchase a custom curve from Micro Motion.

The derived variable, specified during configuration, controls the type of concentration measurement that will be produced. Each derived variable allows the calculation of a subset of concentration measurement process variables (see Table 4-11). The available concentration measurement process variables can be used in process control, just as mass flow rate, volume flow rate, and other process variables are used. For example, an event can be defined on a concentration measurement process variable.

- For all standard curves, the derived variable is Mass Conc (Dens).
- For custom curves, the derived variable may be any of the variables listed in Table 4-11.

The transmitter can hold up to six curves at any given time, but only one curve can be active (used for measurement) at a time. All curves that are in transmitter memory must use the same derived variable.

Table 4-10 Standard curves and associated measurement units

Name	Description	Density unit	Temperature 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/cm^3	°F
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/cm^3	°C
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/cm^3	°F
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/cm^3	°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/cm^3	°C
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/cm^3	°C

Table 4-11 Derived variables and available process variables

	Available process variables					
Derived variable – ProLink II label and definition	Density at reference temperature	Standard volume flow rate	Specific gravity	Concentration	Net mass flow rate	Net volume flow rate
Density @ Ref *Density at reference temperature* Mass/unit volume, corrected to a given reference temperature	✓	✓				
SG *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 Conc (Dens) *Mass concentration derived from reference density* The percent mass of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓	✓	
Mass Conc (SG) *Mass concentration derived from specific gravity* The percent mass of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓	✓	

Table 4-11 Derived variables and available process variables (continued)

Derived variable – ProLink II label and definition	Available process variables: Density at reference temperature	Standard volume flow rate	Specific gravity	Concentration	Net mass flow rate	Net volume flow rate
Volume Conc (Dens) *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 Conc (SG) *Volume concentration derived from specific gravity* The percent volume of solute or of material in suspension in the total solution, derived from specific gravity	☒	☒	☒	☒		☒
Conc (Dens) *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	☒	☒		☒		
Conc (SG) *Concentration derived from specific gravity* The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the total solution, derived from specific gravity	☒	☒	☒	☒		

4.7.2 Configuration procedure

Complete configuration instructions for the concentration measurement application are provided in the manual entitled *Micro Motion Enhanced Density Application: Theory, Configuration, and Use*.

Note: The concentration measurement manual uses ProLink II as the standard configuration tool for the concentration measurement application. Because the fieldbus parameters are very similar to the ProLink II labels, you can follow the instructions for ProLink II and adapt them to your host. All of the parameters related to the concentration measurement application can be found in the CONCENTRATION MEASUREMENT transducer block (see Appendix B).

The typical configuration procedure simply sets up the concentration measurement application to use a standard curve. The following steps are required:

1. Set the transmitter's density measurement unit to match the unit used by the curve (as listed in Table 4-10).
2. Set the transmitter's temperature measurement unit to match the unit used by the curve (as listed in Table 4-10).
3. Set the derived variable to Mass Conc (Dens).
4. Specify the active curve.

4.8 Changing the linearization

Linearization translates a process variable into different measurement units and onto a new scale. Output scaling and linearization relate to each other in the following way:

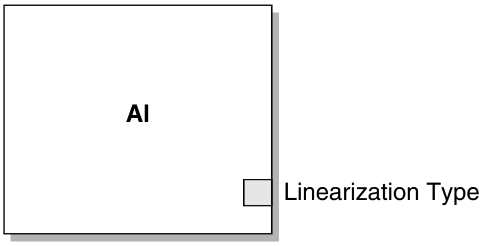
- When the linearization parameter of an AI block is set to *Direct*, the AI block reports process variables directly from the MEASUREMENT transducer block. The transmitter is shipped with all AI blocks set to Direct linearization by default.
- When the linearization parameter of an AI block is set to *Indirect*, the value from the MEASUREMENT transducer block is converted according to the Output Scale parameters (see Section 4.9).

  In addition, the AI block output is converted according to the Transducer Scale parameters, but with a 1/*x* transformation, i.e., if the upper bound of the Transducer Scale is set to 50%, the output will be doubled.

  Indirect linearization can be used along with Output Scale and Transducer Scale to create special measurement units. Refer Section 4.9 and to the *FOUNDATION Fieldbus Blocks* manual, available from the Rosemount web site (www.rosemount.com), for information about creating special units using this method.
- When the linearization parameter of an AI block is set to *Indirect square root*, the AI block reports the square root of the scaled output. In general, indirect square root linearization is not useful for Coriolis meters.

You can change the linearization setting only with a fieldbus host (Figure 4-19).

Figure 4-19 Linearization – Fieldbus host



Linearization Type – Set to the desired linearization value.

4.9 Changing the output scale

The AI function blocks can be configured to scale their output. The output scale is established by defining a process variable value at 0% of scale and at 100% of scale. The output of the AI block will be translated to a value between these two limits.

Note: Although it is possible to set the Output Scale: Units Index parameter to a value different from the Transducer Scale: Units Index parameter, this has no effect on output. The Output Scale: Units Index parameter is primarily useful as a label.

The output scale is a function of the AI blocks, and is only used when linearization is set to *Indirect* (see Section 4.8). If you choose to use output scaling, note that it has no effect on the process values found in the MEASUREMENT transducer block. This results in the following behaviors:

- ProLink II and the display use the process values in the MEASUREMENT transducer block. Therefore, the output of a scaled AI block may differ from the value reported by other communication tools.
- Slug flow and flow cutoffs are configured in the MEASUREMENT block. Therefore, output scaling has no effect on the behavior of the transmitter with regard to slug flow or flow cutoffs.

Example

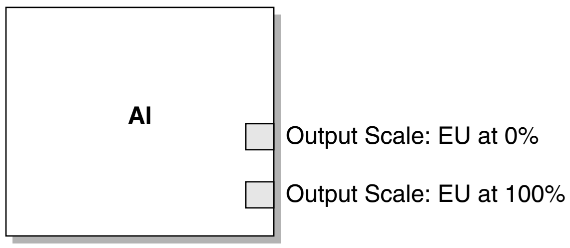
To create a special unit for pints per second, the AI block assigned to channel 4 (volume) can be configured as follows:

- Transducer Scale: Units Index = gal/s
- Transducer Scale: EU at 0% = 0
- Transducer Scale: EU at 100% = 100
- Output Scale: Units Index = pints
- Output Scale: EU at 0% = 0
- Output Scale: EU at 100% = 800
- Linearization Type = Indirect

AI:Out	Volume Flow:Value	Display
16 pints/s	2 gal/s	2 gal/s

You can change the output scale only with a fieldbus host (Figure 4-20).

Figure 4-20 **Output scaling – Fieldbus host**



Output Scale: EU at 0% – Set to process variable value at 0% of scale, in the configured units.
Output Scale: EU at 100% – Set to process variable value at 100% of scale, in the configured units.

4.10 Changing process alarms

The transmitter sends *process alarms* to indicate that a process value has exceeded its user-defined limits. The transmitter maintains four alarm values for each process variable. Each alarm value has a priority associated with it. In addition, the transmitter has an alarm hysteresis function to prevent erratic alarm reports.

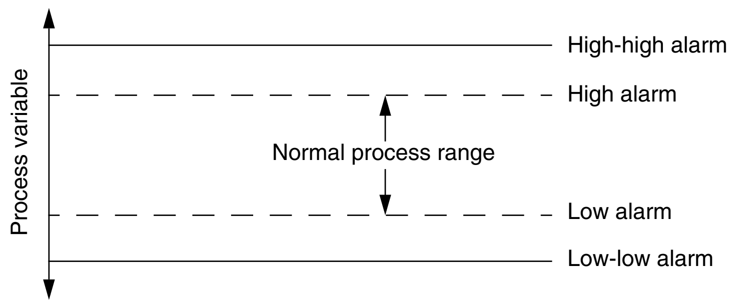
Note: Process alarms are only posted through the AI function block and are NOT shown on the display or in ProLink II.

4.10.1 Alarm values

The *process alarm values* are the limits for process variables. Whenever a process variable exceeds a process alarm value, the transmitter broadcasts an alarm to the fieldbus network.

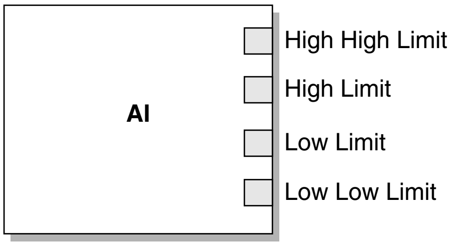
Each AI function block has four process alarm values: high alarm, high-high alarm, low alarm, and low-low alarm. See Figure 4-21.

Figure 4-21 **Alarm values**



You can change the alarm values only with a fieldbus host (Figure 4-22).

Figure 4-22 Alarm values – Fieldbus host



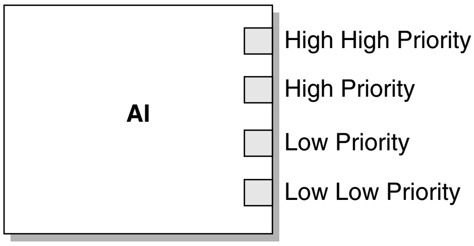
High High Limit – Set to the value for the high-high alarm.
High Limit – Set to the value for the high alarm.
Low Limit – Set to the value for the low alarm.
Low Low Limit – Set to the value for the low-low alarm.

4.10.2 Alarm priorities

Each process alarm is assigned an alarm priority. A *process alarm priority* is a number from 0 to 15. Higher numbers indicate higher alarm priorities. These values are for fieldbus network management and do not affect transmitter operation.

You can change the process alarm priority values only with a fieldbus host (Figure 4-23).

Figure 4-23 Alarm priorities – Fieldbus host



High High Priority – Set to the priority for the high-high alarm.
High Priority – Set to the priority for the high alarm.
Low Priority – Set to the priority for the low alarm.
Low Low Priority – Set to the priority for the low-low alarm.

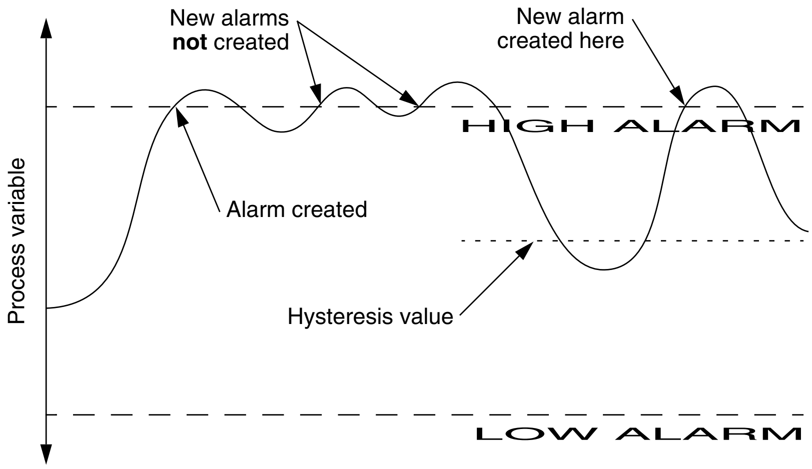
4.10.3 Alarm hysteresis

The *alarm hysteresis* value is a percentage of the output scale. After a process alarm is created, the transmitter will not create new alarms unless the process first returns to a value within the range of the alarm hysteresis percentage. Figure 4-24 shows the transmitter's alarm behavior with an alarm hysteresis value of 50%.

Note the following about hysteresis:

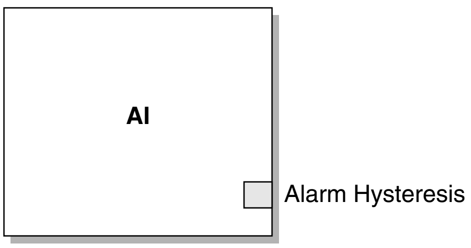
- A low hysteresis value allows the transmitter to broadcast a new alarm every time or nearly every time the process variable crosses over the alarm limit.
- A high hysteresis value prevents the transmitter from broadcasting new alarms unless the process variable first returns to a value sufficiently below the high alarm limit or above the low alarm limit.

Figure 4-24 High versus low alarm hysteresis values



You can change the alarm hysteresis value only with a fieldbus host (Figure 4-25).

Figure 4-25 Alarm hysteresis – Fieldbus host



Alarm Hysteresis – Set to the desired percentage of output scale, where scale is defined by either the Transducer Scale or Output Scale values.

4.11 Configuring status alarm severity

Status alarm severity does not affect the fieldbus alarm system (see Figure 4.10). The main function of status alarm severity in the Model 2700 with FOUNDATION fieldbus transmitter is to control the behavior of the display. See Section 5.4 for information about how the display indicates the severity of alarms.

The severity level of some alarms can be reclassified. For example:

- The default severity level for Alarm A020 (calibration factors unentered) is **Fault**, but you can reconfigure it to either **Informational** or **Ignore**.
- The default severity level for Alarm A102 (drive over-range) is **Informational**, but you can reconfigure it to either **Ignore** or **Fault**.

A list of all status alarms and default severity levels is shown in Table 4-12. (For more information on status alarms, including possible causes and troubleshooting suggestions, see Section 6.10.)

Table 4-12 Status alarms and severity levels

Alarm code	Description	Default severity	Configurable
A001	(E)EPROM Checksum Error (CP)	Fault	No
A002	RAM Error (CP)	Fault	No
A003	Sensor Failure	Fault	Yes
A004	Temperature Sensor Failure	Fault	No
A005	Input Overrange	Fault	Yes
A006	Not Configured	Fault	Yes
A008	Density Overrange	Fault	Yes
A009	Transmitter Initializing/warming Up	Ignore	Yes
A010	Calibration Failure	Fault	No
A011	Cal Fail - Too Low	Fault	Yes
A012	Cal Fail - Too High	Fault	Yes
A013	Cal Fail - Too Noisy	Fault	Yes
A014	Transmitter Failed	Fault	No
A016	Line RTD Temperature Out-of-Range	Fault	Yes
A017	Meter RTD Temperature Out-of-Range	Fault	Yes
A018	(E)EPROM Checksum Error	Fault	No
A019	RAM or ROM Test Error	Fault	No
A020	Calibration Factors Unentered	Fault	Yes
A021	Incorrect Sensor Type (K1)	Fault	No
A025	Protected Boot Sector Fault (CP)	Fault	No
A026	Sensor/Transmitter Communication Error	Fault	No
A028	Core Processor Write Failure	Fault	No
A031	Low Power	Fault	No
A032	Smart Meter Verification In Progress and Outputs Fixed	Fault(1)	No
A033	Sensor OK/Tubes Stopped by Process	Fault	Yes
A034	Smart Meter Verification Failed	Informational	Yes
A102	Drive Overrange/Partially Full Tube	Informational	Yes
A103	Data Loss Possible (Tot and Inv)	Informational	Yes

Table 4-12 Status alarms and severity levels (continued)

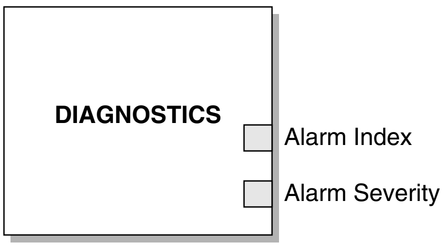
Alarm code	Description	Default severity	Configurable
A104	Calibration-in-Progress	Informational(2)	Yes
A105	Slug Flow	Informational	Yes
A106	AI/AO Simulation Active	Informational	No
A107	Power Reset Occurred	Informational	Yes
A116	API: Temperature Outside Standard Range	Informational	Yes
A117	API: Density Outside Standard Range	Informational	Yes
A120	CM: Unable to Fit Curve Data	Informational	No
A121	CM: Extrapolation Alarm	Informational	Yes
A128	Factory configuration data invalid	Informational	Yes
A129	Factory configuration data checksum invalid	Fault	No
A131	Smart Meter Verification In Progress	Informational	Yes
A132	Simulation Mode Active	Informational	Yes

(1) The severity changes automatically based on the configured output state of a Smart Meter Verification test. If the output state is set to Last Measured Value (LMV), the alarm severity will be Informational. If the output state is set to Fault, the alarm severity will be Fault.

(2) Can be set to either Informational or Ignore, but cannot be set to Fault.

Alarm severity can be configured with a fieldbus host (Figure 4-26) or ProLink II (Figure 4-27). Some configurable alarms can be set to either Informational or Ignore, but not to Fault.

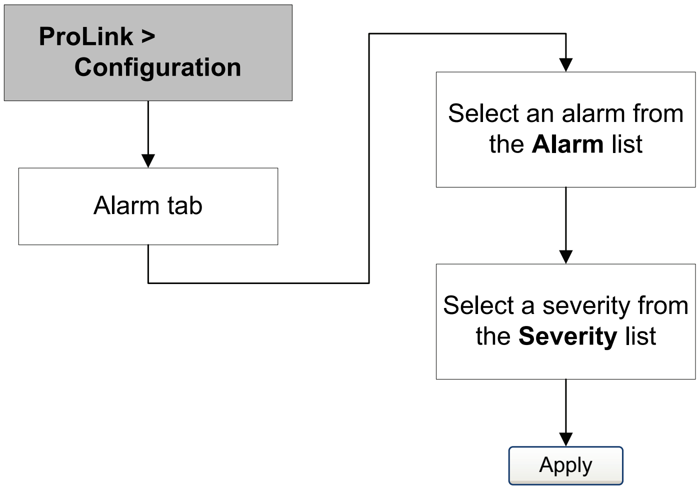
Figure 4-26 Alarm severity – Fieldbus host



Alarm Index – Select an alarm for which you want to modify the severity. (You must write to the transmitter before the Alarm Severity parameter becomes available.)

Alarm Severity – Select a severity for the alarm indicated by the Alarm Index parameter.

Figure 4-27 Alarm severity – ProLink II



4.12 Changing the damping values

A damping value is a period of time, in seconds, over which the process variable value will change to reflect 63% of the change in the actual process. Damping helps the transmitter smooth out small, rapid measurement fluctuations.

- A high damping value makes the output appear to be smoother because the output must change slowly.
- A low damping value makes the output appear to be more erratic because the output changes more quickly.

Damping can be configured for flow, density, and temperature using a fieldbus host (Figure 4-28) or ProLink II (Figure 4-29).

Note: There is also a damping parameter in each AI block called Process Value Filter Time. In order to avoid having two (potentially conflicting) damping values, you should set damping values only in the MEASUREMENT transducer block. The Process Value Filter Time parameter for each AI block should be set to 0.

When you specify a new damping value, it is automatically rounded down to the nearest valid damping value. Valid damping values are listed in Table 4-13.

Note: For gas applications, Micro Motion recommends a minimum flow damping value of 2.56.

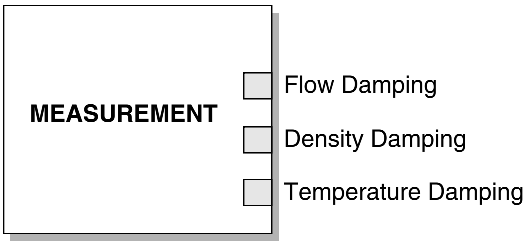
Before setting the damping values, review Section 4.12.1 for information on how the damping values affect other transmitter measurements.

Table 4-13 Valid damping values

Process variable	Valid damping values
Flow (mass and volume)	0, 0.04, 0.08, 0.16, ... 40.96
Density	0, 0.04, 0.08, 0.16, ... 40.96
Temperature	0, 0.6, 1.2, 2.4, 4.8, ... 76.8

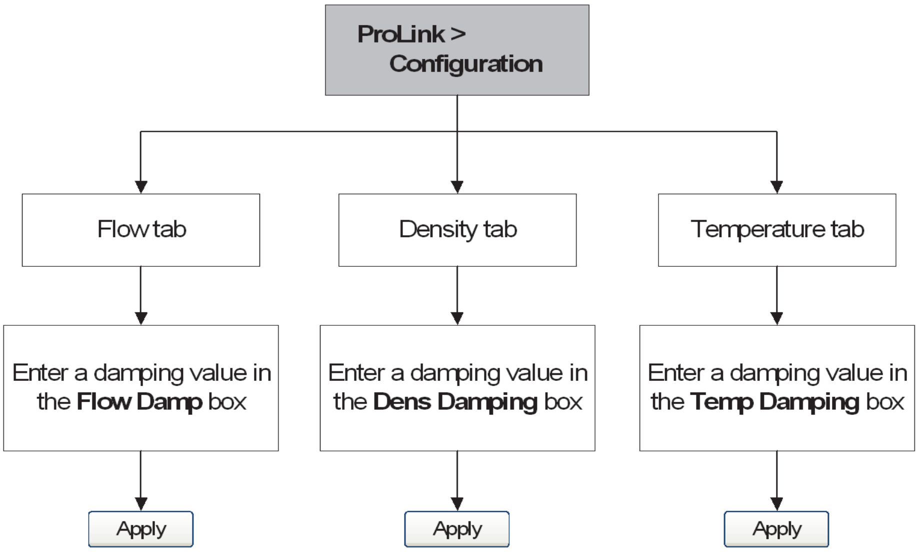
Before You Begin
Startup
Calibration
Configuration

Figure 4-28 Damping – Fieldbus host



Flow Damping – Set to the desired damping value for mass flow and volume flow measurement.
Density Damping – Set to the desired damping value for density measurement.
Temperature Damping – Set to the desired damping value for temperature measurement.

Figure 4-29 Damping – ProLink II



4.12.1 Damping and volume measurement

When configuring damping values, note the following:

- Liquid volume flow is derived from mass and density measurements; therefore, any damping applied to mass flow and density will affect liquid volume measurement.
- Gas standard volume flow is derived from mass flow measurement, but not from density measurement. Therefore, only damping applied to mass flow will affect gas standard volume measurement.

Be sure to set damping values accordingly.

4.13 Changing slug flow limits and duration

Slugs—gas in a liquid process or liquid in a gas process—occasionally appear in some applications. The presence of slugs can significantly affect the process density reading. The slug flow parameters can help the transmitter suppress extreme changes in process variables, and can also be used to identify process conditions that require correction.

Slug flow parameters are as follows:

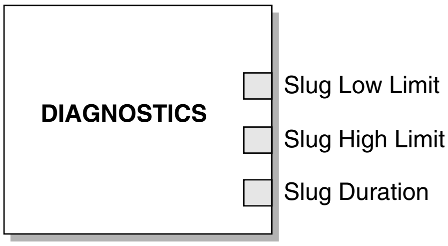
- *Low slug flow limit* — the point below which a condition of slug flow will exist. Typically, this is the lowest density you expect to observe for your process. The default value is 0.0 g/cm^3. The valid range is 0.0–10.0 g/cm^3.
- *High slug flow limit* — the point above which a condition of slug flow will exist. Typically, this is the highest density you expect to observe for your process. The default value is 5.0 g/cm^3. The valid range is 0.0–10.0 g/cm^3.
- *Slug flow duration* — the number of seconds the transmitter waits for a slug flow condition to clear. If the transmitter detects slug flow, it will post a slug flow alarm and hold its last "pre-slug" flow rate until the end of the slug flow duration. If slugs are still present after the slug flow duration has expired, the transmitter will report a flow rate of zero. The default value for slug flow duration is 0.0 seconds. The valid range is 0.0–60.0 seconds.

Note: Raising the low slug flow limit or lowering the high slug flow limit will increase the possibility that slug flow conditions will be detected by the transmitter.

Note: The slug flow limits must be entered in g/cm^3, even if another unit has been configured for density. Slug flow duration must be entered in seconds.

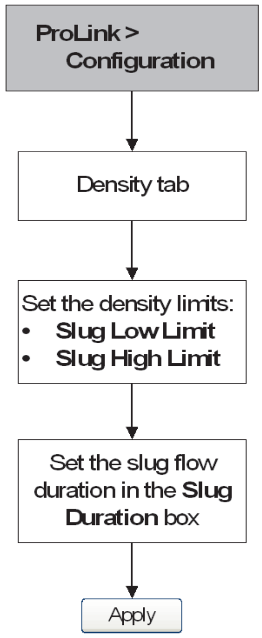
Slug flow can be configured using a fieldbus host (Figure 4-30) or ProLink II (Figure 4-31).

Figure 4-30 Slug flow settings – Fieldbus host



Slug Low Limit	–	Set to the density below which a condition of slug flow will exist.
Slug High Limit	–	Set to the density above which a condition of slug flow will exist.
Slug Duration	–	Set to the number of seconds to wait for a slug flow condition to clear before a slug flow alarm is posted.

Figure 4-31 **Slug flow settings – ProLink II**



4.14 Configuring cutoffs

Cutoffs are user-defined values below which the transmitter reports a value of zero for the specified process variable. Cutoffs can be set for mass flow, volume flow, gas standard volume flow, and density.

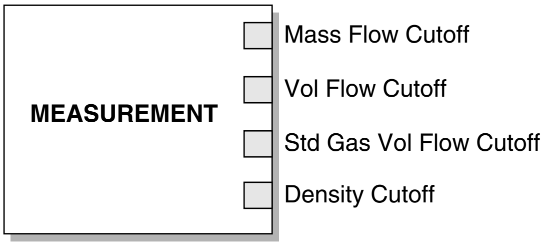
Table 4-14 lists the default values and relevant comments for each cutoff. See Section 4.14.1 for information on how the cutoffs interact with other transmitter measurements.

Table 4-14 **Cutoff default values and comments**

Cutoff	Default value	Comments
Mass	0.0 g/s	Micro Motion recommends a mass flow cutoff value of 0.2% of the sensor's maximum flow rate for standard operation, and 2.5% of the sensor's maximum flow rate for empty-full-empty batching.
Liquid volume	0.0 L/s	The lower limit for volume flow cutoff is 0. The upper limit for volume flow cutoff is the sensor's flow calibration factor, in L/s, multiplied by 0.2.
Gas standard volume flow	0.0 SCFM	No limit
Density	0.2 g/cm^3	The range for density cutoff is 0.0–0.5 g/cm^3

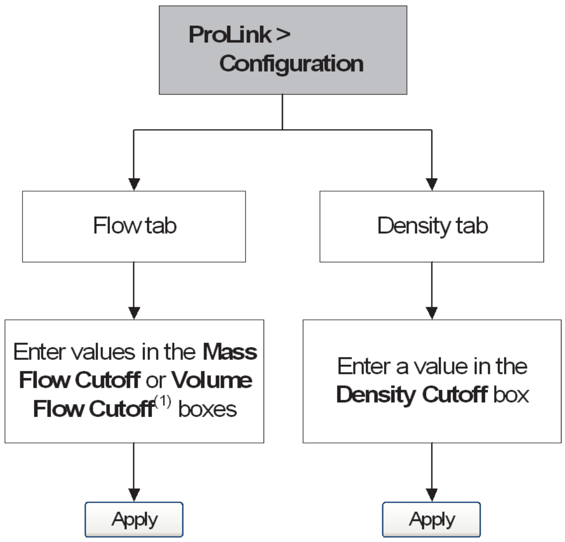
Cutoffs can be configured with a fieldbus host (Figure 4-32) or ProLink II (Figure 4-33).

Figure 4-32 Cutoffs – Fieldbus host



Mass Flow Cutoff	–	Set to the desired mass flow cutoff value.
Vol Flow Cutoff	–	Set to the desired (liquid) volume flow cutoff value.
Std Gas Vol Flow Cutoff	–	Set to the desired (gas) volume flow cutoff value.
Density Cutoff	–	Set to the desired density cutoff value.

Figure 4-33 Cutoffs – ProLink II



(1) When volume flow is configured for gas standard volume, this box is labeled Std gas vol flow cutoff.

4.14.1 Cutoffs and volume flow

If liquid volume flow is enabled:

- The density cutoff is applied to the volume flow calculation. Accordingly, if the density drops below its configured cutoff value, the volume flow rate will go to zero.
- The mass flow cutoff is not applied to the volume flow calculation. Even if the mass flow drops below the cutoff, and therefore the mass flow indicators go to zero, the volume flow rate will be calculated from the actual mass flow process variable.

If gas standard volume flow is enabled, neither the mass flow cutoff nor the density cutoff is applied to the volume flow calculation.

4.15 Changing the flow direction parameter

The *flow direction* parameter controls how the transmitter reports flow rate and how flow is added to or subtracted from the totalizers.

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

Options for flow direction include:

- Forward Flow
- Reverse Flow
- Bi-directional
- Absolute Value
- Negate/Forward Only
- Negate/Bi-directional

The effect of each of these options is shown in Table 4-15.

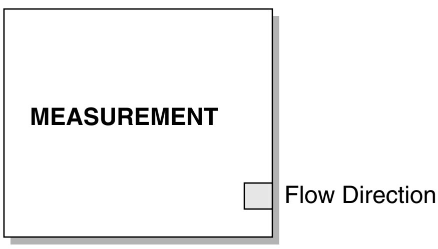
Table 4-15 Transmitter behavior for each flow direction value

	Forward flow		Reverse flow	
Flow direction value	**Flow totals**	**Flow values on display or via digital comm.**	**Flow totals**	**Flow values on display or via digital comm.**
Forward only	Increase	Read positive	No change	Read negative
Reverse only	No change	Read positive	Increase	Read negative
Bi-directional	Increase	Read positive	Decrease	Read negative
Absolute value	Increase	Read positive(1)	Increase	Read positive(1)
Negate/forward only	No change	Read negative	Increase	Read positive
Negate/bi-directional	Decrease	Read negative	Increase	Read positive

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

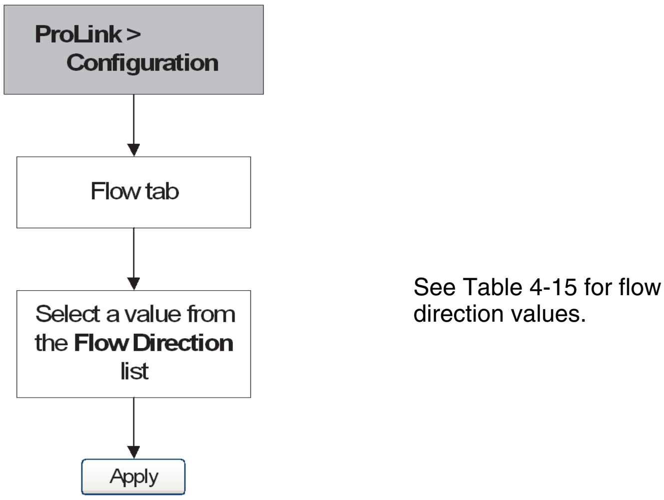
You can change the flow direction parameter with a fieldbus host (Figure 4-34) or ProLink II (Figure 4-35).

Figure 4-34 Flow direction parameter – Fieldbus host



Flow Direction – Set to the desired value (refer to *Flow direction value* in Table 4-15).

Figure 4-35 **Flow direction parameter – ProLink II**



4.16 Changing device settings

The device settings are used to describe the flowmeter components. The following information can be entered:

- Tag
- Message
- Date

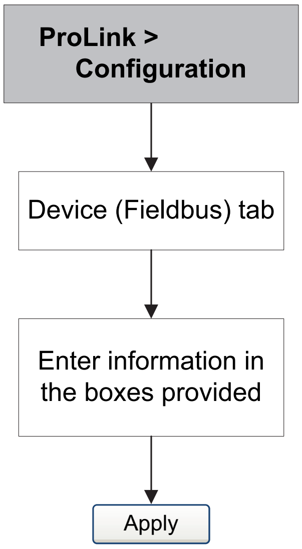
These parameters are for user convenience and network management. They are not used in transmitter processing, and are not required.

You can set the tag with a fieldbus host by using the host's tagging features. You can set the tag, message, and date with ProLink II (Figure 4-36).

CAUTION

Setting the software tag via ProLink II will cause the transmitter to restart.

Figure 4-36 **Device settings – ProLink II**



If you are entering a date, use the left and right arrows at the top of the calendar shown in ProLink II to select the year and month, then click on a date.

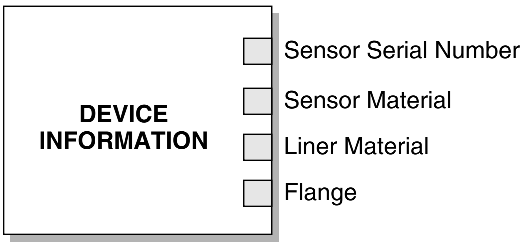
4.17 Configuring sensor parameters

The sensor parameters are used to describe the sensor component of your flowmeter. These sensor parameters are not used in transmitter processing, and are not required:

- Serial number
- Sensor material
- Liner material
- Flange

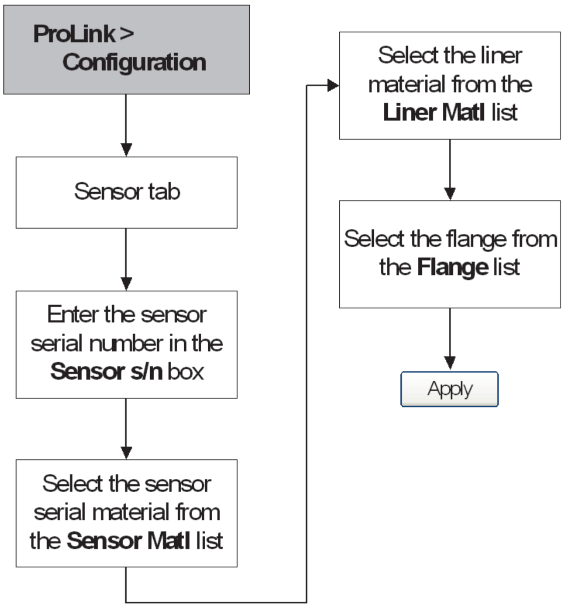
You can configure the sensor parameters with a fieldbus host (Figure 4-37) or ProLink II (Figure 4-38).

Figure 4-37 **Sensor parameters – Fieldbus host**



Sensor Serial Number	–	Enter the sensor serial number.
Sensor Material		Select the sensor material.
Liner Material		Select the liner material.
Flange		Select the flange.

Figure 4-38 **Sensor parameters – ProLink II**



4.18 Changing the display functionality

You can restrict the display functionality or change the variables that are shown on the display.

4.18.1 Enabling and disabling display functions

Display function are listed in Table 4-16.

Table 4-16 **Display functions and parameters**

Display function	Fieldbus parameter	Display code	Enabled	Disabled
Totalizer reset(1)	Totalizer reset	TOTAL RESET	Resetting mass and volume totalizers is permitted.	Resetting mass and volume totalizers is not possible.
Totalizer start/stop	Totalizer start/stop	TOTAL STOP	Operator can start and stop totalizers from the display.	Operator cannot start or stop totalizers.
Auto scroll(2)	Auto scroll	AUTO SCRLL	Display automatically scrolls through each process variable.	Operator must **Scroll** to view process variables.
Offline menu	Offline menu	DISPLAY OFFLN	Operator has access to the offline menu.	No access to the offline menu.
Alarm menu	Alarm menu	DISPLAY ALARM	Operator has access to alarm menu.	No access to the alarm menu.
ACK all alarms	ACK all alarms	DISPLAY ACK	Operator can acknowledge all current alarms at once.	Alarms must be acknowledged individually.
Offline password(3)	Offline password	CODE OFFLN	Password required for offline menu. See Section 4.18.4	Offline menu accessible without a password.

Table 4-16 Display functions and parameters (continued)

Display function	Fieldbus parameter	Display code	Enabled	Disabled
Display backlight	Display backlight	DISPLAY BKLT	Display backlight is ON.	Display backlight is OFF.
Status LED blinking	Status LED blinking	Not accessible via the display	Status LED will blink when there are unacknowledged alarms active.	Status LED will not blink.
Alarm password(3)	Alarm password	CODE ALARM	Password required for alarms menu.	Alarm menu accessible without a password.

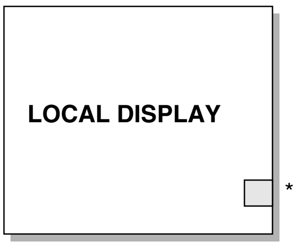
(1) If the petroleum measurement application is installed on your transmitter, the display password is always required to start, stop, or reset a totalizer, even if neither password is enabled. If the petroleum measurement application is not installed, the display password is never required for these functions, even if one of the display passwords is enabled.
(2) If enabled, you may want to configure Scroll Rate. See Section 4.18.2.
(3) If enabled, the display password must also be configured. See Section 4.18.4.

Note the following:

- If you use the display to disable access to the off-line menu, the off-line menu will disappear as soon as you exit the menu system. If you want to re-enable access, you must use a different method (e.g., ProLink II).
- If you are using the display to configure the display:
  - You must enable Auto Scroll before you can configure Scroll Rate.
  - You must enable the off-line password before you can configure the password.

You can enable and disable the display parameters with a fieldbus host (Figure 4-39), ProLink II (Figure 4-40), or the display (Figure 4-41).

Figure 4-39 Display functions – Fieldbus host



* – Refer to the fieldbus parameters in Table 4-16. Each parameter can be set to *Enabled* or *Disabled*.

Figure 4-40 **Display functions – ProLink II**

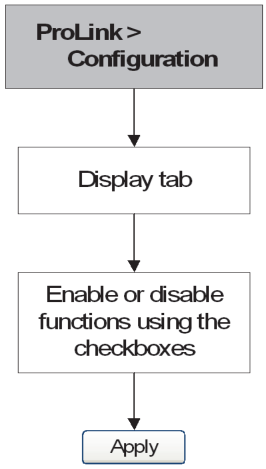
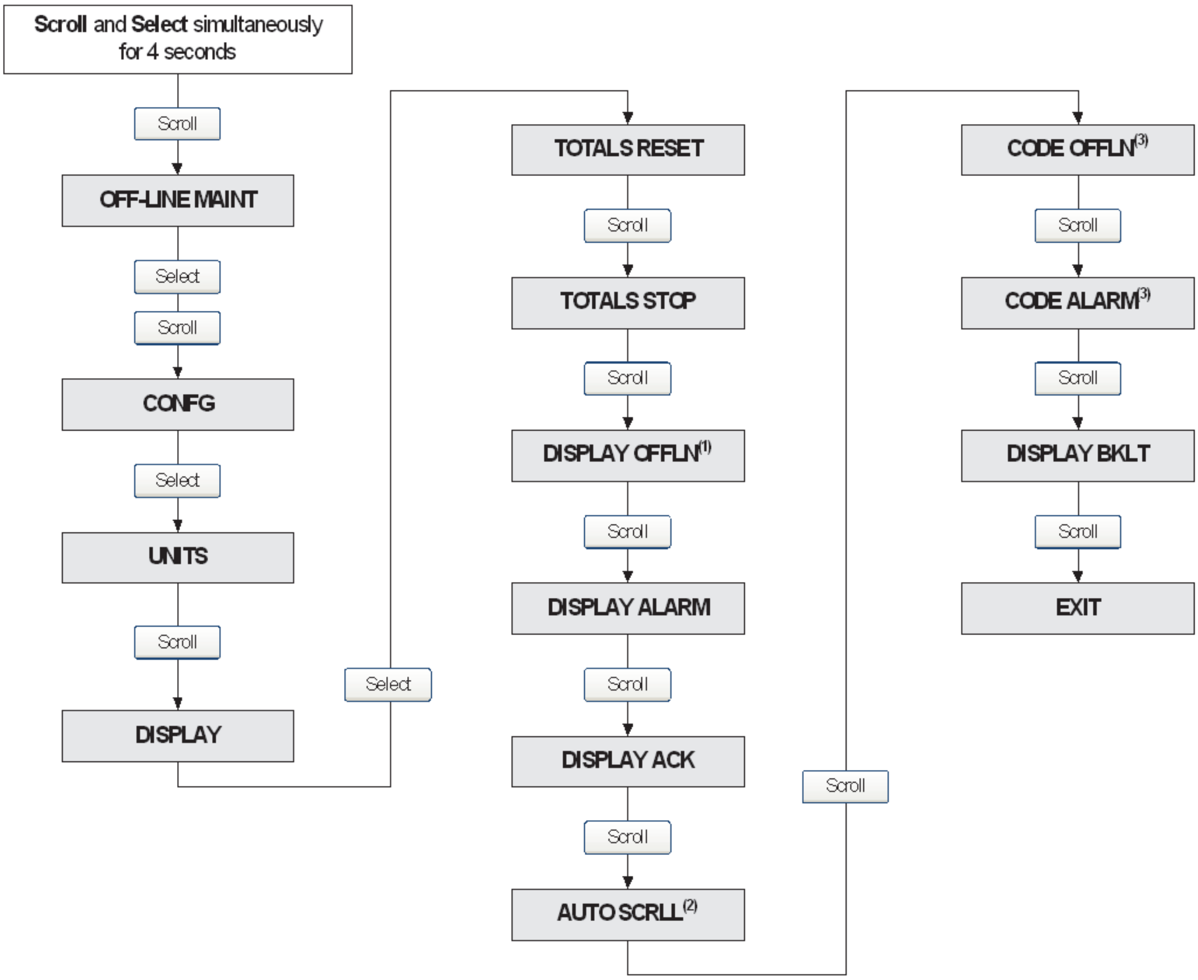


Figure 4-41 Display functions – Display



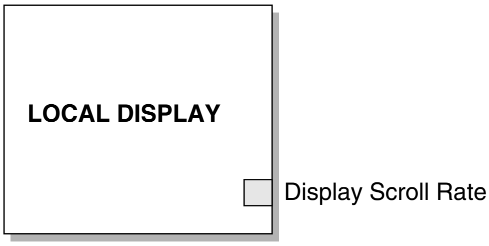
(1) If you disable access to the offline menu, the offline menu will disappear as soon as you exit. To re-enable access, you must use a fieldbus host or ProLink II.
(2) If Auto Scroll is enabled, a Scroll Rate screen is displayed immediately after the Auto Scroll screen.
(3) If either password is enabled, a Change Code screen will be displayed so that the password can be configured.

4.18.2 Changing the scroll rate

The *scroll rate* is used to control the speed of scrolling when auto scroll is enabled. Scroll rate defines how long each display variable will be shown on the display. The time period is defined in seconds (e.g., if scroll rate is set to 10, each display variable will be shown on the display for 10 seconds). The valid range is from 0 to 10 seconds.

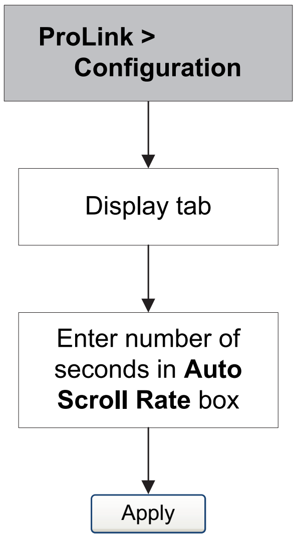
You can change the scroll rate with a fieldbus host (Figure 4-42) or ProLink II (Figure 4-43).

Figure 4-42 **Scroll rate – Fieldbus host**



Display Scroll Rate – Set to the number of seconds each variable should be displayed.

Figure 4-43 **Scroll rate – ProLink II**

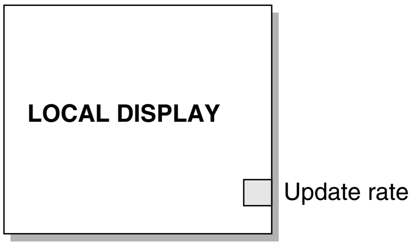


4.18.3 Changing the update period

The update period (or display rate) parameter controls how often the display is refreshed with current data. The default is 200 milliseconds. The range is 100 to 10000 milliseconds. The update period value applies to all displayed process variables.

You can change the update period with a fieldbus host (Figure 4-44), ProLink II (Figure 4-45), or the display (Figure 4-46).

Figure 4-44 Update period – Fieldbus host



Update Rate – Set to the number of milliseconds between updates to the display (100 to 10000, default is 200).

Figure 4-45 Update period – ProLink II

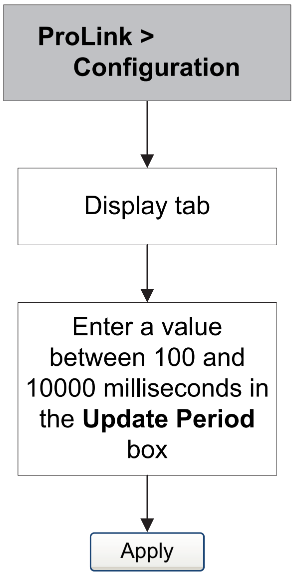
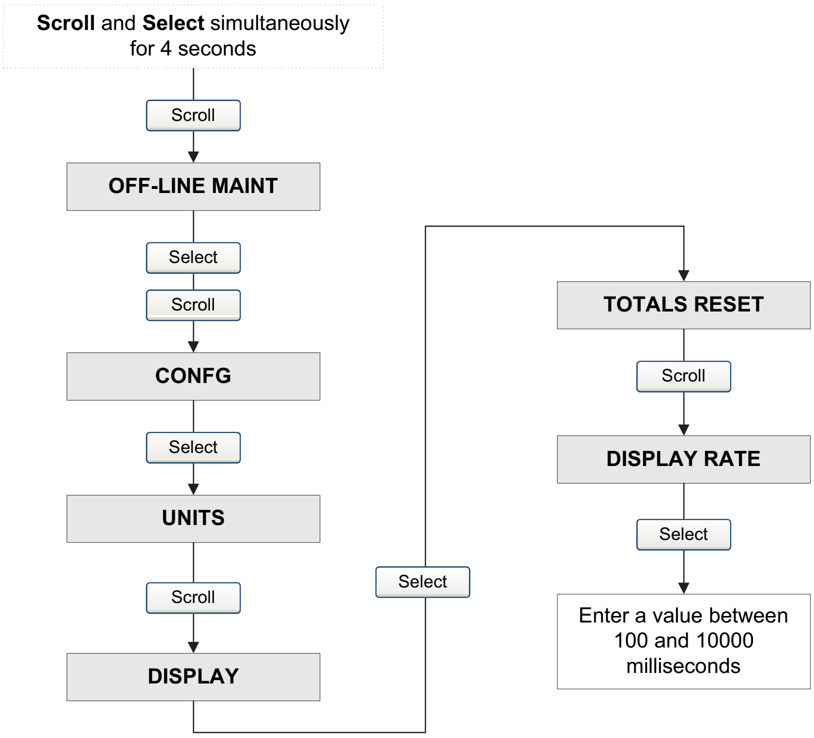


Figure 4-46 **Update period – Display**



4.18.4 Changing the display password

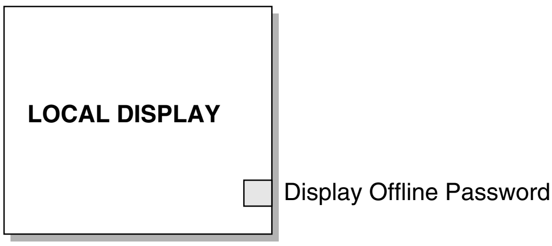
The display password is a numeric code that can contain up to four digits. It is used for both the off-line menu password and the alarm menu password. See Section G.4.4 for information on how the two passwords are implemented.

If you are using the display, you must enable either the off-line password or the alarm screen password before you can configure the password (see Section 4.18.1).

Note: If the petroleum measurement application is installed on your transmitter, the display password is always required to start, stop, or reset a totalizer, even if neither password is enabled. If the petroleum measurement application is not installed, the display password is never required for these functions, even if one of the passwords is enabled.

You can change the password with a fieldbus host (Figure 4-47), Prolink II (Figure 4-48), or the display (Figure 4-49).

Figure 4-47 **Display password – Fieldbus host**



Display Offline Password – Enter a 4-digit password between 0000 and 9999.

Figure 4-48 **Display password – ProLink II**

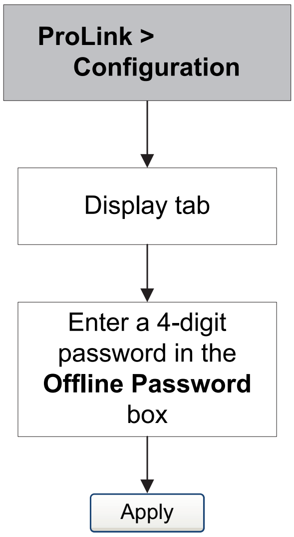
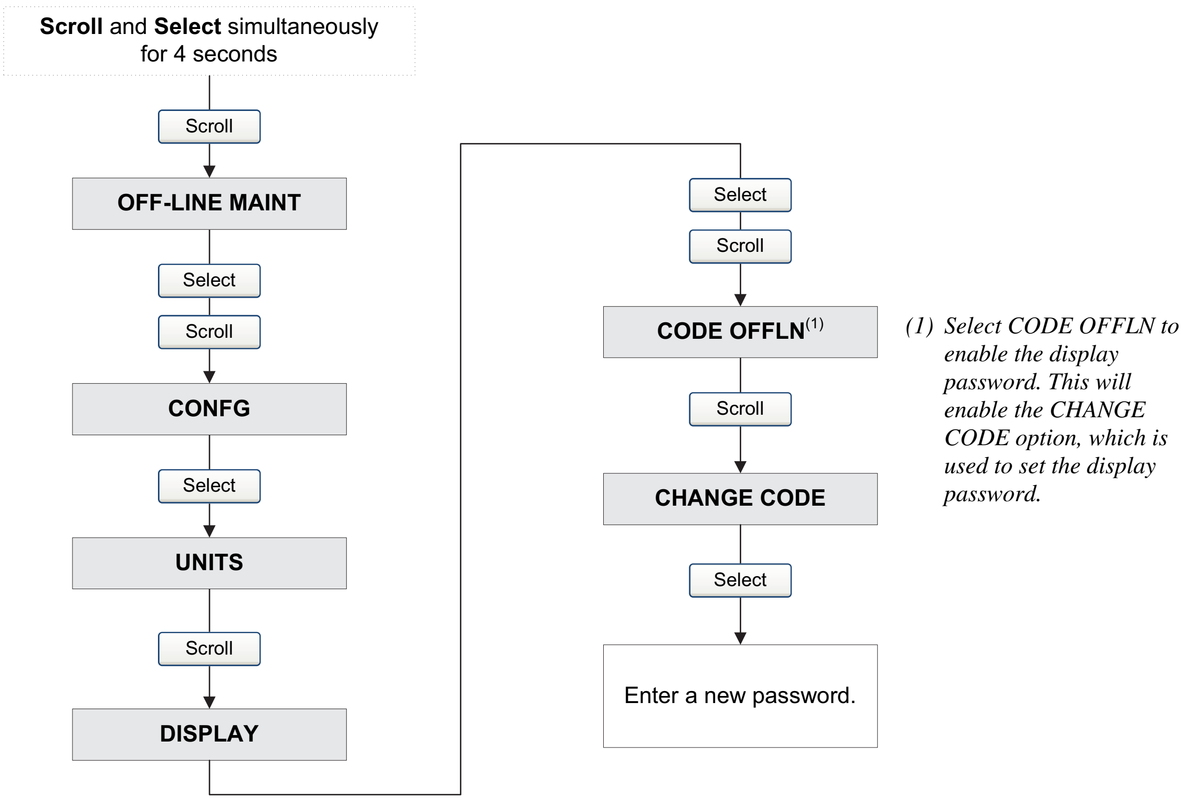


Figure 4-49 **Display password – Display**



4.18.5 Changing the display variables and precision

The display can scroll through up to 15 process variables in any order. You can select the process variables you wish to see and the order in which they should appear.

Additionally, you can configure display precision for each display variable. Display precision controls the number of digits to the right of the decimal place. The range of the display precision is 0 to 5.

Note: If you change the volume flow type from Liquid Volume to Gas Standard Volume (see Section 4.3), any display variables configured for volume flow will change automatically to GSV flow. Likewise, if you change the volume flow type from Gas Standard Volume to Liquid Volume, any display variables configured for GSV flow will change automatically to volume flow.

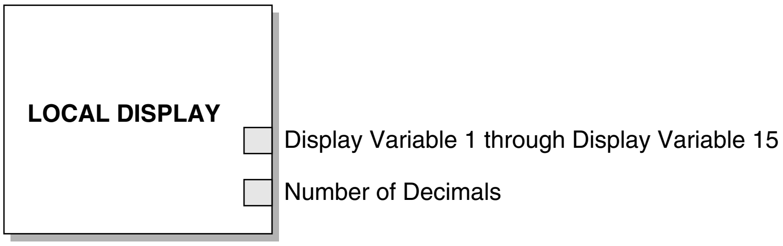
Table 4-17 shows an example of a display variable configuration. Notice that you can repeat variables, and you can choose a value of "None." The actual appearance of each process variable on the display is described in Appendix G.

Table 4-17 Example of a display variable configuration

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

You can change the display variables and precision with a fieldbus host (Figure 4-50) or ProLink II (Figure 4-51).

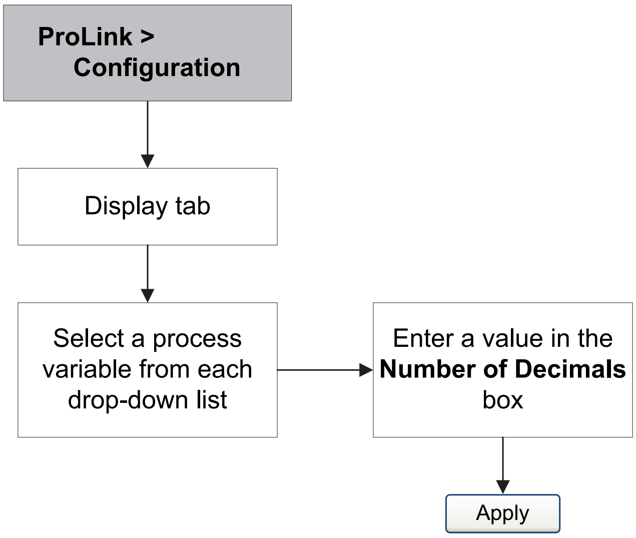
Figure 4-50 **Display variables – Fieldbus host**



Display Variable 1...15 – Set each parameter to an available process variable.

Number of Decimals – Set to the number of decimal places to be shown on the display.

Figure 4-51 **Display variables – ProLink II**



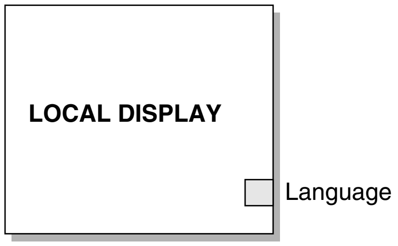
4.18.6 Changing the display language

The display can be configured to use any of the following languages for data and menus:

- English
- French
- German
- Spanish

The display language can be configured using a fieldbus host (Figure 4-52), ProLink II (Figure 4-53), or the display (Figure 4-54).

Figure 4-52 Display language – Fieldbus host



Language – Set to the desired display language.

Figure 4-53 Display language – ProLink II

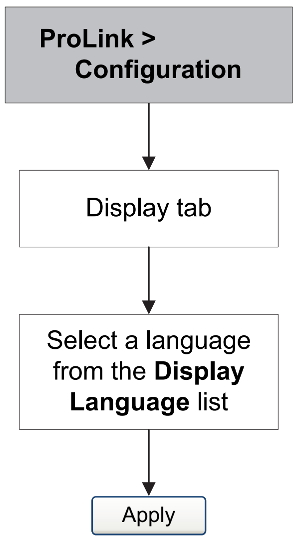
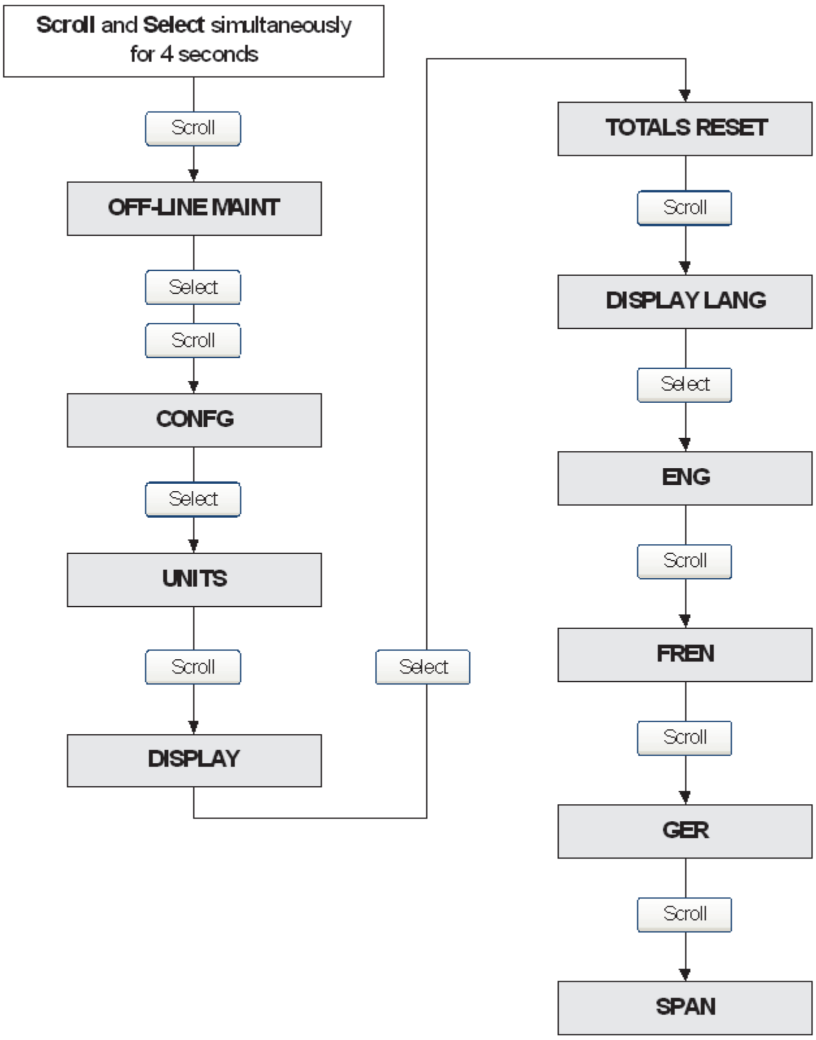


Figure 4-54 Display language – Display

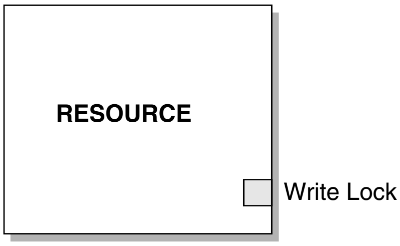


4.19 Configuring write-protect mode

When the transmitter is in write-protect mode, the configuration data stored in the transmitter and core processor cannot be changed until write-protect mode is disabled.

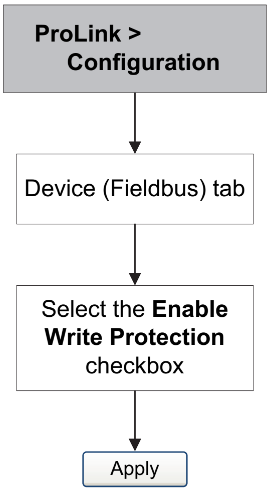
You can configure write-protect mode with a fieldbus host (Figure 4-55), ProLink II (Figure 4-56), or the display (Figure 4-56).

Figure 4-55 Write-protect mode – Fieldbus host



Write Lock – Set to *Locked* to write-protect the transmitter. Set to *Not Locked* to allow configuration.

Figure 4-56 Write-protect mode – ProLink II



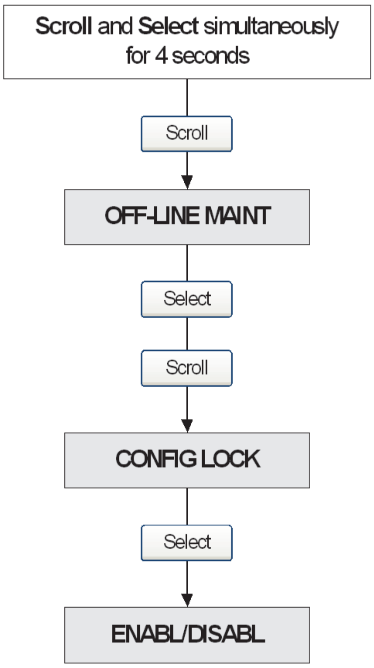


Figure 4-57 **Write-protect mode – Display**

4.20 Enabling LD Optimization

LD Optimization is a special compensation is that is specifically for hydrocarbon liquids. LD Optimization should not be used with any other process fluids. LD Optimization is available only with certain large sensor sizes. If your sensor can benefit from LD Optimization, the enable/disable option will appear in ProLink II or on the display.

> **⚠ CAUTION**
>
> **If you send the transmitter to a calibration facility to perform a water calibration, either during startup or any time thereafter, LD Optimization must be disabled. When you have completed the calibration, re-enable LD Optimization.**

To enable LD Optimization, see Figures 4-58 and 4-59.

Figure 4-58 LD Optimization – ProLink II

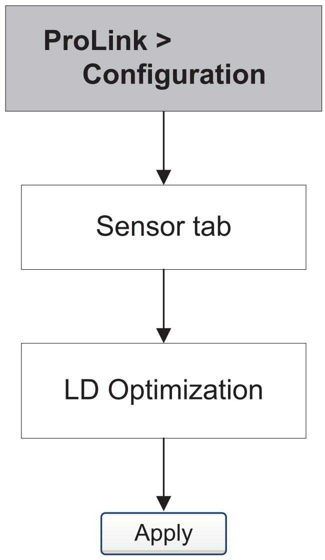
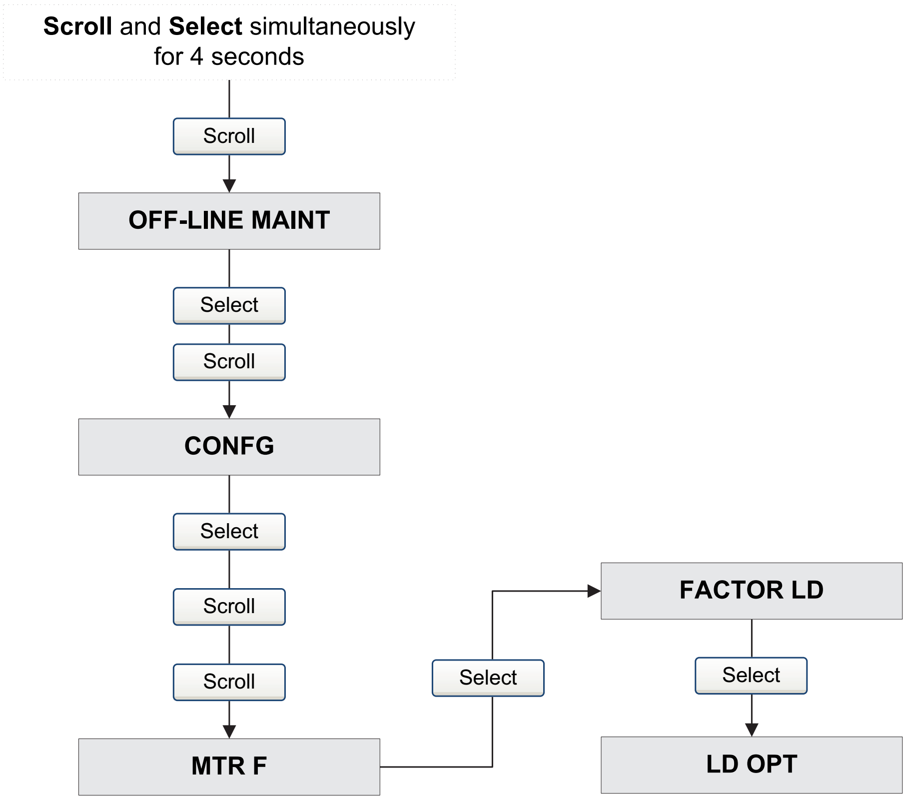


Figure 4-59 **LD Optimization – Display**



Chapter 5
Operation

5.1 Overview

This section describes how to use the transmitter in everyday operation. The procedures in this section will enable you to use a fieldbus host, the display, or ProLink II to:

- View process variables (Section 5.2)
- Use simulation mode (Section 5.3)
- Respond to alarms (Section 5.4)
- Use the totalizers and inventories (Section 5.5)

Note: All procedures provided in this chapter assume that you have established communication with the transmitter and that you are complying with all applicable safety requirements. See Appendices E and F.

5.2 Viewing process variables

Process variables include measurements such as mass flow rate, volume flow rate, mass total, volume total, temperature, density, and drive gain.

You can view process variables with a fieldbus host, the display, or ProLink II.

With a fieldbus host

The transmitter has four fieldbus AI function blocks. Each AI function block reports the value of one process variable, the associated units of measure, and a status value that indicates measurement quality. For more information on the function blocks, refer to the *FOUNDATION Fieldbus Blocks* manual, available at the Rosemount web site (www.rosemount.com).

To view a process variable, select the AI function block that measures that variable, and read the Out parameter. The output of AI blocks may be influenced by output scaling (see Section 4.9).

You can also view each process variable by reading the MEASUREMENT transducer block parameter for each process variable. Table 5-1 lists the process variables that correspond to each MEASUREMENT transducer block parameter.

Table 5-1 Process variable parameters in the MEASUREMENT transducer block

Process variable	Transducer block parameter
Mass-flow rate	Mass Flow: Value
Volume-flow rate	Volume Flow: Value
Temperature	Temperature: Value
Density	Density: Value
Gas standard volume(1)	Gas Volume Flow Rate: Value

(1) Gas standard volume is not available if either the petroleum measurement application or the concentration measurement application is enabled.

With the display

Refer to Appendix G for a detailed explanation of how to use the display to view process variables. The process variables shown by the display may need to be configured. Refer to Section 4.18.5.

With ProLink II software

To view process variables with ProLink II, choose **ProLink > Process Variables**.

5.2.1 Viewing API process variables

You can view petroleum measurement (API) process variables with a fieldbus host, the display, or ProLink II.

With a fieldbus host

If an AI function block has been configured to use one of the petroleum measurement (API) variable channels (see Section 2.3), you can select that AI block and read its Out parameter.

You can also view all of the petroleum measurement (API) variables by examining their parameters in the petroleum measurement (API) transducer block. Table 5-2 lists the API process variables that correspond to each API transducer block parameter.

Table 5-2 Petroleum Measurement process variables by API transducer block parameter

API process variable	API transducer block parameter
Temperature corrected density	API Corr Density: Value
Temperature corrected (standard) volume flow	API Corr Volume Flow: Value
Batch weighted average density	API Ave Density: Value
Batch weighted average temperature	API Ave Temperature: Value

With the display

Refer to Appendix G for a detailed explanation of how to use the display to view process variables. The process variables shown by the display may need to be configured. Refer to Section 4.18.5.

With ProLink II software

To view API process variables with ProLink II software, choose **ProLink > API Process Variables**.

5.2.2 Viewing concentration measurement process variables

You can view concentration measurement (CM) process variables with a fieldbus host, the display, or ProLink II.

With a fieldbus host

If an AI function block has been configured to use one of the CM variable channels (see Section 2.3), you can select that AI block and read its Out parameter.

You can also view all of the CM variables by examining their parameters in the CONCENTRATION MEASUREMENT transducer block. Table 5-2 lists the CM process variables that correspond to each CONCENTRATION MEASUREMENT transducer block parameter.

Table 5-3 CM process variables by CONCENTRATION MEASUREMENT transducer block parameter

CM process variable	CONCENTRATION MEASUREMENT transducer block parameter
Density at reference	CM Density At Ref: Value
Density (fixed specific gravity units)	CM Density SG: Value
Standard volume flow rate	CM Std Volume Flow: Value
Net mass flow rate	CM Net Mass Flow: Value
Concentration	CM Concentration: Value

With the display

Refer to Appendix G for a detailed explanation of how to use the display to view process variables. The process variables shown by the display may need to be configured. Refer to Section 4.18.5.

With ProLink II software

To view CM process variables with ProLink II, choose **ProLink > CM Process Variables**.

5.3 Simulation mode

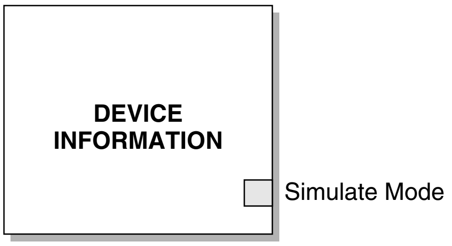
The transmitter has two simulation modes:

- Fieldbus simulation mode
- Sensor simulation mode

5.3.1 Fieldbus simulation mode

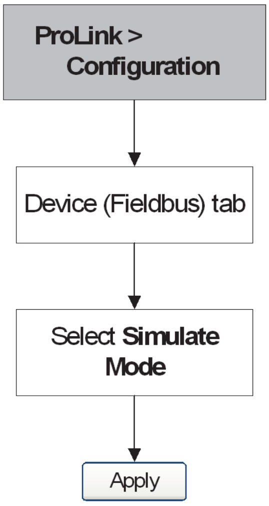
The transmitter has a "simulate enable" switch that causes the transmitter to function in simulation mode as defined in the FOUNDATION fieldbus function block specification. This switch is software-selectable via a fieldbus host (Figure 5-1) or ProLink II (Figure 5-2).

Figure 5-1 Fieldbus simulation mode – Fieldbus host



Simulate Mode – Set to *Enabled* to activate simulation mode.

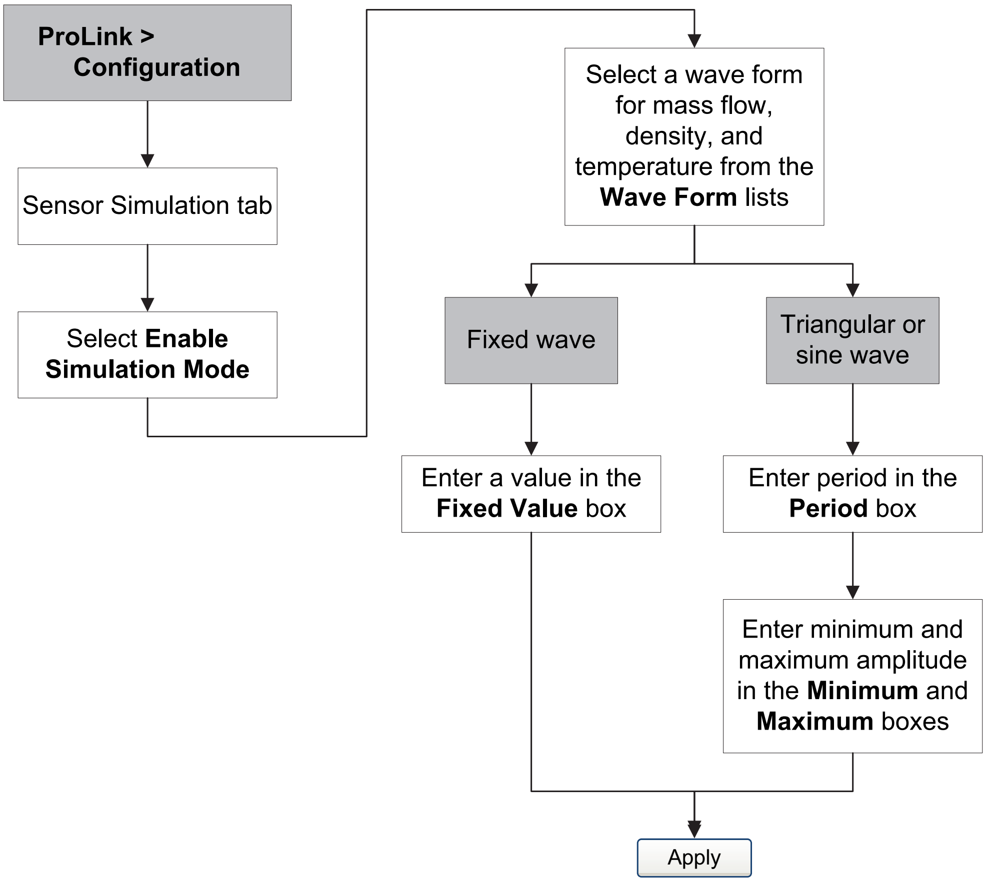
Figure 5-2 Fieldbus simulation mode – ProLink II



5.3.2 Sensor simulation mode

Sensor simulation mode causes simulated values to be substituted for actual process data from the sensor. Sensor simulation mode can be enabled only with ProLink II (Figure 5-3).

Figure 5-3 Sensor simulation mode – ProLink II



5.4 Responding to alarms

The transmitter broadcasts alarms when a process variable exceeds its defined limits or the transmitter detects a fault condition. For instructions regarding all the possible alarms, see Section 6.10.

5.4.1 Viewing alarms

You can view alarms with a fieldbus host, the display, or ProLink II software.

With a fieldbus host

The transmitter sets its fieldbus output status to *bad* or *uncertain* whenever an alarm condition occurs. A PlantWeb Alert may also be posted. (See Appendix A for information about PlantWeb Alerts.) When the output status is bad or uncertain, you can view an alarm by reading the following alarm parameters:

- Each AI function block contains a parameter called Block Error that contains the alarm bits for that AI block.
- The DIAGNOSTICS transducer block contains four parameters named Alarm Status 1 through Alarm Status 4. Each of these parameters has a short list of alarm bits (see Appendix B).

With the display

The display reports alarms in two ways:

- With a status LED, which reports only that one or more alarms has occurred
- Through the alarm queue, which reports each specific alarm

Note: If access to the alarm menu from the display has been disabled (see Section 4.18), then the display will not list alarm codes in an alarm queue and the status LED will not flash. The status LED will indicate status using solid green, yellow, or red.

The status LED is located at the top of the display (Figure 5-4). The status LED can be in one of six possible states, as listed in Table 5-4.

Figure 5-4 Display alarm menu

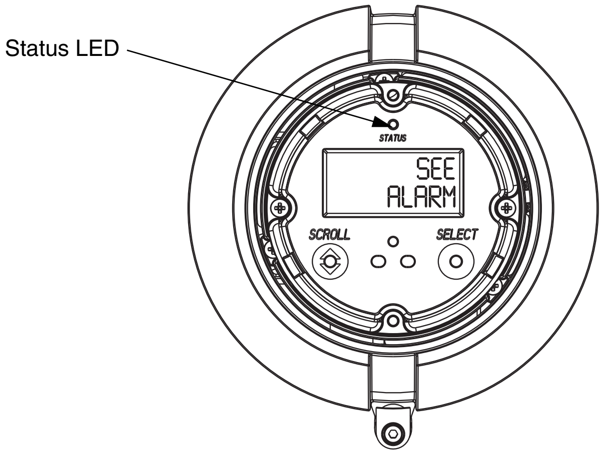


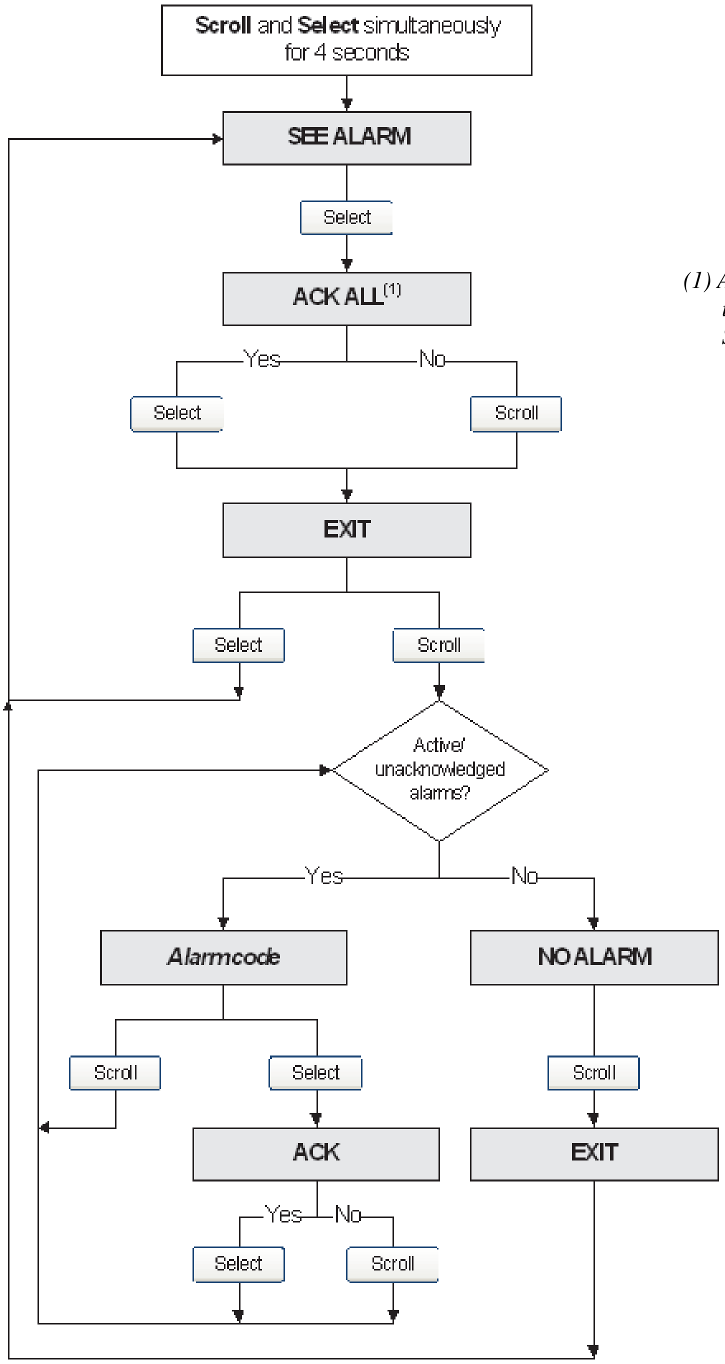
Table 5-4 Priorities reported by the status LED

Status LED state	Alarm priority
Green	No alarm—normal operating mode
Flashing green(1)	Unacknowledged corrected condition
Yellow	Acknowledged low severity alarm
Flashing yellow(1)	Unacknowledged low severity alarm
Red	Acknowledged high severity alarm
Flashing red(1)	Unacknowledged high severity alarm

(1) If the LED blinking option is turned off (see Section 4.18.1), the status LED will flash only during calibration. It will not flash to indicate an unacknowledged alarm.

Alarms in the alarm queue are arranged according to priority. To view specific alarms in the queue, see Figure 5-5.

Figure 5-5 **Viewing and acknowledging alarms – Display**



(1) ACK ALL will appear only if it has been enabled. See Section 5.4.

With ProLink II

ProLink II provides two ways to view alarm information:

- Choose **ProLink > Status**. This window shows the current status of all possible alarms, independent of configured alarm severity. The alarms are divided into three categories: Critical, Informational, and Operational. To view the indicators in a category, click on the associated tab. A tab is red if one or more status indicators in that category is active. On each tab, currently active alarms are shown by red indicators.
- Choose **ProLink > Alarm Log**. This window lists all active alarms, and all inactive but unacknowledged Fault and Informational alarms. (The transmitter automatically filters out Ignore alarms.) A green indicator means “inactive but unacknowledged” and a red indicator means “active.” Alarms are organized into two categories: High Priority and Low Priority.

Note: The location of alarms in the Status and Alarm Log windows are not affected by the configured alarm severity (see Section 4.11). Alarms in the Status window are predefined as Critical, Informational, or Operational. Alarms in the Alarm Log window are predefined as High Priority or Low Priority.

5.4.2 Acknowledging alarms

You can acknowledge alarms using ProLink II or the display. For transmitters with a display, access to the alarm menu can be enabled or disabled, and a password may be required. If access to the alarm menu is enabled, the operator may be disallowed from acknowledging all alarms simultaneously (the **Ack All?** function). See Section 4.18.1 for information on controlling these functions.

If the LED blinking option has been turned off, the status LED will not flash to indicate unacknowledged alarms. Alarms can still be acknowledged.

To acknowledge alarms using the display:

1. Activate and hold **Scroll** and **Select** simultaneously until the words **SEE ALARM** appear on the screen. See Figure 5-4.
2. **Select**.
3. If the words **NO ALARM** appear, go to Step 8.
4. If you want to acknowledge all alarms:
   a. Scroll until the word **ACK** appears by itself. The word **ACK** begins to alternate with the word **ALL?**.
   b. **Select**.

Note: If the “acknowledge all alarms” feature has been disabled (see Section 4.18.1, then you must acknowledge each alarm individually. See Step 5.

5. If you want to acknowledge a single alarm:
   a. Scroll until the alarm you want to acknowledge appears.
   b. Select. The word **ALARM** begins to alternate with the word **ACK**.
   c. Select to acknowledge the alarm.
6. If you want to acknowledge another alarm, go to Step 3.
7. If you do NOT want to acknowledge any more alarms, go to Step 8.
8. Scroll until the word **EXIT** appears.
9. **Select**.

To acknowledge alarms using ProLink II:

1. Click **ProLink > Alarm Log**. Entries in the alarm log are divided into two categories: High Priority and Low Priority, corresponding to the default Fault and Information alarm severity levels. Within each category:
   - All active alarms are listed with a red status indicator.
   - All alarms that are "cleared but unacknowledged" are listed with a green status indicator.
2. For each alarm that you want to acknowledge, select the **ACK** checkbox.

5.5 Using the totalizers and inventories

The *totalizers* keep track of the total amount of mass or volume measured by the transmitter over a period of time. The totalizers can be viewed, started, stopped, and reset.

The *inventories* track the same values as the totalizers but can be reset separately. Because the inventories and totals are reset separately, you can use the inventories to keep a running total of mass or volume across multiple totalizer resets.

5.5.1 Viewing the totalizers and inventories

You can view the current value of the mass totalizer, volume totalizer, mass inventory, and volume inventory with a fieldbus host, the display, or ProLink II.

With a fieldbus host

If you have set up the INT function block to report the status of one of the internal totalizers or inventories (see Section 2.4), you can simply read the Out parameter of the INT function block.

You can also view any of the internal totalizers or inventories by inspecting their respective transducer block parameters. See Table 5-5.

Table 5-5 Totalizer and inventory parameter names

Totalizer/inventory	Transducer block	Parameter name
Mass totalizer	MEASUREMENT	Mass Total: Value
Volume totalizer	MEASUREMENT	Volume Total: Value
Mass inventory	MEASUREMENT	Mass Inventory: Value
Volume Inventory	MEASUREMENT	Volume Inventory: Value
Reference volume gas total(1)	MEASUREMENT	Gas Volume Total: Value
Reference volume gas inventory(1)	MEASUREMENT	Gas Volume Inventory: Value
Temperature corrected volume total	API	API Corr Volume Total: Value
Temperature corrected volume inventory	API	API Corr Vol Inventory: Value
Standard volume total(2)	CONCENTRATION MEASUREMENT	CM Std Volume Total: Value
Standard volume inventory(2)	CONCENTRATION MEASUREMENT	CM Std Vol Inventory: Value
Net mass total(2)	CONCENTRATION MEASUREMENT	CM Net Mass Total: Value

Table 5-5 Totalizer and inventory parameter names (continued)

Totalizer/inventory	Transducer block	Parameter name
Net mass inventory(2)	CONCENTRATION MEASUREMENT	CM Net Mass Inventory: Value
Net volume total(2)	CONCENTRATION MEASUREMENT	CM Net Volume Total: Value
Net volume inventory(2)	CONCENTRATION MEASUREMENT	CM Net Vol Inventory: Value

(1) Not valid when the petroleum measurement or concentration measurement applications are active.
(2) Not all of these totals are available at one time. The available totals depend on the concentration measurement application configuration.

With the display

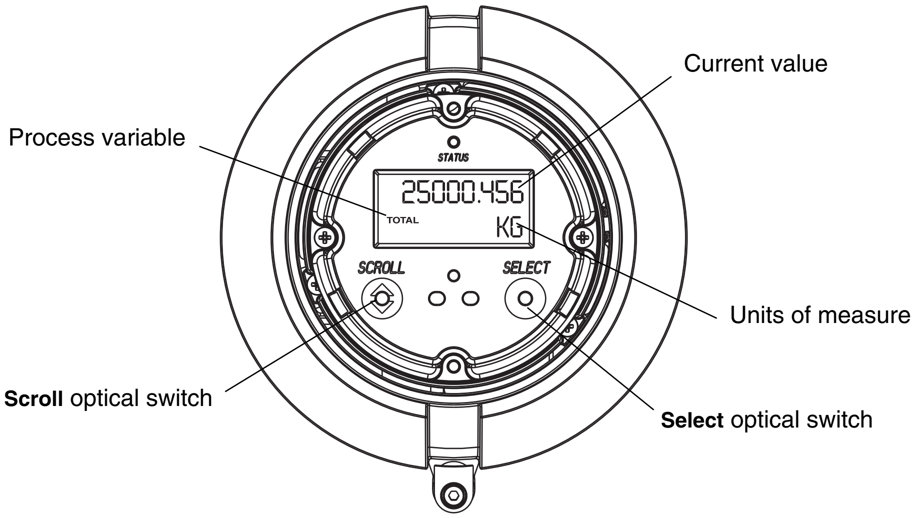
You cannot view totalizers or inventories with the display unless the display has been configured to show them. Refer to Section 4.18.5.

1. To view totalizer values, **Scroll** until the process variable **TOTAL** appears and the units of measure are:
   - For the mass totalizer, mass units (e.g., kg, lb)
   - For the volume totalizer, volume units (e.g., gal, cuft)
   - For petroleum measurement or concentration measurement totalizers, the mass or volume unit alternating with the process variable (e.g., **TCORR** or **NET M**) (see Table G-1).

   See Figure 5-6. Read the current value from the top line of the display.
2. To view inventory values, **Scroll** until the process variable **TOTAL** appears and:
   - For the mass inventory, the word **MASSI** (Mass Inventory) begins to alternate with the units of measure
   - For the volume inventory, the word **LVOLI** (Line Volume Inventory) begins to alternate with the units of measure
   - For petroleum measurement or concentration measurement inventories, the mass or volume unit alternating with the process variable (e.g., **TCORI** or **NET VI**) (see Table G-1).

   See Figure 5-6. Read the current value from the top line of the display.

Figure 5-6 **Display totalizer**



With ProLink II

To view the current value of the totalizers and inventories with ProLink II, choose:

- **ProLink > Process Variables** to view standard totalizers and inventories
- **ProLink > API Process Variables** to view API totalizers and inventories
- **ProLink > CM Process Variables** to view CM totalizers and inventories

5.5.2 Controlling the totalizers and inventories

Table 5-6 shows all of the totalizer functions and which configuration tools you can use to control them.

Table 5-6 **Totalizer and inventory control methods**

Function Name	Fieldbus host	Prolink II	Display(1)
Stop all totalizers and inventories	Yes	Yes	Yes
Start all totalizers and inventories	Yes	Yes	Yes
Reset mass or volume totalizer only	Yes	Yes	Yes(2)
Reset API totalizer only	Yes	No	Yes(2)
Reset CM totalizer only	Yes	Yes	Yes(2)
Reset all totalizers	Yes	Yes	No
Reset all inventories	Yes	Yes(3)	No
Reset individual inventories	Yes	Yes(3)	No

(1) These display functions may be enabled or disabled. See Section 4.18.
(2) This function is available only if the corresponding totalizer is configured as a display variable (see Section 4.18.5).
(3) If enabled in the ProLink II preferences.

With a fieldbus host

If you have set up the INT function block to report the status of one of the internal totalizers (i.e., not *Standard* mode) (see Section 2.4), you can reset that totalizer by selecting the INT function block and setting the OP_CMD_INT method parameter to *Reset*.

You can also control the internal totalizers directly by using the method parameters shown in Table 5-7.

Table 5-7 Totalizer/inventory control – Fieldbus host

To accomplish this	Select this transducer block	And use this method parameter
Stop all totalizers and inventories	MEASUREMENT	Stop All Totals
Start all totalizers and inventories	MEASUREMENT	Start Totals
Reset mass totalizer	MEASUREMENT	Reset Mass Total
Reset volume totalizer	MEASUREMENT	Reset Volume Total
Reset gas volume totalizer	MEASUREMENT	Reset Gas Standard Volume Total
Reset API totalizer	API	Reset API Volume Total
Reset CM standard volume totalizer	CONCENTRATION MEASUREMENT	Reset CM Std Volume Total
Reset CM net mass totalizer	CONCENTRATION MEASUREMENT	Reset CM Net Mass Total
Reset CM net volume totalizer	CONCENTRATION MEASUREMENT	Reset CM Net Volume Total
Reset mass inventory	MEASUREMENT	Reset Mass Inventory
Reset volume inventory	MEASUREMENT	Reset Volume Inventory
Reset gas volume inventory	MEASUREMENT	Reset Gas Standard Volume Inventory
Reset API inventory	API	Reset API Inventory
Reset CM standard volume inventory	CONCENTRATION MEASUREMENT	Reset CM Volume Inventory
Reset CM net mass inventory	CONCENTRATION MEASUREMENT	Reset CM Net Mass Inventory
Reset CM net volume inventory	CONCENTRATION MEASUREMENT	Reset CM Net Volume Inventory
Simultaneously reset all totalizers	MEASUREMENT	Reset Totalizers
Simultaneously reset all inventories	MEASUREMENT	Reset Inventories

With Prolink II

To control CM totalizers and inventories, choose **ProLink > CM Totalizer Control**. To control all other totalizer and inventory functions, choose **ProLink > Totalizer Control**.

To reset inventories using ProLink II, you must first enable this capability. To enable inventory reset using ProLink II:

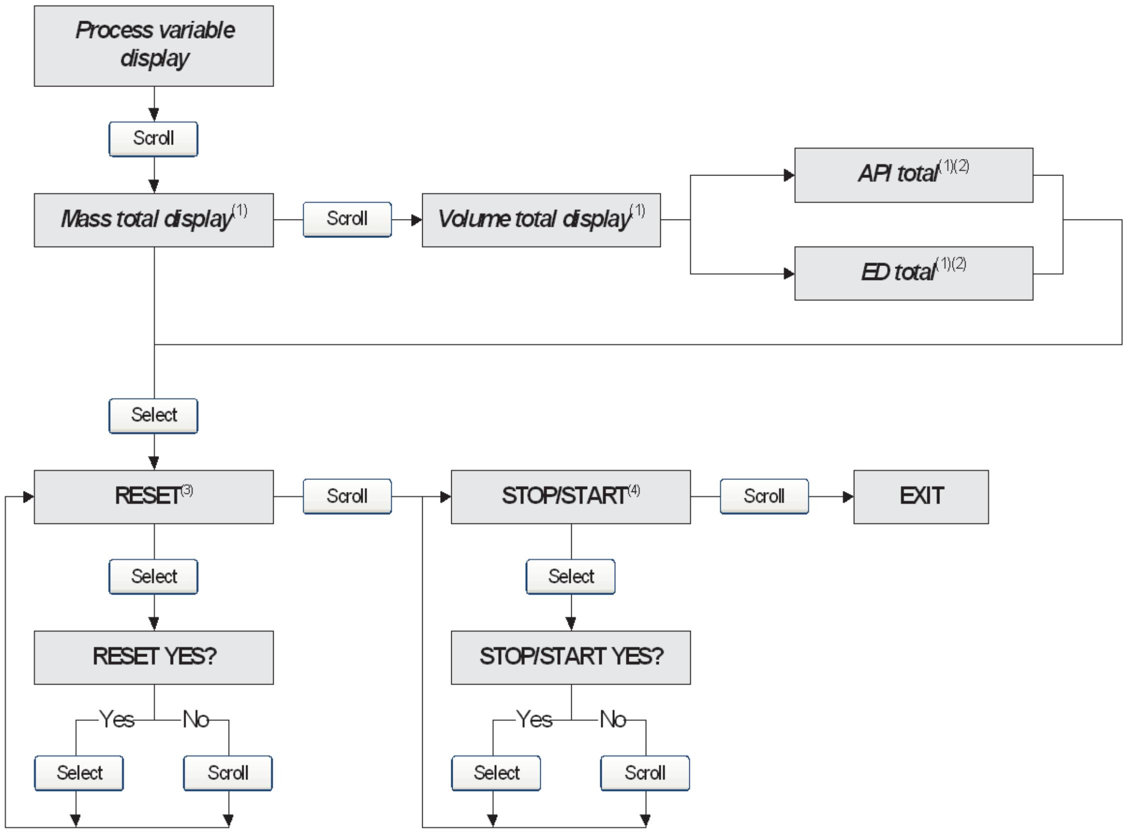
1. Choose **View > Preferences**.
2. Select the **Enable Inventory Totals Reset** checkbox.
3. Click **Apply**.

With the display

Figure 5-7 shows how you can control the totalizers and inventories with the display.

- Starting or stopping totalizers and inventories will start or stop all totalizers and inventories simultaneously.
- Resetting totalizers resets only the totalizer for which the reset is selected. Inventories cannot be reset using the display.

Figure 5-7 Display menu — controlling totalizers and inventories



(1) Displayed only if configured as a display variable (see Section 4.18.5).
(2) The petroleum measurement application or concentration measurement application must be enabled.
(3) The display must be configured to allow totalizer resetting (see Section 4.18).
(4) The display must be configured to allow stopping and starting (see Section 4.18).

Chapter 6
Troubleshooting

6.1

6.2 Overview

This section describes guidelines and procedures for troubleshooting the flowmeter. The information in this section will enable you to:

- Categorize the problem
- Determine whether you are able to correct the problem
- Take corrective measures (if possible)

Note: All procedures provided in this chapter assume that you have established communication with the transmitter and that you are complying with all applicable safety requirements. See Appendices E and F.

6.3 Guide to troubleshooting topics

Refer to Table 6-1 for a list of troubleshooting topics discussed in this chapter.

Table 6-1 Troubleshooting topics

Topic	Section
Transmitter does not operate	Section 6.4
Transmitter does not communicate	Section 6.5
Zero or calibration failure	Section 6.6
AI block configuration error	Section 6.7
Output problems	Section 6.8
Lost static data alarm	Section 6.9
Status alarms	Section 6.10
Diagnosing wiring problems	Section 6.11
Checking slug flow	Section 6.12
Restoring a working configuration	Section 6.13
Checking the test points	Section 6.14
Checking the core processor	Section 6.15
Checking sensor coils and RTD	Section 6.16

6.4 Transmitter does not operate

If the transmitter is receiving power but all blocks are out of service, see Section 6.9.

If the transmitter is not receiving power and cannot communicate over the network or display, then perform all of the procedures under Section 6.11. If the wiring checks do not indicate a problem with electrical connections, contact the Micro Motion Customer Service Department.

6.5 Transmitter does not communicate

If the transmitter fails to communicate:

- Make sure that the entire fieldbus network is grounded only once (individual segments should not be grounded).
- Perform the procedures under Section 6.11.4.
- If you are using a National Instruments® Configurator, perform the procedures under Section 6.5.1.
- Verify the software version by reading the display at power up.
- Verify the transmitter has fieldbus software loaded into it. At power up, the local display will briefly flash the revision level. For revision 1.0, 1.0 is displayed. For other revisions, x.x F is displayed.

6.5.1 National Instruments basic information

To verify the Dlme Basic Info:

1. Launch the National Instruments Interface Configuration Utility.
2. Select the appropriate port, usually **Port 0**.
3. Click **Edit**.
4. Click **Advanced**.
5. Verify the following information:
   - **Slot Time** equals *7*
   - **Max Response Delay** equals *3*
   - **Min Inter-Pdu Delay** equals *6*

6.6 Zero or calibration failure

If a zero or calibration procedure fails, the transmitter will send one or more status alarms indicating the cause of failure. Refer to Table 6-3 for descriptions of status alarms and possible remedies.

6.7 AI block configuration error

Configuring the measurement units with ProLink II or the display can cause the transmitter's AI blocks to get a configuration error unless the AI blocks are also configured for the same measurement units. This is because ProLink II and the display set measurement units in the MEASUREMENT transducer block, not in the AI block. Therefore, if the units have been configured with ProLink II or the display, the AI blocks must be separately configured to match.

See Section 4.4 for more information about configuring measurement units.

6.8 Output problems

Micro Motion suggests that you make a record of the process variables listed below, under normal operating conditions. This will help you recognize when the process variables are unusually high or low.

- Flow rate
- Density
- Temperature
- Tube frequency
- Pickoff voltage
- Drive gain

For troubleshooting, check the process variables under both normal flow and tubes-full no-flow conditions. Except for flow rate, you should see little or no change between flow and no-flow conditions. If you see a significant difference, record the values and contact Micro Motion Customer Service for assistance.

Unusual values for process variables may indicate a variety of different problems. Table 6-2 lists several possible problems and remedies.

Table 6-2 Output problems and possible remedies

Symptom	Cause	Possible remedies
AI block fault	Measurement units mismatch	Make sure the Transducer Scale: Units Index parameter matches the units specified in the transducer block for that process variable.
No output or incorrect process variable	AI Channel parameter set incorrectly	Verify the AI Channel parameter in the AI block matches the correct transducer block measurement channels.
Steady non-zero flow rate under no-flow conditions	Misaligned piping (especially in new installations)	Correct the piping.
	Open or leaking valve	Check or correct the valve mechanism.
	Bad sensor zero	Rezero the flowmeter. See Section 2.7.
	Bad flow calibration factor	Verify characterization. See Section 6.8.4.

Table 6-2 Output problems and possible remedies (continued)

Symptom	Cause	Possible remedies
Erratic non-zero flow rate under no-flow conditions	Wiring problem	Verify all sensor-to-transmitter wiring and ensure the wires are making good contact. Refer to the installation manual.
	Incorrectly grounded 9-wire cable (only in 9-wire remote and remote core processor with remote transmitter installations)	Verify 9-wire cable installation. Refer to the installation manual.
	Noise in fieldbus wiring	Verify that the wiring is properly shielded against noise. Refer to the installation manual.
	Incorrectly set or bad power conditioner	See Section 6.8.6.
	Vibration in pipeline at rate close to sensor frequency	Check the environment and remove the source of vibration.
	Leaking valve or seal	Check pipeline.
	Inappropriate measurement unit	Check measurement units using a fieldbus host.
	Inappropriate damping value	Check damping. See Section 6.8.1.
	Slug flow	See Section 6.12.
	Plugged flow tube	Check drive gain and frequency. Purge the flow tubes.
	Moisture in sensor junction box (only for 9-wire remote and remote core processor with remote transmitter installations)	Open junction box and allow it to dry. Do not use contact cleaner. When closing, ensure integrity of gaskets and O-rings, and grease all O-rings.
	Mounting stress on sensor	Check sensor mounting. Ensure that: • Sensor is not being used to support pipe. • Sensor is not being used to correct misaligned pipe. • Sensor is not too heavy for pipe.
	Sensor cross-talk	Check environment for sensor with similar (±0.5 Hz) tube frequency.
	Improper sensor grounding	Check the sensor grounding. Refer to the installation manual.
	Incorrect sensor orientation	Not all orientations work with all process fluids. See the installation manual for your sensor.
Erratic non-zero flow rate when flow is steady	Output wiring problem	Verify fieldbus wiring.
	Inappropriate measurement unit	Check measurement units using a fieldbus tool.
	Inappropriate damping value	Check damping. See Section 6.8.1.
	Excessive or erratic drive gain	See Sections 6.14.3 and 6.14.4.
	Slug flow	See Section 6.12.
	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes. Sensor may need to be replaced.
	Wiring problem	Verify all sensor-to-transmitter wiring and ensure the wires are making good contact. Refer to the installation manual.

Table 6-2 Output problems and possible remedies (continued)

Symptom	Cause	Possible remedies
Inaccurate flow rate	Bad flow calibration factor	Verify characterization. See Section 6.8.4.
	Inappropriate measurement unit	Check measurement units using a fieldbus host.
	Bad sensor zero	Rezero the flowmeter. See Section 2.7.
	Bad density calibration factors	Verify characterization. See Section 6.8.4.
	Bad flowmeter grounding	See Section 6.11.3.
	Slug flow	See Section 6.12.
	Incorrectly set linearization	See Section 6.8.7.
	Wiring problem	Verify all sensor-to-transmitter wiring and ensure the wires are making good contact. Refer to the installation manual.
Inaccurate density reading	Problem with process fluid	Use standard procedures to check quality of process fluid.
	Bad density calibration factors	Verify characterization. See Section 6.8.4.
	Wiring problem	Verify all sensor-to-transmitter wiring and ensure the wires are making good contact. Refer to the installation manual.
	Bad flowmeter grounding	See Section 6.11.3.
	Slug flow	See Section 6.12.
	Sensor cross-talk	Check environment for sensor with similar (±0.5 Hz) tube frequency.
	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes. Sensor may need to be replaced.
Temperature reading significantly different from process temperature	RTD failure	Check for alarm conditions and follow troubleshooting procedure for indicated alarm.
	Incorrect calibration factors	Perform temperature calibration. See Section 3.7.
		Verify characterization. See Section 6.8.4.
Temperature reading slightly different from process temperature	Incorrect calibration factors	Perform temperature calibration. See Section 3.7.
		Verify characterization. See Section 6.8.4.
Unusually high density reading	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes. Sensor may need to be replaced.
	Incorrect K2 value	Verify characterization. See Section 6.8.4.
Unusually low density reading	Slug flow	See Section 6.12.
	Incorrect K2 value	Verify characterization. See Section 6.8.4.
Unusually high tube frequency	Sensor erosion	Contact Micro Motion Customer Service.
Unusually low tube frequency	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes. Sensor may need to be replaced.
Unusually low pickoff voltages	Several possible causes	See Section 6.14.5.
Unusually high drive gain	Several possible causes	See Section 6.14.3.

6.8.1 Damping

An incorrectly set damping value may make the transmitter's output appear too sluggish or too jumpy. Adjust the Flow Damping, Temperature Damping, and Density Damping parameters in the MEASUREMENT transducer block to achieve the damping effect you want. See Section 4.12.

Other damping problems

If the transmitter appears to be applying damping values incorrectly or the damping effects do not appear to be changed by adjustments to the damping parameters in the MEASUREMENT transducer block, then the Process Value Filter Time parameter in an AI function block may be improperly set. Inspect each AI function block, and ensure that the Process Value Filter Time parameter is set to zero.

6.8.2 Flow cutoff

If the transmitter is sending an output of zero unexpectedly, then one of the cutoff parameters may be set incorrectly. See Section 4.14 for more information about configuring cutoffs.

6.8.3 Output scale

An incorrectly configured output scale can cause the transmitter to report unexpected output levels. Verify that the Transducer Scale and Output Scale values are set up correctly for each AI block. See Section 4.9.

6.8.4 Characterization

Incorrect characterization parameters can cause the transmitter to send unexpected output values. However, you should suspect an incorrect characterization only in specific circumstances (e.g., pairing the transmitter and sensor together for the first time, replacing the core processor). Refer to Section 3.3 for more information about characterization.

6.8.5 Calibration

Improper calibration may cause the transmitter to send unexpected output values. However, you should suspect an improper calibration only if the transmitter has been field-calibrated recently. Refer to Section 3.2.4 for more information about calibration.

Note: Micro Motion recommends using meter factors, rather than calibration, to prove the meter against a regulatory standard or to correct measurement error. Contact Micro Motion before calibrating your flowmeter. Refer to Section 3.5 for information about meter factors.

6.8.6 Fieldbus network power conditioner

An incorrectly set or bad power conditioner can cause inappropriate communication from the transmitter. For the MTL power conditioner, the red switch (dual redundancy) should be set to *Normal Mode*. The yellow switch (termination) should be set to *Termination In*. If you suspect further problems with the power conditioner, contact Micro Motion Customer Service for assistance.

6.8.7 Linearization

The linearization parameter in each AI function block can affect the transmitter's output. Verify that the Linearization Type parameter is set correctly. See Section 4.8.

6.9 EEPROM Checksum Error

After performing an EEPROM initialization (Initialize NVM) using the Micro Motion Load Utility, the resource block may be out of service.

Use Reset Processor method of the Micro Motion Load Utility to reset all resource blocks and function blocks are initialize.

6.10 Status alarms

Status alarms are reported by a fieldbus host, the display, and ProLink II. Remedies for the alarm states appear in Table 6-3.

Table 6-3 Status alarms and remedies

Alarm code	Description	Possible remedies
A001	(E)EPROM Checksum Error (CP)	Cycle power to the transmitter.
		The flowmeter might need service. Contact Micro Motion Customer Service.
A002	RAM Error (CP)	Cycle power to the transmitter.
		The flowmeter might need service. Contact Micro Motion Customer Service.
A003	Sensor Failure	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Check wiring to sensor. See Section 6.11.2.
		Check for slug flow. See Section 6.12.
		Check sensor tubes.
A004	Temperature Sensor Failure	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Check wiring to sensor. See Section 6.11.2.
		Verify process temperature range is within limits for sensor and transmitter.
		Verify flowmeter characterization. See Section 6.8.4.
		Contact Micro Motion Customer Service.
A005	Input Overrange	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Verify process conditions.
		Verify that transmitter is configured to use appropriate measurement units. See Section 4.4.
		Verify flowmeter characterization. See Section 6.8.4.
		Re-zero the flowmeter. See Section 2.7.
A006	Not Configured	Check the characterization. Specifically, verify the FCF and K1 values. See Section 3.3.
		Contact Micro Motion Customer Service.

Table 6-3 Status alarms and remedies (continued)

Alarm code	Description	Possible remedies
A008	Density Overrange	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Check for air in flow tubes, tubes not filled, foreign material in tubes, coating in tubes.
		Verify characterization. See Section 6.8.4.
A009	Transmitter Initializing/warming Up	Allow the transmitter to warm up. The error should disappear from the status words once the transmitter is ready for normal operation. If alarm does not clear, make sure sensor is completely full or completely empty. Verify sensor configuration and transmitter wiring to sensor (refer to installation manual).
A010	Calibration Failure	If alarm appears during zero, ensure there is no flow through the sensor, then retry.
		Cycle power to the flowmeter, then retry.
A011	Cal - Too Low	Ensure there is no flow through sensor, then retry.
		Cycle power to the flowmeter, then retry.
A012	Cal - Too High	Ensure there is no flow through sensor, then retry.
		Cycle power to the flowmeter, then retry.
A013	Cal - Too Noisy	Remove or reduce sources of electromechanical noise, then attempt the calibration or zero procedure again. Possible sources of noise include: • Mechanical pumps • Electrical interference • Vibration effects from nearby machinery
		Cycle power to the flowmeter, then retry.
A014	Transmitter Failed	Cycle power to the transmitter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A016	Line RTD Temperature Out-of-Range	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Check wiring to sensor. Refer to installation manual.
		Make sure the appropriate sensor type is configured. See Section 3.3.1.
		Contact Micro Motion Customer Service.
A017	Meter RTD Temperature Out-of-Range	Check the test points. See Section 6.14.
		Check the sensor coils. See Section 6.16.
		Contact Micro Motion Customer Service.
A018	(E)EPROM Checksum Error	Cycle power to the transmitter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A019	RAM or ROM Test Error	Cycle power to the transmitter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A020	Calibration Factors Unentered	Check the characterization. Specifically, verify the FCF value. See Section 3.3.

Table 6-3 Status alarms and remedies (continued)

Alarm code	Description	Possible remedies
A021	Incorrect Sensor Type (K1)	Check the characterization. Specifically, verify the K1 value. See Section 3.3.
A025	Protected Boot Sector Fault (CP)	Cycle power to the meter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A026	Sensor/Transmitter Communication Error	Check wiring between transmitter and core processor (see Section 6.11.2). The wires may be swapped. After swapping wires, cycle power to the flowmeter.
		Check for noise in wiring or transmitter environment.
		Check core processor LED. See Section 6.15.2.
		Perform the core processor resistance test. See Section 6.15.3.
A028	Core Processor Write Failure	Cycle power to the meter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A031	Low Power	The core processor is not receiving enough power. Check the power supply to the transmitter, and check power wiring between the transmitter and the core processor (4-wire remote installations only).
A032	Smart Meter Verification In Progress and Outputs Fixed	Allow the procedure to complete.
		If desired, abort the procedure and restart with outputs set to Continue Measurement.
A033	Sensor OK / Tubes Stopped by Process	No signal from LPO or RPO, suggesting that sensor tubes are not vibrating. Verify process. Check for air in the flow tubes, tubes not filled, foreign material in tubes, or coating in tubes.
A034	Smart Meter Verification Failed	Rerun the test. If the test fails again, see Section 3.4.3.
A035	Smart Meter Verification Aborted	If desired, read the abort code. See Section 3.4.3, and perform the appropriate action.
A102	Drive Overrange/Partially Full Tube	Excessive or erratic drive gain. See Section 6.14.3.
		Check the sensor coils. See Section 6.16.
A103	Data Loss Possible (Tot and Inv)	Cycle power to the transmitter.
		The transmitter might need service. Contact Micro Motion Customer Service.
A104	Calibration-in-Progress	Allow the flowmeter to complete calibration.
A105	Slug Flow	Allow slug flow to clear from the process.
		See Section 6.12.
A106	AI/AO Simulation Active	Disable simulation mode. See Section 5.3.1.
A107	Power Reset Occurred	No action is necessary.
A116	API: Temperature Outside Standard Range	Contact Micro Motion Customer Service.
A117	API: Density Outside Standard Range	Contact Micro Motion Customer Service.
A120	CM: Unable to Fit Curve Data	Contact Micro Motion Customer Service.
A121	CM: Extrapolation Alarm	Contact Micro Motion Customer Service.
A128	Factory configuration data invalid	Cycle power to the transmitter.
		The flowmeter might need service. Contact Micro Motion Customer Service.

Table 6-3 Status alarms and remedies (continued)

Alarm code	Description	Possible remedies
A0129	Factory configuration data checksum invalid	Cycle power to the transmitter.
		The flowmeter might need service. Contact Micro Motion Customer Service.s
A131	Smart Meter Verification In Progress	Allow the procedure to complete.
		If desired, abort the procedure and restart with outputs set to Fault.
A132	Simulation Mode Active (sensor)	Disable sensor simulation mode. See Section 5.3.2.

6.11 Diagnosing wiring problems

Use the procedures in this section to check the transmitter installation for wiring problems. Installation procedures are provided in the manual entitled *Model 1700 and Model 2700 Transmitters: Installation Manual*.

> **⚠ WARNING**
>
> **Removing the wiring compartment covers in explosive atmospheres while the power is on can cause an explosion.**
>
> Before removing the field wiring compartment cover in explosive atmospheres, shut off the power and wait five minutes.

6.11.1 Checking the power-supply wiring

To check the power-supply wiring:

1. Verify that the correct external fuse is used. An incorrect fuse can limit current to the transmitter and keep it from initializing.
2. Power down the transmitter.
3. If the transmitter is in a hazardous area, wait five minutes.
4. Ensure that the power supply wires are connected to the correct terminals. Refer to the installation manual.
5. Verify that the power-supply wires are making good contact and are not clamped to the wire insulation.
6. Inspect the voltage label on the inside of the field-wiring compartment. Verify that the voltage supplied to the transmitter matches the voltage specified on the label.
7. Use a voltmeter to test the voltage at the transmitter's power supply terminals. Verify that it is within specified limits. For DC power, you may need to size the cable. Refer to the installation manual.

6.11.2 Checking the sensor-to-transmitter wiring

Note: This does not apply to flowmeters with an integrally mounted transmitter.

To check the sensor-to-transmitter wiring, verify that:

- The transmitter is connected to the sensor according to the wiring information provided in the installation manual.
- The wires are making good contact with the terminals.
- For 4-wire connections, the mating connector between the core processor and the transmitter is securely plugged into its socket.

If the wires are incorrectly connected:

1. Power down the transmitter.
2. Wait five minutes before opening the transmitter compartment if the transmitter is in a hazardous area.
3. Correct the wiring.
4. Restore power to the transmitter.

6.11.3 Checking the grounding

The sensor and the transmitter must be grounded. If the core processor is installed as part of the transmitter or the sensor, it is grounded automatically. If the core processor is installed separately, it must be grounded separately. Refer to the installation manual.

6.11.4 Checking the communication wiring

To check the communication wiring, verify that:

- Communication wires and connections meet FOUNDATION fieldbus wiring standards.
- Wires are connected according to instructions provided in the installation manual.
- Wires are making good contact with the terminals.

6.12 Checking slug flow

The dynamics of slug flow are described in Section 4.13. If the transmitter is reporting a slug flow alarm, first check the process and possible mechanical causes for the alarm:

- Actual changes in process density
- Cavitation or flashing
- Leaks
- Sensor orientation — sensor tubes should normally be down when measuring liquids, and up when measuring gases. Refer to the sensor documentation for more information about orientation.

If there are no mechanical causes for the slug flow alarm, the slow flow limits and duration may be set too high or too low. The high limit is set by default to 5.0 g/cm^3, and the low limit is set by default to 0.0 g/cm^3. Lowering the high limit or raising the low limit will cause the transmitter to be more sensitive to changes in density. If you expect occasional slug flow in your process, you may need to increase the slug flow duration. A longer slug flow duration will make the transmitter more tolerant of slug flow.

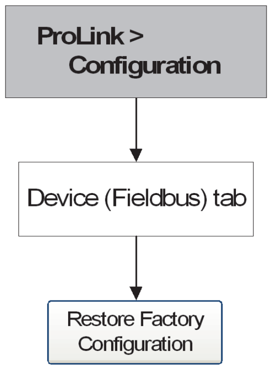
6.13 Restoring a working configuration

At times it may be easier to start from a known working configuration than to troubleshoot the existing configuration. To do this, you can:

- Restore a configuration file saved via ProLink II, if one is available. In ProLink II, choose **File > Send to Xmtr from File**.
- Restore the factory configuration (ProLink II v2.6 or later required; transmitter must be connected to an enhanced core processor). See Figure 6-1.

Neither of these methods will restore all of the transmitter's configuration. For example, neither method will restore the configuration of the AI, AO, and INT blocks. Using the restore factory configuration option will also not restore such things as the configuration of the display.

Figure 6-1 **Restore factory configuration**



6.14 Checking the test points

You can diagnose sensor failure or overrange status alarms by checking the flowmeter test points. The *test points* include left and right pickoff voltages, drive gain, and tube frequency.

6.14.1 Obtaining the test points

You can obtain the test points with a fieldbus host or ProLink II.

With a fieldbus host

The test points are a set of clearly-named parameters in the DIAGNOSTIC transducer block:

- Left pickoff voltage
- Right pickoff voltage
- Tube frequency
- Drive Gain: Value

With ProLink II

To obtain the test points with ProLink II:

1. Choose **ProLink > Diagnostic Information**.
2. Write down the value you find in the **Tube Frequency** box, the **Left Pickoff** box, the **Right Pickoff** box, and the **Drive Gain** box.

6.14.2 Evaluating the test points

Use the following guidelines to evaluate the test points:

- If the drive gain is at 100%, refer to Section 6.14.3.
- If the drive gain is unstable, refer to Section 6.14.4.
- If the value for the left or right pickoff does not equal the appropriate value from Table 6-4, based on the sensor flow tube frequency, refer to Section 6.14.5.
- If the values for the left and right pickoffs equal the appropriate values from Table 6-4, based on the sensor flow tube frequency, contact Micro Motion Customer Service for assistance.

Table 6-4 Sensor pickoff values

Sensor model(1)	Pickoff value
ELITE Model CMF sensors	3.4 mV peak to peak per Hz based on flow tube frequency
Model CMF400 I.S.	2.7 mV peak to peak per Hz based on flow tube frequency
Model CMF400 with booster amplifier	3.4 mV peak to peak per Hz based on flow tube frequency
Model D, DL, and DT sensors	3.4 mV peak to peak per Hz based on flow tube frequency
Model F025, F050, and F100 sensors	3.4 mV peak to peak per Hz based on flow tube frequency
Model F200 sensors (compact case)	2.0 mV peak to peak per Hz based on flow tube frequency
Model F200 sensors (standard case)	3.4 mV peak to peak per Hz based on flow tube frequency
Model H025, H050, and H100 sensors	3.4 mV peak to peak per Hz based on flow tube frequency
Model H200 sensors	2.0 mV peak to peak per Hz based on flow tube frequency
Model R025, R050, or R100 sensor	3.4 mV peak to peak per Hz based on flow tube frequency
Model R200 sensor	2.0 mV peak to peak per Hz based on flow tube frequency
Micro Motion T-Series sensors	0.5 mV peak to peak per Hz based on flow tube frequency

(1) If your sensor model is not listed, contact Micro Motion Customer Support.

6.14.3 Excessive drive gain

The causes and possible solutions of excessive drive gain are listed in Table 6-5.

Table 6-5 Excessive drive gain causes and solutions

Cause	Solution
Excessive slug flow	Eliminate slugs.
	Change the sensor orientation.
Plugged flow tube	Purge the flow tubes. Sensor may need to be replaced.
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, cracked flow tube, or sensor imbalance	Contact Micro Motion Customer Service.
Mechanical binding at sensor	Ensure sensor is free to vibrate.
Open drive or left pickoff sensor coil	Contact Micro Motion Customer Service.
Flow rate out of range	Ensure flow rate is within sensor limits.
Incorrect sensor characterization	Verify characterization. See Section 3.3.

6.14.4 Erratic drive gain

The causes and possible solutions of erratic drive gain are listed in Table 6-6.

Table 6-6 Erratic drive gain causes and solutions

Cause	Solution
Wrong K1 characterization constant for sensor	Re-enter the K1 characterization constant. See Section 3.3.
Polarity of pick-off reversed or polarity of drive reversed	Contact Micro Motion Customer Service.
Slug flow	Verify flow tubes are completely filled with process fluid, and that slug flow limits and duration are properly configured. See Section 6.12.
Foreign material caught in flow tubes	Purge flow tubes. Sensor may need to be replaced.

6.14.5 Low pickoff voltage

The causes and possible solutions of low pickoff voltage are listed in Table 6-7.

Table 6-7 Low pickoff voltage causes and solutions

Cause	Solution
Faulty wiring runs between the sensor and core processor	Refer to the sensor manual and the transmitter installation manual.
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	Verify the flow tubes are completely filled with process fluid, and that slug flow limits and duration are properly configured. See Section 6.12.
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 6.16.
Process beyond the limits of the sensor	Verify that the process flow rate is not out of range of the sensor.
Moisture in the sensor electronics	Eliminate the moisture in the sensor electronics.
The sensor is damaged	Contact Micro Motion Customer Service.

6.15 Checking the core processor

Two core processor procedures are available:

- You can check the core processor LED. The core processor has an LED that indicates different flowmeter conditions.
- You can perform the core processor resistance test to check for a damaged core processor.

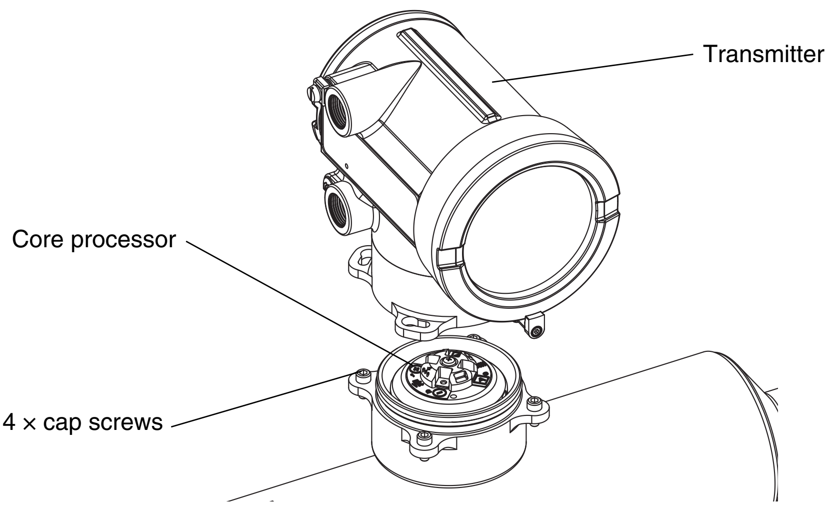
For both tests you will need to expose the core processor.

6.15.1 Exposing the core processor

Follow these procedures to expose the core processor.

1. Determine your installation type. See Appendix D.
2. If you have a 4-wire remote installation or a remote core processor with remote transmitter installation, simply remove the core processor lid. The core processor is intrinsically safe and can be opened in all environments.
3. If you have an integral installation:
   a. Loosen the four cap screws that fasten the transmitter to the base (Figure 6-2).
   b. Rotate the transmitter counter-clockwise so that the cap screws are in the unlocked position.
   c. Gently lift the transmitter straight up, disengaging it from the cap screws. Do not disconnect or damage the wires that connect the transmitter to the core processor.
4. If you have a 9-wire remote installation:
   a. Remove the end-cap.
   b. Inside the core processor housing, loosen the three screws that hold the core processor mounting plate in place. Do not remove the screws. Rotate the mounting plate so that the screws are in the unlocked position.
   c. Holding the tab on the mounting plate, slowly lower the mounting plate so that the top of the core processor is visible. Do not disconnect or damage the wires that connect the core processor to the transmitter.

Figure 6-2 Integral installation components



When reassembling components, take care not to pinch or stress the wires. Grease all O-rings.

6.15.2 Checking the core processor LED

Do not shut off power to the transmitter when checking the core processor LED. To check the core processor LED:

1. Expose the core processor according to the instructions in Section 6.15.1.
2. Check the core processor LED against the conditions listed in Table 6-8 (standard core processor) or Table 6-9 (enhanced core processor).

Table 6-8 Standard core processor LED behavior, flowmeter conditions, and remedies

LED behavior	Condition	Possible remedy
1 flash per second (75% off, 25% on)	Normal operation	No action required
1 flash per second (25% off, 75% on)	Slug flow	See Section 6.12.
Solid on	Zero or calibration in progress	If zero or calibration procedure is in progress, no action is required. If these procedures are not in progress, contact Micro Motion Customer Service.
	Core processor receiving between 11.5 and 5 volts	Check power supply to transmitter. See Section 6.11.1.
3 rapid flashes followed by a pause	Sensor not recognized	Check wiring between transmitter and sensor (9-wire remote installation or remote core processor with remote transmitter installation). Refer to the installation manual.
	Improper configuration	Verify characterization. See Section 3.3.
	Broken pin between sensor and core processor	Contact Micro Motion Customer Service.
4 flashes per second	Fault condition	Check alarm status.
OFF	Core processor receiving less than 5 volts	Verify power supply wiring to core processor. Refer to the installation manual.
		If status LED is lit, transmitter is receiving power. Check voltage across terminals 1 (VDC+) and 2 (VDC–) in core processor. Normal reading is approximately 14 VDC. If reading is normal, internal core processor failure is possible — contact Micro Motion Customer Service. If reading is 0, internal transmitter failure is possible — contact Micro Motion Customer Service. If reading is less than 1 VDC, verify power supply wiring to core processor. Wires may be switched. Refer to the installation manual.
		If status LED is not lit, transmitter is not receiving power. Check power supply. If power supply is operational, internal transmitter, display, or LED failure is possible. Contact Micro Motion Customer Service.
	Core processor internal failure	Contact Micro Motion Customer Service.

Table 6-9 Enhanced core processor LED behavior, meter conditions, and remedies

LED behavior	Condition	Possible remedy
Solid green	Normal operation	No action required.
Flashing yellow	Zero in progress	If calibration is in progress, no action required. If no calibration is in progress, contact Micro Motion.
Solid yellow	Low severity alarm	Check alarm status.

Table 6-9 Enhanced core processor LED behavior, meter conditions, and remedies (continued)

LED behavior	Condition	Possible remedy
Solid red	High severity alarm	Check alarm status.
Flashing red (80% on, 20% off)	Tubes not full	If alarm A105 (slug flow) is active, see Section 6.12.
		If alarm A033 (tubes not full) is active, verify process. Check for air in the flow tubes, tubes not filled, foreign material in tubes, or coating in tubes.
Flashing red (50% on, 50% off)	Electronics failed	Contact Micro Motion.
Flashing red (50% on, 50% off, skips every 4th)	Sensor failed	Contact Micro Motion.
OFF	Core processor receiving less than 5 volts	• Verify power supply wiring to core processor. Refer to Appendix D for diagrams. • If transmitter status LED is lit, transmitter is receiving power. Check voltage across terminals 1 (VDC+) and 2 (VDC–) in core processor. If reading is less than 1 VDC, verify power supply wiring to core processor. Wires may be switched. See Section 6.11.1. Otherwise, contact Micro Motion. • If transmitter status LED is not lit, transmitter is not receiving power. Check power supply. See Section 6.11.1. If power supply is operational, internal transmitter, display, or LED failure is possible. Contact Micro Motion.
	Core processor internal failure	Contact Micro Motion.

6.15.3 Core processor resistance test

To perform the core processor resistance test:

1. Disconnect power to the transmitter and core processor.
2. Expose the core processor according to the instructions in Section 6.15.1.
3. Measure the resistance across the following terminal pairs:
   - The resistance across terminals 3 and 4 (RS-485A and RS-485B) should be 40–50 kohms.
   - The resistance across terminals 2 and 3 (VDC– and RS-485A) should be 20–25 kohms.
   - The resistance across terminals 2 and 4 (VDC– and RS-485B) should be 20–25 kohms.

If any of the resistance measurements are lower than specified, the core processor may not be able to communicate with a transmitter or remote host. Contact Micro Motion Customer Service.

6.16 Checking sensor coils and RTD

Problems with sensor coils can cause several alarms, including sensor failure and a variety of out-of-range conditions. Checking the sensor coils involves testing the terminal pairs and testing for shorts to case.

6.16.1 9-wire remote or remote core processor with remote transmitter installation

If you have a 9-wire remote or a remote core processor with remote transmitter installation:

1. Power down the transmitter.
2. If the transmitter is in a hazardous area, wait five minutes.
3. Remove the end-cap from the core processor housing.
4. Unplug the terminal blocks from the terminal board.
5. Using a digital multimeter (DMM), check the circuits listed in Table 6-10 by placing the DMM leads on the unplugged terminal blocks for each terminal pair.

Table 6-10 Circuit terminal pairs

Circuit	Test terminal pair
Drive coil	Brown to red
Left pickoff coil (LPO)	Green to white
Right pickoff coil (RPO)	Blue to gray
Resistance temperature detector (RTD)	Yellow to violet
Lead length compensator (LLC) (All sensors except CMF400 IS and T-Series) Composite RTD (T-Series only) Fixed resistor (CMF400 IS only)	Yellow to orange

6. There should be no open circuits (i.e., no infinite resistance readings). The LPO and RPO readings should be the same or very close (±5 ohms). If there are any unusual readings, repeat the coil measurement tests at the sensor junction box to eliminate the possibility of faulty cable. The readings for each coil pair should match at both ends.

   If the cable is faulty, replace the cable.
7. Leave the core processor terminal blocks disconnected. At the sensor, remove the lid of the junction box and test each sensor terminal for a short to case by placing one 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.

8. Test the terminal pairs as follows:
   - Brown against all other terminals except Red
   - Red against all other terminals except Brown
   - Green against all other terminals except White
   - White against all other terminals except Green
   - Blue against all other terminals except Gray
   - Gray against all other terminals except Blue
   - Orange against all other terminals except Yellow and Violet
   - Yellow against all other terminals except Orange and Violet
   - Violet against all other terminals except Yellow and Orange

Note: D600 sensors and CMF400 sensors with booster amplifiers have different terminal pairs. Contact Micro Motion Customer Service for assistance.

   There should be infinite resistance for each pair. If there is any resistance at all, there is a short between terminals.

9. See Table 6-11 for possible causes and solutions.
10. If the problem is not resolved, contact Micro Motion Customer Service.

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

Table 6-11 Sensor and cable short to case possible causes and remedies

Possible cause	Solution
Moisture inside the sensor junction box	Make sure that the junction box is dry and no corrosion is present.
Liquid or moisture inside the sensor case	Contact Micro Motion.
Internally shorted feedthrough (sealed passage for wiring from sensor to sensor junction box)	Contact Micro Motion.
Faulty cable	Replace cable.
Improper wire termination	Verify wire terminations inside sensor junction box. See the *Micro Motion 9-Wire Flowmeter Cable Preparation and Installation Guide* or the sensor documentation.

6.16.2 4-wire remote or integral installation

If you have a 4-wire remote installation or an integral installation:

1. Power down the transmitter.
2. If the transmitter is in a hazardous environment, wait five minutes.
3. If you have a 4-wire remote installation, remove the core processor lid.
4. If you have an integral installation:
   a. Loosen the four cap screws that fasten the transmitter to the base (Figure 6-2).
   b. Rotate the transmitter counter-clockwise so that the cap screws are in the unlocked position.
   c. Gently lift the transmitter straight up, disengaging it from the base.

Note: You have the option of disconnecting the 4-wire cable or leaving it connected.

5. If you have a standard core processor, loosen the captive screw (2,5 mm) at the center of the core processor. Carefully remove the core processor from the sensor by grasping it and lifting it straight up. **Do not twist or rotate the core processor**.
6. If you have an enhanced core processor, loosen the two captive screws (2,5 mm) that hold the core processor in the housing. Gently lift the core processor out of the housing, then disconnect the sensor cable from the feedthrough pins. **Do not damage the feedthrough pins**.

> **⚠ CAUTION**
>
> **If the core processor (feedthrough) pins are bent, broken, or damaged in any way, the core processor will not operate.**
>
> To avoid damage to the core processor (feedthrough) pins:
>
> - Do not twist or rotate the core processor when lifting it.
> - When replacing the core processor (or sensor cable) on the pins, be sure to align the guide pins and mount the core processor (or sensor cable) carefully.

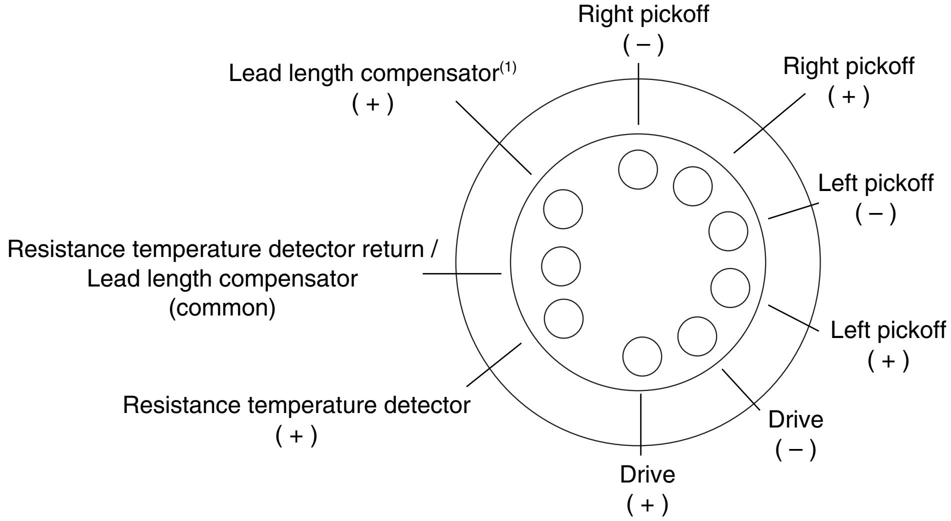
7. Use a digital multimeter (DMM) to check the resistance across the right and left pickoff coils. See Figure 6-3. Neither pair should be an open circuit (i.e., infinite resistance). The resistance values should be the same or very close (±5 ohms).
8. Use the DMM to check the resistance across the RTD and LLC (lead length compensation) circuits. See Figure 6-3. Neither pair should be an open circuit (i.e., infinite resistance).
9. Test for a ground to case by checking the resistance between each pin and 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.

   If a short to case is indicated, check for moisture or corrosion. If you are unable to determine the source of the problem, contact Micro Motion Customer Service.
10. Test for shorts across terminals by testing resistance across the following terminal pairs (see Figures 6-3 and 6-4). There should be infinite resistance in each case. If there is any resistance at all, there is a short between the terminals.
    - Brown against all other terminals except Red
    - Red against all other terminals except Brown
    - Green against all other terminals except White
    - White against all other terminals except Green
    - Blue against all other terminals except Gray
    - Gray against all other terminals except Blue
    - Orange against all other terminals except Yellow and Violet
    - Yellow against all other terminals except Orange and Violet
    - Violet against all other terminals except Yellow and Orange

Note: D600 sensors and CMF400 sensors with booster amplifiers have different terminal pairs. Contact Micro Motion Customer Service for assistance.

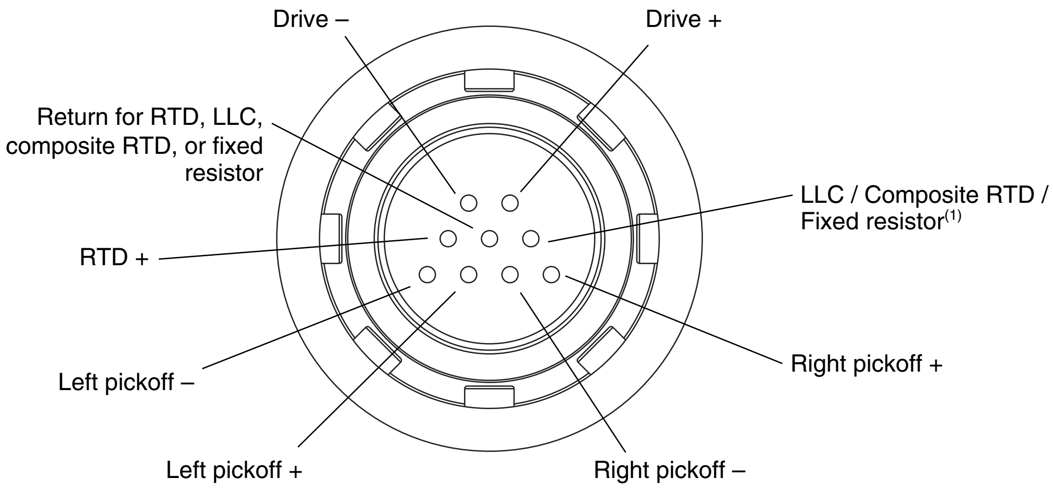
If a short between terminals is indicated, contact Micro Motion Customer Service.

Figure 6-3 Sensor pins – Standard core processor



(1) LLC for all sensors except T-Series and CMF400 I.S. For T-Series sensors, functions as composite RTD. For CMF400 I.S. sensors, functions as fixed resistor.

Figure 6-4 Sensor pins – Enhanced core processor



(1) Lead length compensator (LLC) for all sensors except T-Series, CMF400 I.S., and F300. For T-Series sensors, functions as composite RTD. For CMF400 I.S. and F300 sensors, functions as fixed resistor.

Note: The pins are shown as they appear while looking at the feedthrough on the sensor.

Reinstalling the core processor

If you removed the core processor, replace the core processor according to the instructions below.

1. If you have a standard core processor:
   a. Align the three guide pins on the bottom of the core processor with the corresponding holes in the base of the core processor housing.
   b. Carefully mount the core processor on the pins, taking care not to bend any pins.
2. If you have an enhanced core processor:
   a. Plug the sensor cable onto the feedthrough pins, being careful not to bend or damage any pins.
   b. Replace the core processor in the housing.
3. Tighten the captive screw(s) to 6 to 8 in-lbs (0,7 to 0,9 N-m) of torque.
4. If you have a 4-wire remote installation, replace the core processor lid.
5. If you have an integral installation:
   a. Gently lower the transmitter onto the base, inserting the cap screws into the slots. Do not pinch or stress the wires.
   b. Rotate the transmitter clockwise so that the cap screws are in the locked position.
   c. Tighten the cap screws, torquing to 20 to 30 in-lbs (2,3 to 3,4 N-m).

Note: When reassembling the flowmeter components, grease all O-rings.

Operation

Troubleshooting

PlantWeb Alerts

TB Reference

Appendix A
PlantWeb Alerts

A.1 PlantWeb Alerts explained

Intelligent Emerson Process Management field devices (such as the Micro Motion Model 2700 with FOUNDATION fieldbus) possess advanced diagnostic features. PlantWeb Alerts help operators take control of this diagnostic information by informing the operator of device issues and providing support guidance for dealing with these issues.

PlantWeb Alerts are divided into three categories:

- *Advisory* – Allow maintenance to address a problem before it impacts operations. These alerts are presented to maintenance personnel as an aid to maintenance planning.
- *Maintenance* – Indicate a malfunction has occurred (or is about to occur), and what the effects might be.
- *Failed* – Indicate a failure has occurred which renders the device inoperative.

A.2 Setting PlantWeb Alerts

Table A-1 describes the conditions under which PlantWeb Alerts are triggered for the Micro Motion Model 2700 with FOUNDATION fieldbus.

Table A-1 Setting PlantWeb Alerts

PlantWeb Alert	What the alert is detecting	Default alert category	Related parameters (and defaults)	Guidelines for setting
Density out of range	The measured density has exceeded the sensor defined limits.	Failed	D1, D2, K1, K2, FD, DTC, Tube Frequency, Drive Gain, LPO, RPO, process density	Refer to Section 3.2.1 for characterization information.
Mass flow out of range	The measured mass flow has exceeded the sensor defined limits.	Failed	Process flow rate	
Calibration failed	The calibration attempted by the user failed.	Failed	Process flow rate, process density, process temperature	See Section 6.6.
Tube not full	There is no signal from the left or right pickoffs.	Failed	Tube Frequency, Drive Gain, LPO, RPO, process density	
Slug flow	Entrained gas in a liquid process or condensation in a gas process has caused the density to exceed the configured slug limits.	Maintenance	Slug Low Limit (0.0), Slug High Limit (5.0), Slug Duration (1.0), Drive Gain, process density	Refer to Sections 4.13 and 6.12 for more information about slug flow.

Table A-1 Setting PlantWeb Alerts (continued)

PlantWeb Alert	What the alert is detecting	Default alert category	Related parameters (and defaults)	Guidelines for setting
Drive out of range	The drive needed to operate the sensors has exceeded the optimal point.	Maintenance	Drive Gain, LPO, RPO, process density	
API: Process variable out of range	The process temperature or density is outside the API-defined extrapolation limits.	Maintenance	None	
Sensor not responding	The sensor is not functioning properly.	Failed	LPO, RPO, Live Zero, Drive Gain, Tube Frequency	
Sensor temperature out of range	Either the temperature reading from the RTD on the sensor tube or sensor case is outside the normal operating limits.	Failed	Line RTD, Meter RTD, process temperature	
Transmitter not characterized	The transmitter has not had the proper flow or density calibration parameters entered from the sensor tag or flow calibration sheet.	Failed	K1, K2, FCF	Refer to Section 3.3 for characterization information.
CM: Unable to fit curve data	The data entered as inputs to the curve fit yield unacceptable errors in the fit.	Failed	CM curve parameters	Refer to Section 4.7.
Smart Meter Verification failed	The Smart Meter Verification procedure has unexpectedly failed.	Maintenance	None	
Smart Meter Verification aborted	The Smart Meter Verification procedure was aborted by the user.	Maintenance	None	
CM: Extrapolation alarm	The process temperature or process density is outside the user-defined extrapolation limits.	Maintenance	Process density, process temperature	
Calibration in progress	There is a calibration (zero, density, temperature, or Meter Verification) in progress. If Meter Verification is in progress, the outputs are held at last measured value.	Advisory		
Sensor simulate active	Sensor simulate mode is active.	Advisory	None	
Electronics failure Device	The core processor or transmitter has experienced either an EEPROM, RAM, boot sector or real-timer interrupt failure.	Failed	None	
Electronics failure ASIC	Transmitter RAM Error, Manufacturing Block checksum fail	Failed	None	

Table A-1 Setting PlantWeb Alerts (continued)

PlantWeb Alert	What the alert is detecting	Default alert category	Related parameters (and defaults)	Guidelines for setting
Transmitter initializing/ warming up	The transmitter is undergoing its initial startup routines.	Failed	None	
Core processor/ transmitter communication failure	There is a communication failure between the core processor and the transmitter.	Failed	None	
ECP low power	The enhanced core processor is not receiving enough power.	Failed	None	Refer to Product Data Sheet for transmitter power requirements.
Possible data loss	The core processor was unable to successfully store the totalizers on the last power down.	Maintenance	None	
Electronics failure Hornet	Perform Restart Processor. If problem persists, call Micro Motion	Failed	None	
NV Memory Failure	Perform Restart Processor. If problem persists, call Micro Motion	Failed	Failed	
Check function	Check Transducer Block Mode	Advisory	Advisory	
Factory configuration checksum invalid	Factory configuration data check sum is failed. The data might be corrupted.	Failed	Failed	Temperature over range missing.
Factory configuration invalid	The Factory configuration data is changed.You can save the current configuration as factory configuration	Advisory	Advisory	

A.3 Using PlantWeb Alerts

Table A-2 shows information required for using PlantWeb Alerts with the Micro Motion Model 2700 with FOUNDATION fieldbus. Table A-3 shows the status of AI and AO block outputs under various combinations of transducer block modes and PlantWeb Alerts.

Table A-2 Using PlantWeb Alerts

PlantWeb Alert	What the Alert is detecting	Default alert category	Effect on device	Recommended action/help
Density out of range	The measured density has exceeded the sensor defined limits.	Failed	Density measurement unavailable.	• Check for partially filled or blocked flow tubes. • Check process to ensure density is correct. • Verify all characterization parameters are correct, especially density factors. • Perform a density calibration.
Mass flow out of range	The measured mass flow has exceeded the sensor defined limits.	Failed	Mass flow measurement unavailable.	• Check process to ensure mass flow is correct. • Verify characterization parameters are correct. • Zero the flowmeter.
Calibration failed	The zero or density calibration attempted by the user failed.	Failed	Device may not be properly calibrated or zeroed.	• If zeroing, verify there is no flow. • If performing an FD cal, verify there is sufficient flow. • Cycle power to the transmitter, then try recalibrating the transmitter. • Eliminate mechanical noise.
Tube not full	There is no signal from the left or right pickoffs.	Failed	Measurements are wrong or erratic.	Check for air in the flow tubes, tubes not filled, foreign material in tubes, or coating in tubes.
Slug flow	Entrained gas in a liquid process or condensation in a gas process has caused the density to exceed the configured slug limits.	Maintenance	Measurements may be incorrect. If temporary or expected, this can be ignored.	In a liquid process, check process for cavitation, flashing or leaks. In a gas process, check temperature and pressure to verify gas is not condensing. If slug condition occurred while batching, actual product delivered may not match target. Monitor density and try to resolve process problems. If slug condition persists, reconfigure slug limits and/or slug timeout.
Drive out of range	The drive needed to operate the sensors has exceeded the optimal point.	Maintenance	Flowmeter continues to function normally, but there may be a problem.	• Purge the flow tubes • Increase inlet or back pressure at the sensor • Change sensor orientation • If no other alert is active, this condition can be ignored.
API: Process variable out of range	The process temperature or density is outside the API-defined extrapolation limits.	Maintenance	API measurements may be incorrect.	Check the API configuration.

Table A-2 Using PlantWeb Alerts (continued)

PlantWeb Alert	What the Alert is detecting	Default alert category	Effect on device	Recommended action/help
Sensor not responding	The sensor is not functioning properly.	Failed	Incorrect or unusable data.	• Check sensor wiring. • Check test points. • Purge flow tubes.
Sensor temperature out of range	Either the temperature reading from the RTD on the sensor tube or sensor case is outside the normal operating limits.	Failed	Bad temperature reading. This may adversely affect CM and API variables.	• Verify characterization parameters are correct. • Check sensor wiring. There may be an open or short lead length compensator or an open or short RTD in the sensor. If open or short is at transmitter, repair. If open or short is at sensor, return to Micro Motion. • Verify process fluid temperature is within sensor specifications.
Transmitter not characterized	The transmitter has not had the proper flow or density calibration parameters entered from the sensor tag or flow calibration sheet.	Failed	Measurements may be incorrect.	Check the characterization. Specifically, verify the Flow Cal Factors, K1 and K2 values.
CM: Unable to fit curve data	The data entered as inputs to the curve fit yield unacceptable errors in the fit.	Failed	This CM curve is not usable.	Check the curve data.
Meter verification in progress	The meter verification routine is in progress.	Failed	Outputs held at last measured values.	Wait until meter verification routine is complete.
CM: Extrapolation alarm	The process temperature or process density is outside the user-defined extrapolation limits.	Maintenance	CM variables may be incorrect or unusable.	Check enhanced density configuration data.
Calibration in progress	There is a calibration (zero, density, temperature, or meter verification) in progress.	Advisory	If meter verification is in progress, the outputs are held at last measured values. Otherwise, no effect.	Allow the calibration to complete.
Sensor simulate active	Sensor simulate mode is active.	Advisory	Outputs are fixed.	Disable sensor simulate mode.
Transmitter initializing/ warming up	The transmitter is undergoing its initial startup routines.	Failed	Temporary unavailability. A valid measurement cannot be calculated until the startup phase is complete.	Allow the transmitter to warm up. The error should go away when the transmitter is ready for normal operation.
Electronics failure Device	The core processor or transmitter has experienced either an EEPROM, RAM, boot sector or real-timer interrupt failure.	Failed	None	
Electronics failure Hornet	Perform Restart Processor. If problem persists, call Micro Motion	Failed	None	

Table A-2 Using PlantWeb Alerts (continued)

PlantWeb Alert	What the Alert is detecting	Default alert category	Effect on device	Recommended action/help
Core processor/ transmitter communication failure	There is a communication failure between the core processor and the transmitter.	Failed	Inoperable.	Verify the wiring between the transmitter and the core processor. Cycle power to the transmitter. If the problem persists, contact Micro Motion.
ECP low power	The enhanced core processor is not receiving enough power.	Failed	Inoperable.	Check the power supply to the transmitter. Check the wiring between the transmitter and the core processor.
Possible data loss	The core processor was unable to successfully store the totalizers on the last power down.	Maintenance	Potential loss of information. The core processor must rely on the totals that were previously saved in the device up to 2 hours before the power was lost.	Contact Micro Motion for a transmitter software upgrade.
Electronics failure Hornet	Perform Restart Processor. If problem persists, call Micro Motion	Failed	None	
NV Memory Failure	NV memory data check sum invalid. NV data might be corrupt.	Failed	Failed	
Check function	Check Transducer Block Mode	Advisory	Advisory	
Factory configuration checksum invalid	Perform Restart Processor. If problem persists, call Micro Motion	Failed		
Factory configuration invalid	The Factory configuration data is changed.You can save the current configuration as factory configuration	Advisory		

Table A-3 AI / AO block status

Transducer block mode (Actual)	Active PlantWeb Alerts	AI / AO status	AI / AO substatus
OOS	No effect	Bad	Device failure
Man	No effect	Bad	Non-specific
Auto	Fail	Bad	Non-specific
Auto	Maint., no Fail	Uncertain	Non-specific
Auto	Advisory only	Good	Non-specific
Auto	None	Good	Non-specific

Appendix B
Model 2700 Transducer Blocks Reference

B.1 Overview

The Micro Motion Model 2700 transmitter has seven separate transducer blocks.

B.1.1 Transducer block names

Throughout this manual, the transducer blocks are referred to by their tag (e.g., MEASUREMENT). Fieldbus hosts that do not support the use of tags as block names will instead show the name TRANSDUCER followed by a numeric code. Table B-1 shows the relationship between transducer block tag names and codes, and gives the table number where the parameters and views are described in this appendix.

Table B-1 Transducer block tag names, code names, and table numbers

Tag name	Code Name	Parameters	Views
MEASUREMENT TB 1200	Transducer 1200	Table B-2	Table B-3
CALIBRATION TB 1400	Transducer 1400	Table B-4	Table B-5
DIAGNOSTICS TB 1600	Transducer 1600	Table B-6	Table B-7
DEVICE INFORMATION TB 1800	Transducer 1800	Table B-8	Table B-9
LOCAL DISPLAY TB 2000	Transducer 2000	Table B-10	Table B-11
API TB 2200	Transducer 2200	Table B-12	Table B-13
ENHANCED DENSITY TB 2400	Transducer 2400	Table B-14	Table B-15

B.2 MEASUREMENT transducer block parameters

Following are the parameters (Table B-2) and views (Table B-3) for the MEASUREMENT transducer block.

Table B-2 MEASUREMENT transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64(5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	YES	Spaces	“	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	YES	0		R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	YES	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	YES	Auto	1	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8 (1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	Process Variables Data										
8	MFLOW	Mass Flow Rate	VARIABLE	DS-65 (5)	R-0247 -0248	D/20		0		R	N/A
9	MFLOW_UNITS	Standard or special mass flow rate unit	ENUM	Unsigned16 (2)	R-0039	S	YES	g/s	1318	R/W (OOS)	1318 = g/s 1319 = g/min 1320 = g/hr 1322 = kg/s 1323 = kg/min 1324 = kg/hr 1325 = kg/day 1327 = t/min 1328 = t/h 1329 = t/d 1330 = lb/s 1331 = lb/min 1332 = lb/hr 1333 = lb/day 1335 = Ston/min 1336 = Ston/hr 1337 = Ston/day 1340 = Lton/hr 1341 = Lton/day 253 = Special units

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
10	MFLOW_SPECIAL_UNIT_BASE	Base Mass Unit	ENUM	Unsigned16 (2)	R-132	S	YES	g	1089	R/W (OOS)	1089 = Grams 1088 = Kilograms 1092 = Metric Tons 1094 = Pounds 1095 = Short tons 1096 = long tons
11	MFLOW_SPECIAL_UNIT_TIME	Base time unit for special mass unit	ENUM	Unsigned16 (2)	R-133	S	YES	s	1054	R/W (OOS)	1058 = Minutes 1054 = Seconds 1059 = Hours 1060 = Days
12	MFLOW_SPECIAL_UNIT_CONV	Special mass unit conversion factor	VARIABLE	FLOAT (4)	R-237 - 238	S	YES	1	1.0	R/W (OOS)	N/A
13	MFLOW_SPECIAL_UNIT_STR	Special mass flow unit string	STRING	VISIBLE STRING (8)	R-52 - 55	S	YES	NONE	NONE	R/W (OOS)	Any 8 characters
14	TEMPERATURE	Temperature	VARIABLE	DS-65 (5)	R-0251 - 0252	D/20		–		R	N/A
15	TEMPERATURE_UNITS	Temperature Unit	ENUM	Unsigned16 (2)	R-0041	S	YES	C°	1001	R/W (OOS)	1000 = K 1001 = Deg C 1002 = Deg F 1003 = Deg R
16	DENSITY	Density	VARIABLE	DS-65 (5)	R-0249 - 0250	D/20		–		R	N/A
17	DENSITY_UNITS	Density Unit	ENUM	Unsigned16 (2)	R-0040	S	YES	g/cm^3	1100	R/W (OOS)	1097 = kg/m3 1100 = g/cm3 1103 = kg/L 1104 = g/ml 1105 = g/L 1106 = lb/in3 1107 = lb/ft3 1108 = lb/gal 1109 = Ston/yd3 1113 = DegAPI 1114 = SGU
18	VOL_FLOW	Volume flow rate	VARIABLE	DS-65 (5)	R-0253 -0254	D/20		–		R	N/A

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
19	VOLUME_FLOW_UNITS	Standard or special volume flow rate unit	ENUM	Unsigned16 (2)	R-0042	S	YES	l/s	1351	R/W (OOS)	1347 = m3/s 1348 = m 3/min 1349 = m3/hr 1350 = m3/day 1351 = L/s 1352 = L/min 1353 = L/hr 1355 = Ml/day 1356 = CFS 1357 = CFM 1358 = CFH 1359 = ft3/day / Standard cubic ft. per day 1362 = gal/s 1363 = GPM 1364 = gal/hour 1365 = gal/day 1366 = Mgal/day 1367 = ImpGal/s 1368 = ImpGal/min 1369 = ImpGal/hr 1370 = Impgal/day 1371 = bbl/s 1372 = bbl/min 1373 = bbl/hr 1374 = bbl/day 1631 = barrel (US Beer) per day 1632 = barrel (US Beer) per hour 1633 = barrel (US Beer) per minute 1634 =barrel (US Beer) per Second 253 = Special units
20	VOL_SPECIAL_UNIT_BASE	Base Volume Unit	ENUM	Unsigned16 (2)	R -133	S	YES	1	1038	R/W (OOS)	1048 = Gallons 1038 = Liters 1049 = Imperial Gallons 1043 = Cubic Feet 1034 = Cubic Meters 1051 = Barrels
21	VOL _SPECIAL_UNIT_TIME	Base time unit for special volume unit	ENUM	Unsigned16 (2)	R - 134	S	YES	s	1054	R/W (OOS)	1058 = Minutes 1054 = Seconds 1059 = Hours 1060 = Days
22	VOL _SPECIAL_UNIT_CONV	Special volume unit conversion factor	VARIABLE	FLOAT (4)	R - 239 - 240	S	YES	1	1.0	R/W (OOS)	N/A
23	VOL _SPECIAL_UNIT_STR	Special volume unit string	STRING	VISIBLE STRING (8)	R - 60 - 63	S	YES	NONE	NONE	R/W (OOS)	Any 8 characters
24	MASS_TOT_INV_SPECIAL_ STR	Special mass total and inventory unit string	STRING	VISIBLE STRING(8)	R -56 - 59	S	YES	NONE	NONE	R/W (OOS)	Any 4 characters
25	VOLUME_TOT_INV_ SPECIAL_ STR	Special volume total and inventory unit string	STRING	VISIBLE STRING (8)	R -64 - 67	S	YES	NONE	NONE	R/W (OOS)	Any 4 characters
26	FLOW_DAMPING	Flow rate (Mass and Volume) internal damping (seconds)	VARIABLE	FLOAT (4)	R-189 -190	S	YES	0.8	0.8	R/W (OOS)	N/A
27	TEMPERATURE_DAMPING	Temperature internal damping (seconds)	VARIABLE	FLOAT (4)	R-191 -192	S	YES	4.8	4.8	R/W (OOS)	N/A
28	DENSITY_DAMPING	Density internal damping (seconds)	VARIABLE	FLOAT (4)	R 193 -194	S	YES	1.6	1.6	R/W (OOS)	N/A
29	MFLOW_M_FACTOR	Mass Rate Factor	VARIABLE	FLOAT (4)	R-279-0280	S	YES	1.0	1.0	R/W (OOS)	N/A

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
30	DENSITY_M_FACTOR	Density Factor	VARIABLE	FLOAT (4)	R-283 -284	S	YES	1.0	1.0	R/W (OOS)	N/A
31	VOL_M_FACTOR	Volume Rate Factor	VARIABLE	FLOAT (4)	R-281-282	S	YES	1.0	1.0	R/W (OOS)	N/A
32	MASS_LOW_CUT	Mass flow cutoff for internal totalizers	VARIABLE	FLOAT (4)	R-195 - 196	S	YES	0.0	0.0	R/W (OOS)	N/A
33	VOLUME_FLOW_LOW_ CUTOFF	Volume flow cutoff for internal totalizers	VARIABLE	FLOAT (4)	R-197-198	S	YES	0.0	0.0	R/W (OOS)	N/A
34	DENSITY_LOW_CUTOF F	Density cutoff for internal totalizers	VARIABLE	FLOAT (4)	R-149-150	S	YES	0.2	0.2	R/W (OOS)	N/A
35	FLOW_DIRECTION	Flow direction	ENUM	Unsigned16 (2)	R-0017	S	YES	0	0	R/W (Any)	0 = Forward Only 1 = Reverse Only 2 = Bi-Directional 3 = Absolute Value 4 = Negate/Forward Only 5 = Negate/Bi-Dir
36	HIGH_MASS_LIMIT	High mass flow limit of sensor	VARIABLE	FLOAT (4)	R-165-166	S		Calc		R	N/A
37	HIGH_TEMP_LIMIT	High Temperature limit of sensor	VARIABLE	FLOAT (4)	R-167-168	S		Calc		R	N/A
38	HIGH_DENSITY_LIMIT	High density limit of sensor (g/cc)	VARIABLE	FLOAT (4)	R-169-170	S		Calc		R	N/A
39	HIGH_VOLUME_LIMIT	High volume flow limit of sensor	VARIABLE	FLOAT (4)	R-171-172	S		Calc		R	N/A
40	LOW_MASS_LIMIT	Low mass flow limit of sensor	VARIABLE	FLOAT (4)	R-173-174	S		Calc		R	N/A
41	LOW_TEMP_LIMIT	Low Temperature limit of sensor	VARIABLE	FLOAT (4)	R-175-176	S		Calc		R	N/A
42	LOW_DENSITY_LIMIT	Low density limit of sensor (g/cc)	VARIABLE	FLOAT (4)	R-177-178	S		Calc		R	N/A
43	LOW_VOLUME_LIMIT	Low volume flow limit of sensor	VARIABLE	FLOAT (4)	R-179-180	S		Calc		R	N/A
	Totalizers										
44	INTEGRATOR_FB_CON FIG	Configuration of Integrator Function Block	ENUM	Unsigned16 (2)	R-1511	S	YES	0	0	R/W (Any)	0 = Standard 1 = Internal Mass Total 2 = Internal Vol Total 3 = Internal Mass Inv. 4 = Internal Vol Inv. 5 = Int Gas Vol Tot 6 = Int Gas Vol Inv 7 = Int API Vol Tot 8 = Int API Vol Inv 9 = Int ED Std Vol Tot 10= Int ED Std Vol Inv 11= Int ED Net Mass Tot 12= Int ED Net Mass Inv 13= Int ED Net Vol Tot 14= Int ED Net Vol Inv
45	START_STOP_TOTALS	Start/Stop all Totalizers	VARIABLE	DS-66 (2)	C - 2	-	YES	1	0	R/W (Any)	Value part of DS-66 0 = Stop Totals 1 = Start Totals
46	RESET_TOTALS	Reset all Totals	VARIABLE	DS-66 (2)	C - 3	-	YES	0	0	R/W (Any)	Value part of DS-66 1 = Reset

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
47	RESET_INVENTORIES	Reset all Inventories	METHOD	Unsigned16 (2)	C - 4	-	YES	0	0	R/W (Any)	1 = Reset
48	RESET_MASS_TOTAL	Reset Mass Total	VARIABLE	DS-66 (2)	C - 56	-	YES	0	0	R/W (Any)	Value part of DS-66 1 = Reset
49	RESET_VOLUME_TOTAL	Reset Volume Total	VARIABLE	DS-66 (2)	C - 57	-	YES	0	0	R/W (Any)	Value part of DS-66 1 = Reset
50	MASS_TOTAL	Mass Total	VARIABLE	DS-65 (5)	R-0259 -0260	D/20		–		R	N/A
51	VOLUME_TOTAL	Volume Total	VARIABLE	DS-65 (5)	R-0261 -0262	D/20		–		R	N/A
52	MASS_INVENTORY	Mass Inventory	VARIABLE	DS-65 (5)	R-0263 -0264	D/20		–		R	N/A
53	VOLUME_INVENTORY	Volume Inventory	VARIABLE	DS-65 (5)	R-0265 -0266	D/20		–		R	N/A
54	MASS_TOT_INV_UNITS	Standard or special mass total and mass inventory unit	ENUM	Unsigned16 (2)	R-0045	S		g		R	1088 = Kg 1089 = g 1092 = metric tons 1094 = lbs 1095 = short tons 1096 = long tons 253 = Special units
55	VOLUME_TOT_INV_UNITS	Standard or special volume total or mass inventory unit.	ENUM	Unsigned16 (2)	R-0046	S		1l		R	1034 = m3 1036 = cm3 1038 = l 1043 = ft3 1048 = gal 1049 = ImpGal 1051 = bbl 253 = Special units.
	Gas Process Variables										
56	GSV_Gas_Dens	Gas Density used to calculate Reference Volume Gas Flow and Totals	VARIABLE	FLOAT (4)	R-0453 -0454	S	YES	0.001205	0.001205	R/W (OOS)	N/A
57	GSV_Vol_Flow	Reference Volume Gas Flow Rate (not valid when API or CM is enabled)	VARIABLE	DS-65 (5)	R-0455 -0456	D/20		–		R	N/A
58	GSV_Vol_Tot	Reference Volume Gas Total (not valid when API or CM is enabled)	VARIABLE	DS-65 (5)	R-0457 -0458	D/20		–		R	N/A
59	GSV_Vol_Inv	Reference Volume Gas Inventory (not valid when API or CM is enabled)	VARIABLE	DS-65 (5)	R-0459 -0460	D/20		–		R	N/A
60	SNS_EnableGSV	Enable/Disable Gas Standard Volume Flow and Totals	ENUM	Unsigned16 (2)	C-78	S	YES	0	0	R/W (OOS)	0 = disabled (liquid) 1 = enabled (gas)

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
61	SNS_GSV_FlowUnits	Gas Standard Volume Flow Engineering Units	ENUM	Unsigned16 (2)	R-2601	S	YES	SCFM	1360	R/W (OOS)	1356 = SCFS 1359 = SCFD 1360 = SCFM 1361 = SCFH 1522 = Nm3/s 1523 = Nm3/m 1524 = Nm3/h 1525 = Nm3/d 1527 = Sm3/s 1528 = Sm3/m 1529 = Sm3/h 1530 = Sm3/d 1532 = NL/s 1533 = NL/m 1534 = NL/h 1535 = NL/d 1537 = SL/s 1538 = SL/m 1539 = SL/h 1540 = SL/d 253 = Special units.
62	SNS_GSV_TotalUnits	Gas Standard Volume Total and Inventory Engineering Units	ENUM	Unsigned16 (2)	R-2602	S		SCF		R	1053 = SCF 1521 = Nm3 1526 = Sm3 1531 = NL 1536 = SL 253 = Special units
63	SNS_GSVflowBaseUnit	Base Gas Standard Volume Unit	ENUM	Unsigned16 (2)	R-2603	S	YES	SCF		R/W (OOS)	1521 = Normal cubic meter 1531 = Normal liter 1053 = Standard cubic ft 1536 = Standard liter 1526 = Standard cu meter
64	SNS_GSVflowBaseTime	Base time unit for special gas standard volume unit.	ENUM	Unsigned16 (2)	R-2604	S	YES	min	1058	R/W (OOS)	1058 = Minutes 1054 = Seconds 1059 = Hours 1060 = Days
65	SNS_GSVflowFactor	Special gas standard volume unit conversion factor	VARIABLE	FLOAT (4)	R-2605 - 2606	S	YES	1	1.0	R/W (OOS)	N/A
66	SNS_GSVflowText	Special gas standard volume unit string	STRING	VISIBLE STRING (8)	R-2607 - 2610	S	YES	NONE	NONE	R/W (OOS)	Any 8 characters
67	SNS_GSVtotText	Special gas standard volume total and inventory unit string	STRING	VISIBLE STRING (8)	R-2611 - 2614	S	YES	NONE	NONE	R/W (OOS)	Any 4 characters
68	SNS_GSV_FlowCutoff	Gas Standard Volume Low Flow Cutoff	VARIABLE	FLOAT (4)	R-461-462	S	YES	-	0	R/W (OOS)	Must be >=0.0
69	SNS_ResetGSVolTotal	Reset Gas Standard Volume Total	VARIABLE	DS-66 (2)	C-63	SS	YES	–	0	R/W (Any)	Value part of DS-66 1 = Reset
70	SNS_ResetAPIGSVInv	Reset Gas Standard Volume Inventory	Method	Unsigned16 (2)	C-194	S	YES	–	0	R/W (Any)	1 = Reset

Table B-2 MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access Mode	Enumerated List of Values
	Other 4.0 additions										
71	SNS_ResetMassInventory	Reset Mass Inventory	Method	Unsigned16 (2)	C-192	S	YES	0	0	R/W (Any)	1 = Reset
72	SNS_ResetVolumeInventory	Reset Volume Inventory	Method	Unsigned16 (2)	C-193	S	YES	0	0	R/W (Any)	1 = Reset
	v7.0 Additions										
73	SNS_ActualFlowDirection	Indicates whether flow is moving in the forward or reverse direction	VARIABLE	DS-66 (2)	R422/Bit #4	-		0		R	Value part of DS-66 0 = Forward or Zero Flow 1 = Reverse Flow

Table B-3 MEASUREMENT transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	Process Variables Data				
8	MFLOW	5		5	
9	MFLOW_UNITS		2		
10	MFLOW_SPECIAL_UNIT_BASE				2
11	MFLOW_SPECIAL_UNIT_TIME				2
12	MFLOW_SPECIAL_UNIT_CONV				4
13	MFLOW_SPECIAL_UNIT_STR				8
14	TEMPERATURE	5		5	
15	TEMPERATURE_UNITS		2		
16	DENSITY	5		5	
17	DENSITY_UNITS		2		
18	VOL_FLOW	5		5	
19	VOL_FLOW_UNITS		2		
20	VOL_SPECIAL_UNIT_BASE				2
21	VOL _SPECIAL_UNIT_TIME				2
22	VOL _SPECIAL_UNIT_CONV				4
23	VOL _SPECIAL_UNIT_STR				8
24	MASS_TOT_INV_SPECIAL_ STR				8
25	VOLUME_TOT_INV_ SPECIAL_ STR				8
26	FLOW_DAMPING		4		

Table B-3 MEASUREMENT transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
27	TEMPERATURE_DAMPING		4		
28	DENSITY_DAMPING		4		
29	MFLOW_M_FACTOR		4		
30	DENSITY_M_FACTOR		4		
31	VOL_M_FACTOR		4		
32	MASS_LOW_CUT		4		
33	VOLUME_LOW_CUT		4		
34	DENSITY_LOW_CUT		4		
35	FLOW_DIRECTION		2		
36	HIGH_MASS_LIMIT		4		
37	HIGH_TEMP_LIMIT		4		
38	HIGH_DENSITY_LIMIT		4		
39	HIGH_VOLUME_LIMIT		4		
40	LOW_MASS_LIMIT		4		
41	LOW_TEMP_LIMIT		4		
42	LOW_DENSITY_LIMIT		4		
43	LOW_VOLUME_LIMIT		4		
	Totalizers				
44	INTEGRATOR_FB_CONFIG		2		
45	START_STOP_TOTALS		2		
46	RESET_TOTALS		2		
47	RESET_INVENTORIES		2		
48	RESET_MASS_TOTAL		2		
49	RESET_VOLUME_TOTAL		2		
50	MASS_TOTAL	5		5	
51	VOLUME_TOTAL	5		5	
52	MASS_INVENTORY	5		5	
53	VOLUME_INVENTORY	5		5	
54	MASS_TOT_INV_UNITS		2		
55	VOLUME_TOT_INV_UNITS		2		
	Gas Process Variables				
56	GSV_Gas_Dens		4		
57	GSV_Vol_Flow	5		5	
58	GSV_Vol_Tot	5		5	
59	GSV_Vol_Inv	5		5	
60	SNS_EnableGSV				2
61	SNS_GSV_FlowUnits				2
62	SNS_GSV_TotalUnits				2
63	SNS_GSVflowBaseUnit				2
64	SNS_GSVflowBaseTime				2
65	SNS_GSVflowFactor				4
66	SNS_GSVflowText				8
67	SNS_GSVtotText				8
68	SNS_GSV_FlowCutoff				2
69	SNS_ResetGSVolTotal		2		
70	SNS_ResetAPIGSVInv		2		
71	SNS_ResetMassInventory		2		

Table B-3 MEASUREMENT transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
72	SNS_ResetVolumeInventory		2		
73	SNS_ActualFlowDirection		2		
	Totals	**64**	**110**	**64**	**85**

B.3 CALIBRATION transducer block parameters

Following are the parameters (Table B-4) and views (Table B-5) for the CALIBRATION transducer block.

Table B-4 CALIBRATION transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	“ “	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	Yes	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	Yes	Auto	11	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8 (1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	Calibration										
8	MASS_FLOW_GAIN	Flow calibration factor	VARIABLE	FLOAT (4)	R-407 – 408	S	Yes	1.0	1.0	R/W (OOS)	N/A

Table B-4 CALIBRATION transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
9	MASS_FLOW_T_COMP	Temperature coefficient for flow	VARIABLE	FLOAT (4)	R-409-410	S	Yes	5.13	5.12	R/W (OOS)	N/A
10	ZERO_CAL	Perform auto zero	VARIABLE	DS-66 (2)	C-0005	-	Yes	0	0	R/W (OOS)	Value part of DS-66 0 = Abort Zero Cal 1 = Start Zero Cal
11	ZERO_TIME	Maximum zeroing time	VARIABLE	Unsigned16 (2)	R-0136	S	Yes	20	20	R/W (OOS)	N/A
12	ZERO_STD_DEV	Standard deviation of auto zero	VARIABLE	FLOAT (4)	R-0231 -232	S		0		R	N/A
13	ZERO_OFFSET	Present flow signal offset at zero flow in µsec	VARIABLE	FLOAT (4)	R-233-234	S		0		R/W (OOS)	N/A
14	ZERO_FAILED_VAULE	Value of the zero if the zero cal failed	VARIABLE	FLOAT (4)	R-0235 -0236	S		0		R	N/A
15	LOW_DENSITY_CAL	Perform low density calibration	METHOD	Unsigned16 (2)	C-0013	-	Yes	0	0	R/W (OOS)	0 = None 1 = Start Cal
16	HIGH_DENSITY_CAL	Perform high-density calibration	METHOD	Unsigned16 (2)	C-0014	-	Yes	0	0	R/W (OOS)	0x0000 = None 0x0001 = Start Cal
17	FLOWING_DENSITY_CAL	Perform flowing-density calibration	METHOD	Unsigned16 (2)	C-0018	-	Yes	0	0	R/W (any)	0 = None 1 = Start Cal
18	D3_DENSITY_CAL	Perform third point calibration	METHOD	Unsigned16 (2)	C-0044	-	Yes	0	0	R/W (OOS)	0 = None 1 = Start Cal
19	D4_DENSITY_CAL	Perform fourth point calibration	METHOD	Unsigned16 (2)	C-0045	-	Yes	0	0	R/W (OOS)	0x0000 = None 0x0001 = Start Cal
20	K1	Density calibration constant 1 (msec)	VARIABLE	FLOAT (4)	R-159-160	S	Yes	1000	7000.00	R/W (OOS)	N/A
21	K2	Density calibration constant 2 (msec)	VARIABLE	FLOAT (4)	R-161-162	S	Yes	50000	11000.0	R/W (OOS)	N/A
22	FD	Flowing Density calibration constant	VARIABLE	FLOAT (4)	R303-304	S	Yes	0	0	R/W (OOS)	N/A
23	K3	Density calibration constant 3 (µsec)	VARIABLE	FLOAT (4)	R-0503	S	Yes	0	0	R/W (OOS)	N/A
24	K4	Density calibration constant 4 (µsec)	VARIABLE	FLOAT (4)	R-0519	S	Yes	0	0	R/W (OOS)	N/A
25	D1	Density 1 (g/cc)	VARIABLE	FLOAT (4)	R-0155 -0156	S	Yes	0	0	R/W (OOS)	N/A
26	D2	Density 2 (g/cc)	VARIABLE	FLOAT (4)	R-0157 -0158	S	Yes	1	1.0	R/W (OOS)	N/A
27	FD_VALUE	Flowing Density (g/cc)	VARIABLE	FLOAT (4)	R277-278	S	Yes	0	0	R/W (Any)	N/A
28	D3	Density 3 (g/cc)	VARIABLE	FLOAT (4)		S	Yes	0	0	R/W (OOS)	N/A
29	D4	Density 4 (g/cc)	VARIABLE	FLOAT (4)	R-511	S	Yes	0	0	R/W (OOS)	N/A
30	DENS_T_COEFF	Density temperature coefficient	VARIABLE	FLOAT (4)	R-0163 -164	S	Yes	4.44	4.44	R/W (OOS)	N/A
31	T_FLOW_TG_COEFF	T-Series: Flow TG Coefficient (FTG)	VARIABLE	FLOAT (4)	R-505	S	Yes	0	0	R/W (OOS)	N/A
32	T_FLOW_FQ_COEFF	T-Series: Flow FQ Coefficient (FFQ)	VARIABLE	FLOAT (4)	R-507	S	Yes	0	0	R/W (OOS)	N/A
33	T_DENSITY_TG_COEFF	T-Series: Density TG Coefficient (DTG)	VARIABLE	FLOAT (4)	R-513	S	Yes	0	0	R/W (OOS)	N/A
34	T_DENSITY_FQ_COEFF1	T-Series: Density FQ Coefficient #1 (DFQ1)	VARIABLE	FLOAT (4)	R-515	S	Yes	0	0	R/W (OOS)	N/A
35	T_DENSITY_FQ_COEFF2	T-Series: Density FQ Coefficient #2 (DFQ2)	VARIABLE	FLOAT (4)	R-517	S	Yes	0	0	R/W (OOS)	N/A

Table B-4 CALIBRATION transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
36	TEMP_LOW_CAL	Perform temperature calibration at the low point (point 1)	METHOD	Unsigned16 (2)	C-15	-	Yes	0	0	R/W (OOS)	0 = None 1 = Start Cal
37	TEMP_HIGH_CAL	Perform temperature calibration at the high point 2)	METHOD	Unsigned16 (2)	C - 16	-	Yes	0	0	R/W (OOS)	0 = None 1 = Start Cal
38	TEMP_VALUE	Temperature Value for temp calibrations (in degC)	VARIABLE	FLOAT (4)	R - 151-152	S	Yes	0	0	R/W (OOS)	N/A
39	TEMP_OFFSET	Temperature calibration offset	VARIABLE	FLOAT (4)	R-0413 -414	S	Yes	0.0	0	R /W (OOS)	N/A
40	TEMP_SLOPE	Temperature calibration slope	VARIABLE	FLOAT (4)	R-0411 -0412	S	Yes	0	1.0	R/W (OOS)	N/A
	Pressure Compensation										
41	PRESSURE	Pressure	VARIABLE	DS-65 (5)	R-0451 -452	D/20		0		R/W (any)	N/A
42	PRESSURE_UNITS	Pressure Unit	ENUM	Unsigned16 (2)	R-0044	S	Yes	psi	1141	R/W (OOS)	1148 = inch water @ 68F / inch water@60F 1156 = inch HG @ 0C 1154 = ft water @ 68F 1151 = mm water @ 68F 1158 = mm HG @ 0C 1141 = psi 1137 = bar 1138 = millibar 1144 = g/cm2 1145 = kg/cm2 1130 = pascals 1132 = Mega pascals 1133 = kilopascals 1139 = torr @ 0C 1140 = atmospheres 1147 = Inches water @ 4 degrees Celsius 1150 = Millimeters water @ 4 degrees Celsius
43	EN_PRESSURE_COMP	Enable/Disable Pressure Compensation	ENUM	Unsigned16 (2)	C-0082	S	Yes	0	0	R/W (OOS)	0= disabled 1 = enabled
44	PRESSURE_FACTOR_ FLOW	Pressure correction factor for flow	VARIABLE	FLOAT (4)	R-267-268	S	Yes	1	1	R/W (OOS)	N/A
45	PRESSURE_FACTOR_ DENS	Pressure correction factor for density	VARIABLE	FLOAT (4)	R-269-270	S	Yes	1	1	R/W (OOS)	N/A
46	PRESSURE_FLOW_CA L	Flow calibration pressure	VARIABLE	FLOAT (4)	R-271-272	S	Yes	1	1	R/W (OOS)	N/A
	Temperature Compensation										
47	SNS_EnableExtTemp	Enable/Disable Temperature Compensation	Method	Unsigned16 (2)	C-0086	S	Yes	0	0	R/W (OOS)	0= disabled 1 = enabled

Table B-4 CALIBRATION transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
48	SNS_ExternalTempInput	External Temperature	VARIABLE	DS-66 (2)	R421/Bit #14	-		0		R/W (Any)	
	v7.0 Additions										
49	SNS_ZeroInProgress	Indicates whether a zero calibration, density calibration or temperature calibration is running.	VARIABLE	DS-65 (5)		S		0		R	Value part of DS-66 0 = Not Running 1 = Calibration Running

Table B-5 CALIBRATION transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	Calibration				
8	MASS_FLOW_GAIN		4		
9	MASS_FLOW_T_COMP		4		
10	ZERO_CAL		2		
11	ZERO_TIME		2		
12	ZERO_STD_DEV			4	
13	ZERO_OFFSET			4	
14	ZERO_FAILED_VAULE			4	
15	LOW_DENSITY_CAL		2		
16	HIGH_DENSITY_CAL		2		
17	FLOWING_DENSITY_CAL		2		
18	D3_DENSITY_CAL		2		
19	D4_DENSITY_CAL		2		
20	K1		4		
21	K2		4		
22	FD		4		
23	K3		4		
24	K4		4		
25	D1		4		
26	D2		4		
27	FD_VALUE		4		
28	D3		4		
29	D4		4		

Table B-5 CALIBRATION transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
30	DENS_T_COEFF		4		
31	T_FLOW_TG_COEFF		4		
32	T_FLOW_FQ_COEFF		4		
33	T_DENSITY_TG_COEFF		4		
34	T_DENSITY_FQ_COEFF1		4		
35	T_DENSITY_FQ_COEFF2		4		
36	TEMP_LOW_CAL		2		
37	TEMP_HIGH_CAL		2		
38	TEMP_VALUE		4		
39	TEMP_OFFSET			4	
40	TEMP_SLOPE			4	
	Pressure Compensation				
41	PRESSURE	5		5	
42	PRESSURE_UNITS		2		
43	EN_PRESSURE_COMP				2
44	PRESSURE_FACTOR_FLOW				4
45	PRESSURE_FACTOR_DENS				4
46	PRESSURE_FLOW_CAL				4
	Temperature Compensation				
47	SNS_EnableExtTemp		2		
48	SNS_ExternalTempInput	5			
	v7.0 Additions				
49	SNS_ZeroInProgress		2		
	Totals	**19**	**102**	**34**	**19**

B.4 DIAGNOSTICS transducer block parameters

Following are the parameters (Table B-6) and views (Table B-7) for the DIAGNOSTICS transducer block.

Table B-6 DIAGNOSTICS transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	" "	R/W (OOS or Auto)	Any 32 Characters

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8(1)	N/A	S	Yes	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	Yes	Auto	01	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8(1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	Slug Flow Setup										
8	SLUG_TIME	Slug duration (seconds)	VARIABLE	FLOAT (4)	R-0141-142	S	Yes	0.0	0.0	R/W (Any)	N/A
9	SLUG_LOW_LIMIT	Low Density limit (g/cc)	VARIABLE	FLOAT (4)	R-201-202	S	Yes	0.0	0.0	R/W (Any)	N/A
10	SLUG_HIGH_LIMIT	High Density limit (g/cc)	VARIABLE	FLOAT (4)	R-199-200	S	Yes	5.0	5.0	R/W (Any)	N/A
	Alarm Status										
11	ALARM1_STATUS	Status Word 1	ENUM	BIT STRING (2)	N/A	D/20		-		R	0x0001 = Transmitter Fail 0x0002 = Sensor Fail 0x0004 = EEPROM error (CP) 0x0008 = RAM error (CP) 0x0010= Boot Fail (CP) 0x0020 = Uncofig – FloCal 0x0040 = Uncofig – K1 0x0080 = Input Overrange 0x0100 = Temp. Overrange 0x0200 = Dens. Overrange 0x0400 = RTI Failure 0x0800 = Cal Failed 0x1000= Xmitter Init 0x2000 = Sns/Xmitter comm fault 0x4000 = Other Failure 0x8000 = Xmitter Not Characterized

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
12	ALARM2_STATUS	Status Word 2	ENUM	BIT STRING (2)	N/A	D/20		-		R	0x0001 = Line RTD Over 0x0002 = Meter RTD Over 0x0004 = CP Exception 0x0008 = API: Temp OOL 0x0010= API:Density OOL 0x0020 = ED: Unable to fit curve data 0x0040 = ED: Extrapolation alarm 0x0080 = Not Used 0x0100 = EEPROM err (2700) 0x0200 = RAM err (2700) 0x0400 = Factory Config err 0x0800 = Low Power 0x1000= Tube not full 0x2000 = Meter Verify fault 0x4000 = Not Used 0x8000 = Not Used
13	ALARM3_STATUS	Status Word 3	ENUM	BIT STRING (2)	N/A	D/20		-		R	0x0001 = Drive Overrange 0x0002 = Slug Flow 0x0004 = Cal in Progress 0x0008 = Data Loss Possible 0x0010 = Upgrade Series 2000 0x0020 = Simulation Mode 0x0040 = Meter Verify warn 0x0080 = Warming Up 0x0100 = Power Reset 0x0200 = Reverse Flow 0x0400 = AI/AO Simulation Active 0x0800 = Not Used 0x1000= Not Used 0x2000 = Not Used 0x4000 = Not Used 0x8000 = Not Used

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
14	ALARM4_STATUS	Status Word 4	ENUM	BIT STRING (2)		D/20		-		R	0x0001 = Cal Fail: Low 0x0002 = Cal Fail: High 0x0004 = Cal Fail: Noisy 0x0008 = Auto Zero IP 0x0010= D1 IP 0x0020 = D2 IP 0x0040 = FD IP 0x0080 = Temp slope IP 0x0100 = Temp offset IP 0x0200 = D3 IP 0x0400 = D4 IP 0x0800 = 1 - Factory configuration invalid 0x1000= 1 - Factory configuration data checksum invalid 0x2000 = Core EEPROM DB corrupt 0x4000 = Core EEPROM Totals corrupt 0x8000 = Core EEPROM Program corrupt
15	FAULT_LIMIT	Fault Limit Code	ENUM	Unsigned16 (2)	R-124	S		5		R/W (OOS)	0 = Upscale 1 = Downscale 2 = Zero 3 = NAN 4 = Flow goes to zero 5 = None
16	LAST_MEASURED_VALUE _FAULT_TIMEOUT	Last Measured Value Fault Timeout	VARIABLE	Unsigned16	R-314	S	Yes	0	0	R/W (Any)	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
17	ALARM_INDEX	Alarm Index	ENUM	Unsigned16 (2)	N/A	S	Yes	0	1	R/W (Any)	0 = N/A 1 = EEPROM Error (CP) 2 = RAM Error (CP) 3 = Sensor Fail 4 = Temp. Overrange 5 = Input Overrange 6 = Xmitter Not Characterized 7 = N/A 8 = Dens. Overrange 9 = Xmitter Init 10 = Cal Failed 11 = Cal Failed: Low 12 = Cal Failed: High 13 = Cal Failed: Noisy 14 = Transmitter Failed 15 = N/A 16 = Line RTD Over 17 = Meter RTD Over 18 = EEPROM Checksum Error 19 = RAM Error 20 = Unconfig K1 21 = Incorrect Sensor 22 = Core EEPROM DB Corrupt 23 = Core EEPROM Totals Corrupt 24 = Core EEPROM Promram Corrupt 25 = Boot Failed (CP) 26 = Sns/Xmitter comm error 27 = N/A 28 = CP Exception 29-30 = N/A 31 = Low Power 32 = Meter Verification in Progress 33 = Tube Stoped in process 34 = Meter Verification Failed 35 = Meter Verification Aborted 36-41 = N/A 42 = Drive Overrange 43 = Data Loss Possible 44 = Cal in Progress 45 = Slug Flow 46 = N/A 47 = Power Reset 48-55 = N/A 60 = ED: Unable to fit curve data 56 = API: Temp OOL 57 = API:Density OOL 58-59 = N/A 72 = Simulation Mode

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
											61 = ED: Extrapolation Alarm 62-67 = N/A 68 = Factory Config Invalid 69 = Factory Config Checksum Invalid 70 = N/A 71 = Meter Verification In progress
18	ALARM_SEVERITY	Alarm Severity	ENUM	Unsigned16 (2)	R-1238 with R-1237 = OD 17	S	Yes	0	2	R/W (OOS)	0 = Ignore 1 = Info 2 = Fault
	Diagnostics										
19	DRIVE_GAIN	Drive Gain	VARIABLE	DS-65 (50)	R-291-292	D/20		–		R	N/A
20	TUBE_FREQUENCY	Raw Tube Period	VARIABLE	FLOAT (4)	R-285-286	D/20		–		R	N/A
21	LIVE_ZERO	Live Zero (Mass Flow)	VARIABLE	FLOAT (4)	R-293-294	D/20		–		R	N/A
22	LEFT_PICKUP_VOLTAGE	Left Pickoff Voltage	VARIABLE	FLOAT (4)	R-287-28	D/20		–		R	N/A
23	RIGHT_PICKUP_VOLTAGE	Right Pickoff Voltage	VARIABLE	FLOAT (4)	R-289-290	D/20		–		R	N/A
24	BOARD_TEMPERATURE	Board Temperature (degC)	VARIABLE	FLOAT (4)	R-383-384	D/20		–		R	N/A
25	ELECT_TEMP_MAX	Maximum electronics temperature	VARIABLE	FLOAT (4)	R-463	D/20		–		R	N/A
26	ELECT_TEMP_MIN	Minimum electronics temperature	VARIABLE	FLOAT (4)	R-465	D/20		–		R	N/A
27	ELECT_TEMP_AVG	Average electronics temperature	VARIABLE	FLOAT (4)	R-467	D/20		–		R	N/A
28	SENSOR_TEMP_MAX	Maximum sensor temperature	VARIABLE	FLOAT (4)	R-435-436	D/20		–		R	N/A
29	SENSOR_TEMP_MIN	Minimum sensor temperature	VARIABLE	FLOAT (4)	R-437-438	D/20		–		R	N/A
30	SENSOR_TEMP_AVG	Average sensor temperature	VARIABLE	FLOAT (4)	R-439-440	D/20		–		R	N/A
31	RTD_RESISTANCE_CABLE	9-wire cable RTD Resistance (ohms)	VARIABLE	FLOAT (4)	R-469	D/20		–		R	N/A
32	RTD_RESISTANCE_METER	Meter RTD Resistance (ohms)	VARIABLE	FLOAT (4)	R-475	D/20		–		R	N/A
33	CP_POWER_CYCLE	Number of core processor power cycles	VARIABLE	Unsigned16 (2)	R-497	D		–		R	N/A
	Meter Fingerprinting										
34	MFP_SAVE_FACTORY	Save Factory Cal Meter Fingerprint	ENUM	Unsigned16 (2)	C - 39	S	Yes	0	0	R/W (Any)	0x0000 = no action 0x0001 = save
35	MFP_RESET_STATS	Reset Meter Current Fingerprint Statistics	ENUM	Unsigned16 (2)	C - 40	S	Yes	0	0	R/W (Any)	0x0000 = no action 0x0001 = reset
36	EN_MFP	Enable/Disable Meter Fingerprinting	ENUM	Unsigned16 (2)	C - 74	S	Yes	1	1	R/W (Any)	0x0000 = disabled 0x0001 = enabled
37	MFP_UNITS	Meter Fingerprint in SI (0) or English (1) units	ENUM	Unsigned16 (2)	R - 625	S	Yes	0	0	R/W (Any)	0x0000 = SI 0x0001 = English

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
38	MFP_TV_INDEX	Meter Fingerprint Transmitter Variable Index	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (Any)	0 = Mass Flow Rate 1 = Temperature 3 = Density 5 = Volume Flow Rate 46 = Raw Tube Frequency 47 = Drive Gain 48 = Case Temperature 49 = LPO Amplitude 50 = RPO Amplitude 51 = Board Temperature 52 = Input Voltage 54 = Live Zero
39	MFP_TYPE	Fingerprint Type	ENUM	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (Any)	0 = Current 1 = Factory Cal 2 = Installation 3 = Last Zero
40	MFP_TV_INST	Transmitter Variable, Instantaneous (only valid for Current print)	VARIABLE	FLOAT (4)	R-629-630	D		–		R	
41	MFP_TV_AVG	Transmitter Variable, Average (1-min rolling)	VARIABLE	FLOAT (4)	R-631-632	D		–		R	
42	MFP_TV_STD_DEV	Transmitter Variable, Std Dev (1-min rolling)	VARIABLE	FLOAT (4)	R-633-634	D		–		R	
43	MFP_TV_MAX	Transmitter Variable, Maximum (since last statistics reset)	VARIABLE	FLOAT (4)	R-635-636	D		–		R	
44	MFP_TV_MIN	Transmitter Variable, Minimum (since last statistics reset)	VARIABLE	FLOAT (4)	R-637-638	D		–		R	
	v4.0 Additions										
45	DIAG_FEATURE_KEY	Enabled Features	STRING	BIT STRING (2)	R-5000	S		–		R	0x0000 = standard 0x0010 = Meter Verify. 0x0080 = PID 0x0800 = Enh. Density 0x1000 = API
46	SYS_PowerOnTimeSec	Power on time (Seconds since last reset)	VARIABLE	UnsignedI32 (4)	R-2625-2626	D		–		R	N/A
47	SNS_InputVoltage	Input Voltage (Volts)	VARIABLE	FLOAT (4)	R-385-386	D		–		R	N/A
48	SNS_TargetAmplitude	Actual Target Amplitude (mV/Hz) (Pre 700 2.1, Actual & Override)	VARIABLE	FLOAT (4)	R-395-396	D		–		R	N/A
49	SNS_CaseRTDRes	Case RTD Resistance (ohms)	VARIABLE	FLOAT (4)	R-473-474	D		–		R	N/A
50	SYS_RestoreFactoryConfig	Restore Factory Configuration	Method	Unsigned16 (2)	C-0247	S	Yes	0	0	R/W (OOS)	0x0000 = no action 0x0001 = Restore
51	SNS_FlowZeroRestore	Restore Factory Zero	Method	Unsigned16 (2)	C-243	S	Yes	0		R/W (OOS)	0x0000 = no action 0x0001 = Restore
52	SNS_AutoZeroFactory	Factory flow signal offset at zero flow (units of μSec)	VARIABLE	FLOAT (4)	R – 2673-2674	S		–		R	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
53	SYS_ResetPowerOnTime	Reset power-on time	Method	Unsigned16 (2)	C-242	S	Yes	0	0	R/W (Any)	0x0000 = no action 0x0001 = Reset
54	FRF_EnableFCFValidation	Start/Stop Meter Verification	Method	Unsigned16 (2)	R-3000	S	Yes	0	0	R/W (OOS)	0 = Disabled 1 = Full Meter Verification (including current calibrations) 2 =Factory Air Verification 3 =Factory Water Verification 4 =Special debug mode 5 =Abort 6 =Background Meter Verification (no current cal) 7 = Single Point Baseline (takes the place of factory air and factory water)
55	FRF_FaultAlarm	The state of the outputs when the meter verification routine is running.	ENUM	Unsigned16 (2)	R-3093	S	Yes	0	0	R/W (Any)	0=Last Value
56	FRF_StiffnessLimit	The setpoint of the stiffness limit. Represents percentage.	VARIABLE	FLOAT (4)	R – 3147-31 48	S	Yes	0	0.04	R/W (Any)	
57	FRF_AlgoState	The current state of the meter verification routine.	VARIABLE	Unsigned16 (2)	R-3001	S		–		R	1 through 18
58	FRF_AbortCode	The reason the meter verification routine aborted.	ENUM	Unsigned16 (2)	R-3002	S		–		R	0=No error 1=Manual Abort 2=Watchdog Timeout 3=Frequency Drift 4=High Peak Drive Voltage 5=High Drive Current Standard Deviation 6=High Drive Current Mean Value 7=Drive loop reported error 8=High Delta T Standard Deviation 9=High Delta T Value 10=State Running
59	FRF_StateAtAbort	The state of the meter verification routine when it aborted.	VARIABLE	Unsigned16 (2)	R-3003	S		–		R	1 through 18
60	FRF_Progress	Progress (% Complete)	VARIABLE	Unsigned16 (2)	R-3020	S		–		R	N/A
61	FRF_StiffOutLimLpo	Is the LPO Stiffness out of limits?	VARIABLE	Unsigned16 (2)	R - 3004	S		–		R	N/A
62	FRF_StiffOutLimRpo	Is the RPO Stiffness out of limits?	VARIABLE	Unsigned16 (2)	R - 3005	S		–		R	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
63	FRF_StiffnessLpo_mean	The current LPO stiffness calculated as a mean	VARIABLE	FLOAT (4)	R – 3101 – 3102 with 3100=0	S		–		R	N/A
64	FRF_StiffnessRpo_mean	The current RPO stiffness calculated as a mean	VARIABLE	FLOAT (4)	R – 3103-3104 with 3100=0	S		–		R	N/A
65	FRF_Damping_meanR – 3109-3110 with 3100=0	The current damping calculated as a mean	VARIABLE	FLOAT (4)	R – 3105-3106 with 3100=0	S		–		R	N/A
66	FRF_MassLpo_mean	The current LPO mass calculated as a mean	VARIABLE	FLOAT (4)	R – 3107-3108 with 3100=0	S		–		R	N/A
67	FRF_MassRpo_mean	The current RPO mass calculated as a mean	VARIABLE	FLOAT (4)	R – 3109-3110 with 3100=0	S		–		R	N/A
68	FRF_StiffnessLpo_stddev	The current LPO stiffness calculated as a standard deviation	VARIABLE	FLOAT (4)	R – 3101 – 3102 with 3100=1	S		–		R	N/A
69	FRF_StiffnessRpo_stddev	The current RPO stiffness calculated as a standard deviation	VARIABLE	FLOAT (4)	R – 3103-3104 with 3100=1	S		–		R	N/A
70	FRF_Damping_stddev	The current damping calculated as a standard deviation	VARIABLE	FLOAT (4)	R – 3105-3106 with 3100=1	S		–		R	N/A
71	FRF_MassLpo_stddev	The current LPO mass calculated as a standard deviation	VARIABLE	FLOAT (4)	R – 3107-3108 with 3100=1	S		–		R	N/A
72	FRF_MassRpo_stddev	The current RPO mass calculated as a standard deviation	VARIABLE	FLOAT (4)	R – 3109-3110 with 3100=1	S		–		R	N/A
73	FRF_StiffnessLpo_air	The LPO stiffness calculated as a mean during Factory Cal of Air	VARIABLE	FLOAT (4)	R – 3101 – 3102 with 3100=2	S		–		R	N/A
74	FRF_StiffnessRpo_air	The RPO stiffness calculated as a mean during Factory Cal of Air	VARIABLE	FLOAT (4)	R – 3103-3104 with 3100=2	S		–		R	N/A
75	FRF_Damping_air	The damping calculated as a mean during Factory Cal of Air	VARIABLE	FLOAT (4)	R – 3105-3106 with 3100=2	S		–		R	N/A
76	FRF_MassLpo_air	The LPO mass calculated as a mean during Factory Cal of Air	VARIABLE	FLOAT (4)	R – 3107-3108 with 3100=2	S		–		R	N/A
77	FRF_MassRpo_air	The RPO mass calculated as a mean during Factory Cal of Air	VARIABLE	FLOAT (4)	R – 3109-3110 with 3100=2	S		–		R	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
78	FRF_StiffnessLpo_water	The LPO stiffness calculated as a mean during Factory Cal of Water	VARIABLE	FLOAT (4)	R – 3101 – 3102 with 3100=3	S		–		R	N/A
79	FRF_StiffnessRpo_water	The RPO stiffness calculated as a mean during Factory Cal of Water	VARIABLE	FLOAT (4)	R – 3103-3104 with 3100=3	S		–		R	N/A
80	FRF_Damping_water	The damping calculated as a mean during Factory Cal of Water	VARIABLE	FLOAT (4)	R – 3105-3106 with 3100=3	S		–		R	N/A
81	FRF_MassLpo_water	The LPO mass calculated as a mean during Factory Cal of Water	VARIABLE	FLOAT (4)	R – 3107-3108 with 3100=3	S		–		R	N/A
82	FRF_MassRpo_water	The RPO mass calculated as a mean during Factory Cal of Water	VARIABLE	FLOAT (4)	R – 3109-3110 with 3100=3	S		–		R	N/A
83	ALERT_TIMEOUT	Alert Timeout	VARIABLE	Unsigned16 (2)	R - 1512	S	Yes	0	0	R/W (Any)	0 to 300 sec
	v5.0 Additions										
84	FRF_FCFValidCounter	Counts the number of times the Meter Verification algorithm has run successfully.	VARIABLE	Unsigned16 (2)	R-3017	S		0		R	N./A
	V6.0 Additions										
85	FRF_StartMeterVer	Start On-Line Meter Verification (Equivalent to Reg 3000=6)	VARIABLE	DS-66 (2)	Coil 190	S		0		RW (Any)	Value part of DS-66 0 = no action 1 = Start Meter Verification in continue measurement mode
86	FRF_MV_Index	FCF Datalog Index (0-19, 0 = most recent run)	VARIABLE	Unsigned16 (2)	2984	S		0		RW (Any)	N/A
87	FRF_MV_Counter	FCF Datalog Item 1: Run Number	VARIABLE	Unsigned16 (2)	2985	S		-		R	N/A
88	FRF_MV_Status	FCF Datalog Item 2: Status (Bit7 = FCF pass/fail, Bits6-4 = state, Bits3-0 = Abort code) Abort States are compressed to fit in 3 bits	VARIABLE	Unsigned16 (2)	2986	S		-		R	N/A
89	FRF_MV_Time	FCF Datalog Item 3: Time Initiated	VARIABLE	Unsigned32 (4)	2987-2988	S		-		R	N/A
90	FRF_MV_LPO_Norm	FCF Datalog Item 4: LPO Normalized Data	VARIABLE	FLOAT (4)	2989-2990	S		-		R	N/A
91	FRF_MV_RPO_Norm	FCF Datalog Item 5: RPO Normalized Data	VARIABLE	FLOAT (4)	2991-2992	S		-		R	N/A
92	FRF_DriveCurr	Drive Current	VARIABLE	FLOAT (4)	3113-3114	S		-		RW (Any)	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
93	FRF_DL_T	Delta T	VARIABLE	FLOAT (4)	3115-3116	S		-		RW (Any)	N/A
94	FRF_Temp	Temperature	VARIABLE	FLOAT (4)	3117-3118	S		-		R	N/A
95	FRF_Density	Density	VARIABLE	FLOAT (4)	3119-3120	S		-		RW (OOS)	N/A
96	FRF_DriveFreq	Drive Frequency	VARIABLE	FLOAT (4)	3121-3122	S		-		RW (OOS)	N/A
97	FRF_LpoFilt	LPO Filter	VARIABLE	FLOAT (4)	3123-3124	S		-		RW (OOS)	N/A
98	FRF_RpoFilt	RPO Filter	VARIABLE	FLOAT (4)	3125-3126	S		-		RW (OOS)	N/A
99	FRF_DataSetSelIndex	FCF Verification Data Set Selection	VARIABLE	Unsigned16 (2)	Unsigned16 (2)	S		-		RW (Any)	0=Current Data Means 1=Current Data Std Deviations 2=Factory Cal of Air Means 3=Factory Cal of Water Means 4=Running average data 5=Standard Error of the Estimate
	V7.0 Changes - Moved from Calibration TB										
100	FRF_MV_FirstRun_Time	FCF Timers: Time Until First Run in Hours (Applicable only if Meter Verification Feature is Enabled)	VARIABLE	FLOAT (4)	2993-2994	S		-		RW (Any)	N/A
101	FRF_MV_Elapse_Time	FCF Timers: Time between each run after the first run initiated in hours (Applicable only if Meter Verification is Enabled)	VARIABLE	FLOAT (4)	2995-2996	S		-		RW (Any)	N/A
102	FRF_MV_Time_Left	FCF Timers: Time Until Next Run in Hours	VARIABLE	FLOAT (4)	2997-2998	S		-		R	N/A
103	FRF_ToneLevel	Frf Tone Level (mA) (Applicable only if Meter Verification is Enabled)	VARIABLE	FLOAT (4)	3083-3084	S		-		RW (OOS)	N/A
104	FRF_DriveFreq	Tone Ramp Time (Seconds) (Applicable only if Meter Verification is enabled)	VARIABLE	FLOAT (4)	3085-3086	S		-		RW (OOS)	N/A
105	FRF_BlCoeff	BL Coef. (Applicable only if Meter Verification feature is enabled)	VARIABLE	FLOAT (4)	3087-3088	S		-		RW (OOS)	N/A
106	FRF_DriveTarget	FRF Drive Target (Applicable only if Meter Verification Feature is Enabled)	VARIABLE	FLOAT (4)	3089-3090	S		-		RW (OOS)	N/A
107	FRF_DrivePCoeff	FRF Drive P Coefficient (Applicable only if Meter Verification Feature is Enabled)	VARIABLE	FLOAT (4)	3091-3092	S		-		RW (OOS)	N/A

Table B-6 DIAGNOSTICS transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
108	FRF_ToneSpacingMult	Tone Spacing Multiplier (Applicable only if Meter Verification Feature is Enabled)	VARIABLE	FLOAT (4)	3159-3160	S		-		RW (OOS)	N/A
109	FRF_Freq_DriftLimit	Frequency Drift Limit (Applicable only if Meter Verification Feature is Enabled)	VARIABLE	FLOAT (4)	3161-3162	S		-		RW (OOS)	N/A
110	FRF_Max_Current_mA	Max Sensor Current (Applicable only if Meter Verification Feature is Enabled	VARIABLE	FLOAT (4)	3163-3164	S		-		RW (OOS)	N/A
111	FRF_KFQ2	KFQ2 Linear Density Correction for Stiffness Value	VARIABLE	FLOAT (4)	3165-3166	S		0		RW (Any)	N/A
	v7.0 Additions										
112	SYS_AnalogOutput_Fault	Indicates whether there is a critical fault present	VARIABLE	DS-66 (2)	-	-		0		R	Value part of DS-66 0 = No Critical Fault 1 = Critical Fault Present
113	SNS_MV_Failed	Indicates whether Meter Verification Failed	VARIABLE	DS-66 (2)	R433/Bit #14	-		0		R	Value part of DS-66 0 = Meter Verification did not Fail 1 = Meter Verification Failed

Table B-7 DIAGNOSTICS transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4	View 4_1	View 4_2
	Standard FF Parameters						
0	BLOCK_STRUCTURE						
1	ST_REV	2	2	2	2	2	2
2	TAG_DESC						
3	STRATEGY				2		
4	ALERT_KEY				1		
5	MODE_BLK	4		4			
6	BLOCK_ERR	2		2			
7	XD_ERROR	1		1			
	Slug Flow Setup						
8	SLUG_TIME				4		
9	SLUG_LOW_LIMIT				4		
10	SLUG_HIGH_LIMIT				4		
	Alarm Status						
11	ALARM1_STATUS	2		2			
12	ALARM2_STATUS	2		2			
13	ALARM3_STATUS	2		2			
14	ALARM4_STATUS	2		2			

Table B-7 DIAGNOSTICS transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4	View 4_1	View 4_2
15	FAULT_LIMIT_CODE		2				
16	LAST_MEASURED_VALUE_FAULT_TIMEOUT		2				
17	ALARM_INDEX				2		
18	ALARM_SEVERITY				2		
	Diagnostics						
19	DRIVE_GAIN	5		5			
20	TUBE_FREQUENCY			4			
21	LIVE_ZERO			4			
22	LEFT_PICKOFF_VOLTAGE			4			
23	RIGHT_PICKOFF_VOLTAGE			4			
24	BOARD_TEMPERATURE			4			
25	ELECT_TEMP_MAX			4			
26	ELECT_TEMP_MIN			4			
27	ELECT_TEMP_AVG			4			
28	SENSOR_TEMP_MAX			4			
29	SENSOR_TEMP_MIN			4			
30	SENSOR_TEMP_AVG			4			
31	RTD_RESISTANCE_CABLE			4			
32	RTD_RESISTANCE_METER			4			
33	CP_POWER_CYCLE			2			
	Meter Fingerprinting						
34	MFP_SAVE_FACTORY				2		
35	MFP_RESET_STATS				2		
36	EN_MFP				2		
37	MFP_UNITS				2		
38	MFP_TV_INDEX				2		
39	MFP_TYPE				2		
40	MFP_TV_INST			4			
41	MFP_TV_AVG			4			
42	MFP_TV_STD_DEV			4			
43	MFP_TV_MAX			4			
44	MFP_TV_MIN			4			
	v4.0 Additions						
45	DIAG_FEATURE_KEY				2		
46	SYS_PowerOnTimeSec			4			
47	SNS_InputVoltage			4			
48	SNS_TargetAmplitude			4			
49	SNS_CaseRTDRes			4			
50	SYS_RestoreFactoryConfig		2				
51	SNS_FlowZeroRestore		2				
52	SNS_AutoZeroFactory				4		
53	SYS_ResetPowerOnTime		2				
54	FRF_EnableFCFValidation		2				
55	FRF_FaultAlarm		2				
56	FRF_StiffnessLimit		4				
57	FRF_AlgoState					2	
58	FRF_AbortCode					2	

Table B-7 DIAGNOSTICS transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4	View 4_1	View 4_2
59	FRF_StateAtAbort					2	
60	FRF_Progress					2	
61	FRF_StiffOutLimLpo					2	
62	FRF_StiffOutLimRpo					2	
63	FRF_StiffnessLpo_mean					4	
64	FRF_StiffnessRpo_mean					4	
65	FRF_Damping_mean					4	
66	FRF_MassLpo_mean					4	
67	FRF_MassRpo_mean					4	
68	FRF_StiffnessLpo_stddev					4	
69	FRF_StiffnessRpo_stddev					4	
70	FRF_Damping_stddev					4	
71	FRF_MassLpo_stddev					4	
72	FRF_MassRpo_stddev					4	
73	FRF_StiffnessLpo_air					4	
74	FRF_StiffnessRpo_air					4	
75	FRF_Damping_air					4	
76	FRF_MassLpo_air					4	
77	FRF_MassRpo_air					4	
78	FRF_StiffnessLpo_water					4	
79	FRF_StiffnessRpo_water					4	
80	FRF_Damping_water					4	
81	FRF_MassLpo_water					4	
82	FRF_MassRpo_water					4	
83	ALERT_TIMEOUT		2				
84	FRF_FCFValidCounter					2	
85	FRF_StartMeterVer						2
86	FRF_MV_Index						2
87	FRF_MV_Counter						2
88	FRF_MV_Status						2
89	FRF_MV_Time						4
90	FRF_MV_LPO_Norm						4
91	FRF_MV_RPO_Norm						4
92	FRF_DriveCurr						4
93	FRF_DL_T						4
94	FRF_Temp						4
95	FRF_Density						4
96	FRF_DriveFreq						4
97	FRF_LpoFilt						4
98	FRF_RpoFilt						4
99	FRF_DataSetSelIndex						4
100	FRF_MV_FirstRun_Time						4
101	FRF_MV_Elapse_Time						4
102	FRF_MV_Time_Left						4
103	FRF_Density						4
104	FRF_ToneRampTime						4
105	FRF_BlCoeff						4

Table B-7 DIAGNOSTICS transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4	View 4_1	View 4_2
106	FRF_DriveTarget						4
107	FRF_DrivePCoeff						4
108	FRF_ToneSpacingMult						4
109	FRF_Freq_DriftLimit						4
110	FRF_Max_Current_mA						4
111	FRF_KFQ2						4
112	SYS_AnalogOutput_Fault		2				
113	SNS_MV_Failed		2				
	Totals	**22**	**26**	**112**	**39**	**96**	**100**

B.5 DEVICE INFORMATION transducer block parameters

Following are the parameters (Table B-8) and views (Table B-9) for the DEVICE INFORMATION transducer block.

Table B-8 DEVICE INFORMATION transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	" "	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	Yes	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	Yes	Auto	01	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903

Table B-8 DEVICE INFORMATION transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8 (1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	Transmitter Data										
8	SERIAL_NUMBER	Serial number of this device	VARIABLE	Unsigned32 (4)	R-48-49	S	Yes	0	0	R/W (Any)	≥0
9	OPTION_BOARD_CODE	Code of the Output Option Board	ENUM	Unsigned16 (2)	R-1138	S		20		R	0 = None 2 = Foundation Fieldbus (LC302 board) 20 = Foundation Fieldbus (Hornet board)
10	700_SW_REV	Model 700 Transmitter software revision	VARIABLE	Unsigned16 (2)	R-1137	S		S/W Rev		R	N/A
11	2700_SW_REV	Model 2700 Transmitter software revision	VARIABLE	Unsigned16 (2)	R-1200	S		S/W Rev		R	N/A
12	CEQ_NUMBER	Model 2700 Transmitter CEQ Number	VARIABLE	Unsigned16 (2)	R-5005	S		S/W Rev		R	N/A
13	DESCRIPTION	User Text	STRING	OCTET STRING (16)	R-96-103	S	Yes	"CONFIGURE XMTR"	"CONFIGURE XMTR"	R / W (Any)	
	Sensor Data										
14	SENSOR_SN	Sensor serial number	VARIABLE	Unsigned32 (4)	R-0127-128	S	Yes	0	0	R/W (Any)	≥0
15	SENSOR_TYPE	Sensor type (i.e. F200, CMF025)	STRING	VISIBLE STRING (16)	R-0425	S	"@@@@@@@@@@@@@@@@"	"@@@@@@@@@@@@@@@@"		R	
16	SENSOR_TYPE_CODE	Sensor type code	ENUM	Unsigned16 (2)	R-1139	S	Yes	0	0	R/W	0 = Curve Tube 1 = Straight Tube
17	SENSOR_MATERIAL	Sensor Material	ENUM	Unsigned16 (2)	R-0130	S	Yes	253	253	R/W (Any)	3 = Hastelloy C-22 4 = Monel 5 = Tantalum 6 = Titanium 19 = 316L stainless steel 23 = Inconel 252 = Unknown 253 = Special
18	SENSOR_LINER	Liner Material	ENUM	Unsigned16 (2)	R-0131	S	Yes	253	253	R/W (Any)	10 = PTFE (teflon) 11 = Halar 16 = Tefzel 251 = None 252 = Unknown 253 = Special

Table B-8 DEVICE INFORMATION transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
19	SENSOR_END	Flange Type	ENUM	Unsigned16 (2)	R-0129	S	Yes	253	253	R/W (Any)	0 = ANSI 150 1 = ANSI 300 2 = ANSI 600 5 = PN 40 7 = JIS 10K 8 = JIS 20K 9 = ANSI 900 10 = Sanitary Clamp Fitting 11 = Union 12 = PN 100 251 = None 252 = Unknown 253 = Special
20	MASS_MIN_RANGE	Mass flow minimum range	VARIABLE	FLOAT (4)	R-181-182	S		Calc		R	N/A
21	TEMP_MIN_RANGE	Temperature minimum range	VARIABLE	FLOAT (4)	R-183-184	S		Calc		R	N/A
22	HIGH_DENSITY_LIMIT	High density limit of sensor (g/cc)	VARIABLE	FLOAT (4)	R-187-188	S		Calc		R	N/A
23	VOLUME_MIN_RANGE	Volume flow minimum range	VARIABLE	FLOAT		S		Calc		R/W	N/A
24	SNS_PuckDeviceTypeCode	Device Type for the attached Core Processor	ENUM	Unsigned16 (2)	R-1162	S		-		R	40 = 700 (CP) 50 = 800 (ECP)
25	AI_SIMULATE_MODE	AI Simulate Mode	ENUM	Unsigned16 (2)	C-84	S	Yes	0	0	R/W (Any)	0 = disabled 1 = enabled
26	SNS_HartDeviceID	Core Processor Unique ID	VARIABLE	Unsigned32 (4)	R-1187-1188	S		0		R	N/A
27	SYS_DeviceType	Transmitter Device Type	VARIABLE	Unsigned16 (2)	R-120	S		43		R	N/A

Table B-9 DEVICE INFORMATION transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	Transmitter Data				
8	SERIAL_NUMBER		4		
9	OPTION_BOARD_CODE				2
10	700_SW_REV		2		
11	2700_SW_REV		2		
12	CEQ_NUMBER		2		
13	DESCRIPTION				16
	Sensor Data				
14	SENSOR_SN		4		

Table B-9 DEVICE INFORMATION transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
15	SENSOR_TYPE				16
16	SENSOR_TYPE_CODE				2
17	SENSOR_MATERIAL				2
18	SENSOR_LINER				2
19	SENSOR_END				2
20	MASS_MIN_RANGE				4
21	TEMP_MIN_RANGE				4
22	DENSITY_MIN_RANGE				4
23	VOLUME_MIN_RANGE				4
24	SNS_PuckDeviceTypeCode				2
25	AI_SIMULATE_MODE				2
26	SNS_HartDeviceID				4
27	SYS_DeviceType				2
	Totals	**9**	**16**	**9**	**73**

B.6 LOCAL DISPLAY transducer block parameters

Following are the parameters (Table B-10) and views (Table B-11) for the LOCAL DISPLAY transducer block.

Table B-10 LOCAL DISPLAY transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	" "	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	Yes	0	1	R/W	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix		Auto	01	R/W	See section 2/6 of FF-891

Table B-10 LOCAL DISPLAY transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure of system problems in the block.	VARIABLE	Unsigned8 (1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	LDO										
8	EN_LDO_TOT_RESET	Enable/Disable LDO Totalizer Reset	ENUM	Unsigned16 (2)	C-0094	S	Yes	0	0	R/W (Any)	0 = Disable 1 = Enable
9	EN_LDO_TOT_START_STOP	Enable/Disable LDO Totalizer Start/Stop option	ENUM	Unsigned16 (2)	C-0091	S	Yes	0	0	R/W	0 = Disable 1 = Enable
10	EN_LDO_AUTO_SCROLL	Enable/Disable LDO Auto Scroll Feature	ENUM	Unsigned16 (2)	C-0095	S	Yes	0	0	R/W	0 = Disable 1 = Enable
11	EN_LDO_OFFLINE_MENU	Enable/Disable LDO Offline Menu Feature	ENUM	Unsigned16 (2)	C-0096	S	Yes	1	1	R/W	0 = Disable 1 = Enable
12	EN_LDO_OFFLINE_PWD	Enable/Disable LDO Offline Password	ENUM	Unsigned16 (2)	C-0097	S	Yes	0	0	R/W	0x0000 = disabled 0x0001 = enabled
13	EN_LDO_ALARM_MENU	Enable/Disable LDO Alarm Menu	ENUM	Unsigned16 (2)		S	Yes	1	1	R/W	0x0000 = disabled 0x0001 = enabled
14	EN_LDO_ACK_ALL_ALARMS	Enable/Disable LDO Acknowledge All alarms feature	ENUM	Unsigned16 (2)		S	Yes	1	1	R/W (Any)	0x0000 = disabled 0x0001 = enabled
15	LDO_OFFLINE_PWD	LDO offline password	VARIABLE	Unsigned16 (2)		S	Yes	1234	1234	R/W (Any)	0 - 9999
16	LDO_SCROLL_RATE	LDO Scroll rate	VARIABLE	Unsigned16 (2)		S	Yes	1	1	R/W (Any)	-
17	LDO_BACKLIGHT_ON	LDO Backlight Control	ENUM	Unsigned16 (2)		S	Yes	1	1	R/W (Any)	0 = off 1 = on
18	UI_Language	Display language selection	ENUM	Unsigned16 (2)		S	Yes	0	0	R/W (Any)	0 = English 1 = German 2 = French 3 = Reserved 4 = Spanish
19	LDO_VAR_1_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	0	0	R/W (Any)	Same as LDO_VAR_2_CODE

Table B-10 LOCAL DISPLAY transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
20	LDO_VAR_2_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	2	2	R/W (Any)	0 = Mass Flow Rate 1 = Temperature 2 = Mass Total 3 = Density 4 = Mass Inventory 5 = Volume Flow Rate 6 = Volume Total 7 = Volume Inventory 15 = API: Corr Density 16 = API: Corr Vol Flow 17 = API: Corr Vol Total 18 = API: Corr Vol Inv 19 = API: Avg Density 20 = API: Avg Temp 21 = ED: Density At Ref 22 = ED: Density (SGU) 23 = ED: Std Vol Flow Rate 24 = ED: Std Vo Total 25 = ED: Std Vol Inventory 26 = ED: Net Mass Flow 27 = ED: Net Mass Total 28 = ED: Net Mass Inv 29 = ED: Net Vol Flow Rate 30 = ED: Net Vol Total 31 = ED: Net Vol Inventory 32 = ED: Concentration 33 = API: CTL 46 = Raw Tube Frequency 47 = Drive Gain 48 = Case Temperature 49 = LPO Amplitude 50 = RPO Amplitude 51 = Board Temperature 52 = NA 53 = Ext. Input Pressure 54 = NA 55 = Ext. Input Temp 56 = ED: Density (Baume) 62 = Gas Std Vol Flow 63 = Gas Std Vol Total 64 = Gat Std Vol Inventory 69 = Live Zero 251 = None
21	LDO_VAR_3_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	5	5	R/W (Any)	Same as LDO_VAR_2_CODE
22	LDO_VAR_4_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	6	6	R/W (Any)	Same as LDO_VAR_2_CODE

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Table B-10 LOCAL DISPLAY transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access	Enumerated List of Values
23	LDO_VAR_5_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	3	3	R/W (Any)	Same as LDO_VAR_2_CODE
24	LDO_VAR_6_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	1	1	R/W (Any)	Same as LDO_VAR_2_CODE
25	LDO_VAR_7_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CODE
26	LDO_VAR_8_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CODE
27	LDO_VAR_9_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CODE
28	LDO_VAR_10_CODE	Display the Variable associated with the	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CO
29	LDO_VAR_11_CODE	Display the Variable associated with the	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CO
30	LDO_VAR_12_CODE	Display the Variable associated with the	ENUM	Unsigned16 (2)		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CO
31	LDO_VAR_13_CODE	Display the Variable associated with the	ENUM	Unsigned16		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CO
32	LDO_VAR_14_CODE	Display the Variable associated with the	ENUM	Unsigned16		S	Yes	251	251	R/W (Any)	Same as LDO_VAR_2_CO
33	LDO_VAR_15_CODE	Display the Variable associated with the code on the LDO	ENUM	Unsigned16		S	Yes	251	251	R/W Any)	Same as LDO_VAR_2_CODE
34	FBUS_UI_ProcVarIndex	Process Variable Code	ENUM	Unsigned16 (2)		S	Yes	0	0	R/W (Any)	Same as LDO_VAR_2_CODE
35	UI_NumDecimals	The number of digits displayed to the right of the decimal point for the process variable selected with index 34	VARIABLE	Unsigned16 (2)		S	Yes	4	4	R/W (Any)	0 to 5
36	UI_UpdatePeriodmsec	The period in milliseconds in which the display is updated	VARIABLE	Unsigned16 (2)		S	Yes	200	200	R/W (Any)	100 to 10000
37	UI_EnableStatusLedBlinking	Enable/Disable Display Status LED Blinking	ENUM	Unsigned16 (2)		S	Yes	1	1	R/W (Any)	0 = Disable 1 = Enable
38	UI_EnableAlarmPassword	Enable/Disable Display Alarm Screen Password	ENUM	Unsigned16 (2)		S	Yes	0	0	R/W (Any)	0 = Disable 1 = Enable

Table B-11 LOCAL DISPLAY transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	

Table B-11 LOCAL DISPLAY transducer block views (continued)

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	LDO				
8	EN_LDO_TOT_RESET				2
9	EN_LDO_TOT_START_STOP				2
10	EN_LDO_AUTO_SCROLL				2
11	EN_LDO_OFFLINE_MENU				2
12	EN_LDO_OFFLINE_PWD				2
13	EN_LDO_ALARM_MENU				2
14	EN_LDO_ACK_ALL_ALARMS				2
15	LDO_OFFLINE_PWD		2		
16	LDO_SCROLL_RATE				2
17	LDO_BACKLIGHT_ON				2
18	UI_Language				2
19	LDO_VAR_1_CODE				2
20	LDO_VAR_2_CODE				2
21	LDO_VAR_3_CODE				2
22	LDO_VAR_4_CODE				2
23	LDO_VAR_5_CODE				2
24	LDO_VAR_6_CODE				2
25	LDO_VAR_7_CODE				2
26	LDO_VAR_8_CODE				2
27	LDO_VAR_9_CODE				2
28	LDO_VAR_10_CODE				2
29	LDO_VAR_11_CODE				2
30	LDO_VAR_12_CODE				2
31	LDO_VAR_13_CODE				2
32	LDO_VAR_14_CODE				2
33	LDO_VAR_15_CODE				2
34	FBUS_UI_ProcVarIndex				2
35	UI_NumDecimals				2
36	UI_UpdatePeriodmsec				2
37	UI_EnableStatusLedBlinking				2
38	UI_EnableAlarmPassword				2
	Totals	**9**	**4**	**9**	**65**

B.7 API transducer block parameters

Following are the parameters (Table B-12) and views (Table B-13) for the API transducer block.

Table B-12 API transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	" "	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	Yes	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	Yes	Auto	01	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8 (1)	N/A	D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	API Process Variables										
8	API_Corr_Density	Temp Corrected Density	VARIABLE	DS-65 (5)	R-0325 -326	D/20		–		R	N/A
9	API_Corr_Vol_Flow	Temp Corrected (Standard) Volume Flow	VARIABLE	DS-65 (5)	R-0331 -332	D/20		–		R	N/A
10	API_Ave_Corr_Density	Batch Weighted Average Density	VARIABLE	DS-65 (5)	R-0337 -338	D/20		–		R	N/A
11	API_Ave_Corr_Temp	Batch Weighted Average Temperature	VARIABLE	DS-65 (5)	R-339-340	D/20		–		R	N/A
12	API_CTL	CTL	VARIABLE	DS-65 (5)	R-0329 -330	D/20		–		R	N/A
13	API_Corr_Vol_Total	Temp Corrected (Standard) Volume Total	VARIABLE	DS-65 (5)	R-0333 -0334	D/20		–		R	N/A

Table B-12 API transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
14	API_Corr_Vol_Inv	Temp Corrected (Standard) Volume Inventory	VARIABLE	DS-65 (5)	R-0335 -336	D/20		–		R	N/A
15	API_Reset_Vol_Total	Reset API Reference Volume Total	VARIABLE	DS-65 (5)	C-0058	-	Yes(1)	–	0	R/W (Any)	Value part of DS-66 0 = No effect 1 = Reset
	API Setup Data										
16	EN_API	Enable/Disable API	ENUM	Unsigned16 (2)	C-72	S	Yes	0	0	R/W (OOS)	0 = disabled 1 = enabled
17	API_Ref_Temp	API Reference Temp	VARIABLE	FLOAT (4)	R-0319 -0320	S	Yes (1)	15	15.0	R/W (OOS)	
18	API_TEC	API Thermal Expansion Coeff	VARIABLE	FLOAT (4)	R-0323 -0324	S	Yes (1)	0.001	0.001	R/W (OOS)	
19	API_Table_Type	API 2540 CTL Table Type	ENUM	Unsigned16 (2)	R-0351	S	Yes (1)	81	81	R/W (OOS)	17 = Table 5A 18= Table 5B 19= Table 5D 36= Table 6C 49= Table 23A 50= Table 23B 51= Table 23D 68= Table 24C 81 = Table 53A 82 = Table 53B 83 = Table 53D 100 = Table 54C
20	API_FEATURE_KEY	Enabled Features	STRING	BIT STRING (2)		S		-		R	0x0000 = standard 0x0800 = Meter Verifi. 0x0080 = PID (Not Applicable) 0x0008 = Enh. Density 0x0010 = API
21	SNS_ResetAPIGSVInv	Reset API/GSV Inventory	Method	Unsigned16 (2)	C-0194	S	Yes (1)	0	0	R/W (Any)	0 = No effect 1 = Reset

Table B-12 API transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
22	API_TEMPERATURE_UNITS	Temperature Unit	ENUM	Unsigned16 (2)	R-0041	S		C°		R	1000 = K 1001 = Deg C 1002 = Deg F 1003 = Deg R
23	API_DENSITY_UNITS	Density Unit	ENUM	Unsigned16 (2)	R-0040	S		g/cm^3		R	1097 = kg/m3 1100 = g/cm3 1103 = kg/L 1104 = g/ml 1105 = g/L 1106 = lb/in3 1107 = lb/ft3 1108 = lb/gal 1109 = Ston/yd3 1113 = DegAPI 1114 = SGU
24	API_VOL_FLOW_UNITS	Standard or special volume flow rate unit	ENUM	Unsigned16 (2)	R-0042	S		1/s		R	1347 = m3/s 1348 = m 3/min 1349 = m3/hr 1350 = m3/day 1351 = L/s 1352 = L/min 1353 = L/hr 1355 = Ml/day 1356 = CFS 1357 = CFM 1358 = CFH 1359 = ft3/day / Standard cubic ft. per day 1362 = gal/s 1363 = GPM 1364 = gal/hour 1365 = gal/day 1366 = Mgal/day 1367 = ImpGal/s 1368 = ImpGal/min 1369 = ImpGal/hr 1370 = Impgal/day 1371 = bbl/s 1372 = bbl/min 1373 = bbl/hr 1374 = bbl/day 1631 = barrel (US Beer) per day 1632 = barrel (US Beer) per hour 1633 = barrel (US Beer) per minute 1634 =barrel (US Beer) per Second 253 = Special units

(1) Writable only if the API feature is enabled.

Table B-13 API transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	API Process Variables				
8	API_Corr_Density	5		5	
9	API_Corr_Vol_Flow	5		5	
10	API_Ave_Corr_Density	5		5	
11	API_Ave_Corr_Temp	5		5	
12	API_CTL	5		5	
13	API_Corr_Vol_Total	5		5	
14	API_Corr_Vol_Inv	5		5	
15	API_Reset_Vol_Total		2		
	API Setup Data				
16	EN_API				2
17	API_Ref_Temp				4
18	API_TEC				4
19	API_Table_Type				2
20	API_FEATURE_KEY				2
21	SNS_ResetAPIGSVInv		2		
22	API_TEMPERATURE_UNITS		2		
23	API_DENSITY_UNITS		2		
24	API_VOL_FLOW_UNITS		2		
	Totals	**44**	**12**	**44**	**19**

B.8 CONCENTRATION MEASUREMENT transducer block parameters

Following are the parameters (Table B-14) and views (Table B-15) for the CONCENTRATION MEASUREMENT transducer block.

Table B-14 CONCENTRATION MEASUREMENT transducer block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
	Standard FF Parameters										
0	BLOCK_STRUCTURE	Beginning of the transducer block	VARIABLE	DS_64 (5)	N/A	S		N/A		R/W (OOS or Auto)	N/A
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16 (2)	N/A	S		0		R	N/A
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING (32)	N/A	S	Yes	Spaces	" "	R/W (OOS or Auto)	Any 32 Characters
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16 (2)	N/A	S	Yes	0	0	R/W (OOS or Auto)	N/A
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8 (1)	N/A	S	Yes	0	1	R/W (OOS or Auto)	1 to 255
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69 (4)	N/A	mix	Yes	Auto	01	R/W (OOS or Auto)	See section 2/6 of FF-891
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING (2)	N/A	D/20		-		R	See section 4.8 of FF-903
7	XD_ERROR	Used for all config, H/W, connection failure or system problems in the block.	VARIABLE	Unsigned8 (1)		D		-		R	18 = Process Error 19 = Configuration Error 20 = Electronics Failure 21 = Sensor Failure
	CM Process Variables										
8	CM_Ref_Dens	Density At Reference	VARIABLE	DS-65 (5)	R-963	D/20		–		R	N/A
9	CM_Spec_Grav	Density (Fixed SG Units)	VARIABLE	DS-65 (5)	R-965	D/20		–		R	N/A
10	CM_Std_Vol_Flow	Standard Volume Flow Rate	VARIABLE	DS-65 (5)	R-967	D/20		–		R	N/A
11	CM_Net_Mass_Flow	Net Mass Flow Rate	VARIABLE	DS-65 (5)	R-973	D/20		–		R	N/A
12	CM_Net_Vol_Flow	Net Volume Flow Rate	VARIABLE	DS-65 (5)	R-979	D/20		–		R	N/A
13	CM_Conc	Concentration	VARIABLE	DS-65 (5)	R-985	D/20		–		R	N/A
14	CM_Baume	Density (Fixed Baume Units)	VARIABLE	DS-65 (5)	R-987	D/20		–		R	N/A

Table B-14 CONCENTRATION MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
	CM Totals										
15	CM_Std_Vol_Total	Standard Volume Total	VARIABLE	DS-65 (5)	R-969	D/20		–		R	N/A
16	CM_Std_Vol_Inv	Standard Volume Inventory	VARIABLE	DS-65 (5)	R-971	D/20		–		R	N/A
17	CM_Net_Mass_Total	Net Mass Total	VARIABLE	DS-65 (5)	R-975	D/20		–		R	N/A
18	CM_Net_Mass_Inv	Net Mass Inventory	VARIABLE	DS-65 (5)	R-977	D/20		–		R	N/A
19	CM_Net_Vol_Total	Net Volume Total	VARIABLE	DS-65 (5)	R-981	D/20		–		R	N/A
20	CM_Net_Vol_Inv	Net Volume Inventory	VARIABLE	DS-65 (5)	R-983	D/20		–		R	N/A
21	CM_Reset_Std_Vol_Total	Reset CM Standard Volume Total	VARIABLE	DS-66 (2)	C-59	-		0		R/W (Any)	Value part of DS-66 1 = Reset
22	CM_Reset_Net_Mass_Total	Reset CM Net Mass Total	VARIABLE	DS-66 (2)	C-60	-		0		R/W (Any)	Value part of DS-66 1 = Reset
23	CM_Reset_Net_Vol_Total	Reset CM Net Volume Total	VARIABLE	DS-66 (2)	C-61	-		0		R/W (Any)	Value part of DS-66 1 = Reset
	CM Setup Data										
24	EN_CM	Enable/Disable Concentration Measurement	ENUM	Unsigned16 (2)		S	Yes(1)	0	0	R/W (OOS)	0x0000 = disabled 0x0001 = enabled
25	CM_Curve_Lock	Lock Concentration Measurement Tables	ENUM	Unsigned16 (2)	C-85	S	Yes(1)	0	0	R/W (OOS)	0x0000 = not locked 0x0001 = locked
26	CM_Mode	Concentration Measurement Mode	ENUM	Unsigned16 (2)	R-524	S	Yes(1)	0	0	R/W (OOS)	0 = None 1= Dens @ Ref Temp 2= Specific Gravity 3= Mass Conc (Dens) 4=Mass Conc (SG) 5= Volume Conc (Dens) 6= Volume Conc (SG) 7= Concentration (Dens) 8 = Concentration (SG)
27	CM_Active_Curve	Active Calculation Curve	VARIABLE	Unsigned16 (2)	R-523	S	Yes(1)	0	0	R/W (Any)	0 through 5
28	CM_Curve_Index	Curve Configuration Index (n)	VARIABLE	Unsigned16 (2)		S	Yes(1)	0	0	R/W (Any)	0 through 5
29	CM_Temp_Index	Curve$_n$ Temperature Isotherm Index (x-axis)	VARIABLE	Unsigned16 (2)		S	Yes(1)	0	0	R/W (Any)	0 through 5
30	CM_Conc_Index	Curve$_n$ Concentration Index (y-axis)	VARIABLE	Unsigned16 (2)		S	Yes(1)	0	0	R/W (Any)	0 through 5
31	CM_Temp_ISO	Curve$_n$ (6x5) Temperature Isotherm$_x$ Value (x-axis)	VARIABLE	FLOAT (4)	R-531	S	Yes(1)	0	0.0	R/W (OOS)	
32	CM_Dens_At_Temp_ISO	Curve$_n$ (6x5) Density @ Temperature Isotherm$_X$, Concentration$_Y$	VARIABLE	FLOAT (4)	R-533	S	Yes(1)	0	0.0	R/W (OOS)	
33	CM_Dens_At_Temp_Coeff	Curve$_n$ (6x5) Coeff @ Temperature Isotherm$_X$, Concentration$_Y$	VARIABLE	FLOAT (4)	R-535	S	Yes(1)	0	0.0	R/W (OOS)	
34	CM_Conc_Label_55	Curve$_n$ (6x5) Concentration$_Y$ Value (Label for y-axis)	VARIABLE	FLOAT (4)	R-537	S	Yes(1)	0	0.0	R/W (OOS)	
35	CM_Dens_At_Conc	Curve$_n$ (5x1) Density at Concentration$_Y$ (at Ref Temp)	VARIABLE	FLOAT (4)	R-539	S	Yes(1)	0	0.0	R/W (OOS)	
36	CM_Dens_At_Conc_Coeff	Curve$_n$ (5x1) Coeff at Concentration$_Y$ (at Ref Temp)	VARIABLE	FLOAT (4)	R-541	S	Yes(1)	0	0.0	R/W (OOS)	

Table B-14 CONCENTRATION MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
37	CM_Conc_Label_51	$Curve_n$ (5x1) $Concentration_Y$ Value (y-axis)	VARIABLE	FLOAT (4)	R-543	S	Yes[1]	0	0.0	R/W (OOS)	
38	CM_Ref_Temp	$Curve_n$ Reference Temperature	VARIABLE	FLOAT (4)	R-545	S	Yes[1]	0	0.0	R/W (OOS)	
39	CM_SG_Water_Ref_Temp	$Curve_n$ SG Water Reference Temperature	VARIABLE	FLOAT (4)	R-547	S	Yes[1]	0	4.0	R/W (OOS)	
40	CM_SG_Water_Ref_Dens	$Curve_n$ SG Water Reference Density	VARIABLE	FLOAT (4)	R-549	S	Yes[1]	0	1.0	R/W (OOS)	
41	CM_Slope_Trim	$Curve_n$ Slope Trim	VARIABLE	FLOAT (4)	R-551	S	Yes[1]	0	1.0	R/W (OOS)	Shall accept > 0.8
42	CM_Slope_Offset	$Curve_n$ Offset Trim	VARIABLE	FLOAT (4)	R-553	S	Yes[1]	0	0.0	R/W (OOS)	
43	CM_Extrap_Alarm_Limit	$Curve_n$ Extrapolation Alarm Limit: %	VARIABLE	FLOAT (4)	R-555	S	Yes[1]	5	5.0	R/W (Any)	
44	CM_Curve_Name	$Curve_n$ ASCII String – Name of Curve – 12 chars supported	VARIABLE	VISIBLE STRING (12)	R-557-562	S	Yes[1]	“”"Empty Curve”	“Empty Curve”	R/W (Any)	
45	CM_Max_Fit_Order	Maximum Fit Order for 5x5 curve	VARIABLE	Unsigned16 (2)	R-564	S	Yes[1]	3	3	R/W (OOS)	2, 3, 4, 5 (Shall accept only enum values)
46	CM_Fit_Results	$Curve_n$ Curve Fit Results	ENUM	Unsigned16 (2)	R-569	S		0		R	0 = Good 1 = Poor 2 = Failed 3 = Empty
47	CM_Conc_Unit_Code	$Curve_n$ Concentration Units Code	ENUM	Unsigned16 (2)	R-570	S	Yes[1]	1343	1343	R/W (OOS)	1110 = Degrees Twaddell 1426= Degrees Brix 1111= Deg Baume (heavy) 1112= Deg Baume (light) 1343=% sol/wt 1344=% sol/vol 1427= Degrees Balling 1428= Proof Per Volume 1429 = Proof Per mass 1346 = Percent Plato
48	CM_Expected_Acc	$Curve_n$ Curve Fit Expected Accuracy	VARIABLE	FLOAT(4)	R-571	S		0		R	
49	CM_FEATURE_KEY	Enabled Features	STRING	BIT STRING (2)	R-5000	S		-		R	0x0000 = standard 0x0800 = Meter Verifi. 0x0080 = PID (Not Applicable) 0x0008 = Enh. Density 0x0010 = API
	v4.0 Additions										
50	SNS_ResetCMVolInv	Reset CM Volume Inventory	Method	Unsigned16 (2)	C-0195	S	Yes[1]	0	0	R/W (Any)	0 = No effect 1 = Reset
51	SNS_ResetCMNetMassInv	Reset CM Net Mass Inventory	Method	Unsigned16 (2)	C-0196	S	Yes[1]	0	0	R/W (Any)	0 = No effect 1 = Reset
52	SNS_ResetCMNetVolInv	Reset CM Net Volume Inventory	Method	Unsigned16 (2)	C-0197	S	Yes[1]	0	0	R/W (Any)	0 = No effect 1 = Reset

Table B-14 CONCENTRATION MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
53	SNS_CM_ResetFlag	Reset All Concentration Measurement Curve Information	Method	Unsigned16 (2)	C-249	S	Yes(1)	0	0	R/W (OOS)	1 = Reset
54	SNS_CM_EnableDensLowExtrap	Enable Low Density Extrapolation Alarm	ENUM	Unsigned16 (2)	C-250	S	Yes(1)	0	1	R/W (Any)	1 = Enable
55	SNS_CM_EnableDensHighExtrap	Enable High Density Extrapolation Alarm	ENUM	Unsigned16 (2)	C-251	S	Yes(1)	0	1	R/W (Any)	1 = Enable
56	SNS_CM_EnableTempLowExtrap	Enable Low Temperature Extrapolation Alarm	ENUM	Unsigned16 (2)	C-252	S	Yes(1)	0	1	R/W (Any)	1 = Enable
57	SNS_CM_EnableTempHighExtrap	Enable High Temperature Extrapolation Alarm	ENUM	Unsigned16 (2)	C-253	S	Yes(1)	0	1	R/W (Any)	1 = Enable
	v6.0 Additions										
58	CM_TEMPERATURE_ UNITS	Temperature Unit	ENUM	Unsigned16 (2)	R-0041	S		C°		R	1000 = K 1001 = Deg C 1002 = Deg F 1003 = Deg R
59	CM_DENSITY_UNITS	Density Unit	ENUM	Unsigned16 (2)	R-0040	S		g/cm^3		R	1097 = kg/m3 1100 = g/cm3 1103 = kg/L 1104 = g/ml 1105 = g/L 1106 = lb/in3 1107 = lb/ft3 1108 = lb/gal 1109 = Ston/yd3 1113 = DegAPI 1114 = SGU
60	CM_VOL_FLOW_UNITS	Standard or special volume flow rate unit	ENUM	Unsigned16 (2)	R- 0042	S		l/s		R	1347 = m3/s 1348 = m 3/min 1349 = m3/hr 1350 = m3/day 1351 = L/s 1352 = L/min 1353 = L/hr 1355 = Ml/day 1356 = CFS 1357 = CFM 1358 = CFH 1359 = ft3/day / Standard cubic ft. per day 1362 = gal/s 1363 = GPM 1364 = gal/hour 1365 = gal/day 1366 = Mgal/day 1367 = ImpGal/s 1368 = ImpGal/min 1369 = ImpGal/hr 1370 = Impgal/day 1371 = bbl/s 1372 = bbl/min 1373 = bbl/hr 1374 = bbl/day 1631 = barrel (US Beer) per day 1632 = barrel (US Beer) per hour 1633 = barrel (US Beer) per minute

Table B-14 CONCENTRATION MEASUREMENT transducer block parameters (continued)

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure (size in bytes)	Modbus Register	Store/Rate (HZ)	Add to CFF	Default Value	Example Value	Access (MODE_BLK)	Enumerated List of Values
											1634 =barrel (US Beer) per Second 253 = Special units
	v7.0 Additions										
61	CM_Increment_Curve	Increment the Active Curve to the next one.	VARIABLE	DS-66 (2)	-	-		0		R/W (Any)	Value part of DS-66 0 = None 1 = Increment

(1) Writable only if the API feature is enabled.

Table B-15 CONCENTRATION MEASUREMENT transducer block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
	Standard FF Parameters				
0	BLOCK_STRUCTURE				
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	XD_ERROR	1		1	
	CM Process Variables				
8	CM_Ref_Dens	5		5	
9	CM_Spec_Grav	5		5	
10	CM_Std_Vol_Flow	5		5	
11	CM_Net_Mass_Flow	5		5	
12	CM_Net_Vol_Flow	5		5	
13	CM_Conc	5		5	
14	CM_Baume	5		5	
	CM Totals				
15	CM_Std_Vol_Total	5		5	
16	CM_Std_Vol_Inv	5		5	
17	CM_Net_Mass_Total	5		5	
18	CM_Net_Mass_Inv	5		5	
19	CM_Net_Vol_Total	5		5	
20	CM_Net_Vol_Inv	5		5	
21	CM_Reset_Std_Vol_Total		2		
22	CM_Reset_Net_Mass_Total		2		
23	CM_Reset_Net_Vol_Total		2		
	CM Setup Data				
24	EN_CM				2
25	CM_CURVE_LOCK				2
26	CM_Mode				2

Table B-15 **CONCENTRATION MEASUREMENT transducer block views (continued)**

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 4
27	CM_Active_Curve				2
28	CM_Curve_Index				2
29	CM_Temp_Index				2
30	CM_Conc_Index				2
31	CM_Temp_ISO				4
32	CM_Dens_At_Temp_ISO				4
33	CM_Dens_At_Temp_Coeff				4
34	CM_Conc_Label_55				4
35	CM_Dens_At_Conc				4
36	CM_Dens_At_Conc_Coeff				4
37	CM_Conc_Label_51				4
38	CM_Ref_Temp				4
39	CM_SG_Water_Ref_Temp				4
40	CM_SG_Water_Ref_Dens				4
41	CM_Slope_Trim				4
42	CM_Slope_Offset				4
43	CM_Extrap_Alarm_Limit				4
44	CM_Curve_Name				12
45	CM_Max_Fit_Order				2
46	CM_Fit_Results			2	
47	CM_Conc_Unit_Code		2		
48	CM_Expected_Acc				4
49	CM_FEATURE_KEY				2
	v4.0 Additions				
50	SNS_ResetCMVolInv		2		
51	SNS_ResetCMNetMassInv		2		
52	SNS_ResetCMNetVolInv		2		
53	SNS_CM_ResetFlag		2		
54	SNS_CM_EnableDensLowExtrap				2
55	SNS_CM_EnableDensHighExtrap				2
56	SNS_CM_EnableTempLowExtrap				2
57	SNS_CM_EnableTempHighExtrap				2
	v6.0 Additions				
58	CM_TEMPERATURE_UNITS		2		
59	CM_DENSITY_UNITS		2		
60	CM_VOL_FLOW_UNITS		2		
	v6.0 Additions				
61	CM_Increment_Curve		2		
	Totals	**74**	**26**	**76**	**99**

Appendix C
Model 2700 Resource Block Reference

C.1 Resource block parameters

Following are the parameters (Table C-1) and views (Table C-2) for the resource block.

Table C-1 Resource block parameters

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
	Standard FF Parameters									
0	BLOCK_STRUCTURE	Beginning of the resource block	VARIABLE	DS_64	5	S	N/A	R/W	N/A	1.0
1	ST_REV	The revision level of the static data associated with the function block. Incremented with each write of static store.	VARIABLE	Unsigned16	2	S	0	R	N/A	1.0
2	TAG_DESC	The user description of the intended application of the block.	STRING	OCTET STRING	32	S	Spaces	R/W	Any 32 Characters	1.0
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.	VARIABLE	Unsigned16	2	S	0	R/W	N/A	1.0
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.	VARIABLE	Unsigned8	1	S	0	R/W	0 to 255	1.0
5	MODE_BLK	The actual, target, permitted and normal modes of the block.	RECORD	DS-69	4	mix	Auto	R/W	See section 2.6 of FF-891	1.0
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block.	STRING	BIT STRING	2	D/20	-	R	bit 0 = Other bit 1 = Block Config Error bit 3 = Simulate Active bit 6 = Maintenance Soon bit 7 = Input Failure bit 8 = Output Failure bit 9 = Memory Failure bit 11 = Lost NV Data bit 13 = Maintenance Now bit 15 = Out of Service	1.0
7	RS_STATE	Contains the operational state of the Function Block Application.	VARIABLE	Unsigned8	1	D/20	-	R	0 = Invalid State 1 = Start/Restart 2 = Initialization 3 = On-Line Linking 4 = On-Line 5 = Standby 6 = Failure	1.0
8	TEST_RW	Read/write test parameter - used only for conformance testing.	RECORD	DS-85	112	D/20	0	R		1.0
9	DD_RESOURCE	String identifying the tag of the resource which contains the Device Description for this resource.	STRING	OCTET STRING	32	S	Spaces	R	Any 32 Characters	1.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
10	MANUFAC_ID	Manufacturer identification number - used by an interface device to locate the DD file for the resource.	ENUM	Unsigned32	4	S	0x00 0310	R	0x000310 = Micro Motion	1.0
11	DEV_TYPE	Manufacturer's model number associated with the resource - used by interface devices to locate the DD file for the resource.	ENUM	Unsigned16	2	S	0x20 00	R	0x2000 = 2700	1.0
12	DEV_REV(1)	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.	VARIABLE	Unsigned8	1	S	4	R		1.0
13	DD_REV(1)	Revision of the DD associated with the resource - used by an interface device to locate the DD file for the resource.	VARIABLE	Unsigned8	1	S	1	R		1.0
14	GRANT_DENY	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.	RECORD	DS-70	2	S	0.0	R/W		1.0
15	HARD_TYPES	The types of hardware available as channel numbers.	ENUM	Bit String	2	S	0x80	R	0x80 = SCALAR_INPUT	1.0
16	RESTART	Allows a manual restart to be initiated. Several degrees of restart are possible.	ENUM	Unsigned8	1	D	1	R/W	1 = Run 2 = Restart resource 3 = Restart with defaults 4 = Restart processor	1.0
17	FEATURES	Used to show supported resource block options.	ENUM	Bit String	2	S	0x10 | 0x20 | 0x40 | 0x80	R	0x0010 = SoftWriteLock 0x0020 = FailSafe 0x0040 = Report 0x0080 = Unicode	1.0
18	FEATURE_SEL	Used to select resource block options.	ENUM	Bit String	2	S	0x10	R/W	0x0010 = SoftWriteLock 0x0020 = FailSafe 0x0040 = Report 0x0080 = Unicode	1.0
19	CYCLE_TYPE	Identifies the block execution methods available for this resource.	ENUM	Bit String	2	S	0x80 | 0x40	R	0x0080 = CycleScheduled 0x0040 = BlockComplete	1.0
20	CYCLE_SEL	Used to select the block execution method for this resource.	ENUM	Bit String	2	S	0	RW	0x0080 = CycleScheduled 0x0040 = BlockComplete	1.0
21	MIN_CYCLE_T	Time duration of the shortest cycle interval of which the resource is capable. Measured in 1/32 millisecond.	VARIABLE	Unsigned32	4	S	8000	R		1.0
22	MEMORY_SIZE	Available configuration memory in the empty resource in Kbytes. To be checked before attempting a download.	VARIABLE	Unsigned16	2	S	8	R		1.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
23	NV_CYCLE_T	Minimum time interval in 1/32 millisec specified by the manufacturer for writing copies of NV parameters to non-volatile memory. Zero means it will never be automatically copied. At the end of NV_CYCLE_TIME, only those parameters which have changed (as defined by the manufacturer) need to be updated in NVRAM	VARIABLE	Unsigned32	4	S	31,680,000	R		1.0
24	FREE_SPACE	Percent of memory available for further configuration. Zero in a preconfigured resource.	VARIABLE	Float	4	D	-	R	0-100 Percent	1.0
25	FREE_TIME	Percent of the block processing time that is free to process additional blocks.	VARIABLE	Float	4	D	-	R	0-100 Percent	1.0
26	SHED_RCAS	Time duration in 1/32 millisec at which to give up on computer writes to function block RCas locations. Shed from RCas shall never happen when SHED_RCAS = 0.	VARIABLE	Unsigned32	4	S	640000	R/W		1.0
27	SHED_ROUT	Time duration in 1/32 millisec at which to give up on computer writes to function block ROut locations. Shed from Rout shall never happen when SHED_ROUT = 0.	VARIABLE	Unsigned32	4	S	640000	R/W		1.0
28	FAULT_STATE	Condition set by loss of communication to an output block, fault promoted to an output block or a physical contact. When Fault State condition is set, Then output function blocks will perform their FSTATE actions.	ENUM	Unsigned8	1	N	1	R	1 = Clear 2 = Active	1.0
29	SET_FSTATE	Allows the Fault State condition to be manually initiated by selecting Set.	ENUM	Unsigned8	1	D	1	R/W	1 = Off 2 = Set	1.0
30	CLR_FSTATE	Writing a Clear to this parameter will clear the device fault state if the field condition, if any, has cleared.	ENUM	Unsigned8	1	D	1	R/W	1 = Off 2 = Set	1.0
31	MAX_NOTIFY	Maximum number of unconfirmed notify messages possible.	VARIABLE	Unsigned8	1	S	5	R		1.0
32	LIM_NOTIFY	Maximum number of unconfirmed alert notify messages allowed.	VARIABLE	Unsigned8	1	S	5	R/W	0 to MAX_NOTIFY	1.0
33	CONFIRM_TIME	The time in 1/32 millisec the resource will wait for confirmation of receipt of a report before trying again. Retry shall not happen when CONFIRM_TIME = 0.	VARIABLE	Unsigned32	4	S	640000	R/W		1.0
34	WRITE_LOCK	If locked, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.	ENUM	Unsigned8	1	S	1	R/W	1 = Unlocked 2 = Locked	1.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
35	UPDATE_EVT	This alert is generated by any change to the static data.	RECORD	DS-73	1/4	D	-	R		1.0
36	BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.	RECORD	DS-72	13	D	-	R/W		1.0
37	ALARM_SUM	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.	RECORD	DS-74	8	mix	-	R/W		1.0
38	ACK_OPTION	Selection of whether alarms associated with the block will be automatically acknowledged.	ENUM	Bit String	2	S	0	R/W	0 = Auto Ack Disabled 1 = Auto Ack Enabled	1.0
39	WRITE_PRI	Priority of the alarm generated by clearing the write lock.	VARIABLE	Unsigned8	1	S	0	R/W	0 to 15	1.0
40	WRITE_ALM	This alert is generated if the write lock parameter is cleared.	RECORD	DS-72	1/3	D	-	R/W		1.0
41	ITK_VER	Major revision number of the interoperability test case used in certifying this device as interoperable. The format and range of the version number is defined and controlled by the Fieldbus Foundation. Note: The value of this parameter will be zero (o) if the device has not been registered as interoperable by the FF.	VARIABLE	Unsigned16	2	S	5	R		3.0
42	FD_VER	A parameter equal to the value of the major version of the Field Diagnostics specification that this device was designed to.		Unsigned16	2	S	-	RO		7.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
43	FD_FAIL_ACTIVE	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.		Bit String	4	D	-	RO	0x00000001 = Check Function 0x00000002 = Calibration in Progress 0x00000008 = Sensor Simulation Active 0x00000010 = Slug Flow 0x00000020 = Meter Verification Aborted 0x00000040 = Meter Verification Failed 0x00000080 = Extrapolation Alert 0x00000100 = PM: Temperature or Density Overrange 0x00000200 = Drive Overrange 0x00000400 = Data Loss Possible (Totals) 0x00001000 = Calibration Failure 0x00002000 = Transmitter Not Characterized 0x00004000 = CM: Unable to Fit Curve Data 0x00008000 = Temperature Overrange 0x00010000 = No Left Pickoff/Right Pickoff Signal 0x00020000 = Density Overrange 0x00040000 = Mass Flow Overrange 0x00080000 = No Sensor Response 0x00100000 = Low Power 0x00200000 = Sensor Communication Failure 0x00400000 = NV Memory Failure 0x00800000 = Transmitter Initializing/Warming Up 0x01000000 = Electronics Failure - Hornet 0x02000000 = Electronics Failure - Device 0x04000000 = Factory configuration invalid 0x08000000 = Factory configuration checksum invalid	7.0
44	FD_OFFSPEC_ACTIVE	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.		Bit String	4	D	-	RO	Same as OD Index 43	7.0
45	FD_MAINT_ACTIVE	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.		Bit String	4	D	-	RO	Same as OD Index 43	7.0
46	FD_CHECK_ACTIVE	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.		Bit String	4	D	-	RO	Same as OD Index 43	7.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
47	FD_FAIL_MAP	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 4 alarm categories.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
48	FD_OFFSPEC_MAP	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 4 alarm categories.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
49	FD_MAINT_MAP	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 4 alarm categories.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
50	FD_CHECK_MAP	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 4 alarm categories.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
51	FD_FAIL_MASK	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to ‘1’ will mask i.e. inhibit the broadcast of a condition, and a bit equal to ‘0’ will unmask i.e. allow broadcast of a condition.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
52	FD_OFFSPEC_MASK	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to ‘1’ will mask i.e. inhibit the broadcast of a condition, and a bit equal to ‘0’ will unmask i.e. allow broadcast of a condition.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
53	FD_MAINT_MASK	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to ‘1’ will mask i.e. inhibit the broadcast of a condition, and a bit equal to ‘0’ will unmask i.e. allow broadcast of a condition.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
54	FD_CHECK_MASK	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.		Bit String	4	S	-	RW (OS/ AUTO)	Same as OD Index 43	7.0
55	FD_FAIL_ALM	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.		DS-87	15	D	-	RW (OS/ AUTO)		7.0
56	FD_OFFSPEC_ALM	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.		DS-87	15	D	-	RW (OS/ AUTO)		7.0
57	FD_MAINT_ALM	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.		DS-87	15	D	-	RW (OS/ AUTO)		7.0
58	FD_CHECK_ALM	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.		DS-87	15	D	-	RW (OS/ AUTO)		7.0
59	FD_FAIL_PRI	This parameter allows the user to specify the priority of this alarm category.		Unsigned8	1	S	0	RW (OS/ AUTO)		7.0
60	FD_OFFSPEC_PRI	This parameter allows the user to specify the priority of this alarm category.		Unsigned8	1	S	0	RW (OS/ AUTO)		7.0
61	FD_MAINT_PRI	This parameter allows the user to specify the priority of this alarm category.		Unsigned8	1	S	0	RW (OS/ AUTO)		7.0
62	FD_CHECK_PRI	This parameter allows the user to specify the priority of this alarm category.		Unsigned8	1	S	0	RW (OS/ AUTO)		7.0
63	FD_SIMULATE	This parameter allows the conditions to be manually supplied when simulation is enabled. When simulation is disabled both the diagnostic simulate value and the diagnostic value track the actual conditions. The simulate jumper is required for simulation to be enabled and while simulation is enabled the recommended action will show that simulation is active.		DS-89	9	D	disab led	RW (OS/ AUTO)		7.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
64	FD_RECOMMEN_ACT	This parameter is a device enumerated summarization of the most severe condition or conditions detected. The DD help should describe by enumerated action, what should be done to alleviate the condition or conditions. 0 is defined as Not Initialized, 1 is defined as No Action Required, all others defined by manuf.		Unsigned16	2	D	0	RO	Same as OD Index 77	7.0
65	FD_EXTENDED_ACTIVE	An optional parameter or parameters to allow the user finer detail on conditions causing an active condition in the FD_*_ACTIVE parameters.		Bit String	4	D	-	RO	Same as OD Index 43	7.0
66	FD_EXTENDED_MAP	An optional parameter or parameters to allow the user finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters.		Bit String	4	S	-	RW	Same as OD Index 43	7.0
	EPM Parameters									
67	COMPATIBILITY_REV	This parameter is used when replacing field devices. The correct value of this parameter is the DEV_REV value of the replaced device.		unsigned8	4	D		R		7.0
68	HARDWARE_REVISION	Hardware revision of that hardware	VARIABLE	unsigned8	1	S	Set on Build	R		7.0
69	SOFTWARE_REV	Software revision of source code which has resource block in it.		Visible String	32	S	Set on Build	R		7.0
70	PD_TAG	PD tag description of device		Visible String	32	S	Copy of MIB PD_ TAG	R		7.0
71	DEV_STRING	This is used to load new licensing into the device. The value can be written but will always read back with a value of 0.	VARIABLE	Array of unsigned32	32	S	0	R/W		1.0
72	DEV_OPTIONS	Indicates which miscellaneous device licensing options are enabled.		bit string	4	S		R/W	0x00000001 = Download	7.0
73	OUTPUT_BOARD_SN	Output board serial number.	VARIABLE	unsigned32	4	S	0	R		1.0
74	FINAL_ASSY_NUM	The same final assembly number placed on the neck label.	VARIABLE	unsigned32	4	S	0	R/W		1.0
75	DOWNLOAD_MODE	Gives access to the boot block code for over the wire downloads	ENUM	unsigned8	1	S	0	R		1.0
76	HEALTH_INDEX	Parameter representing the overall health of the device, 100 being perfect.	VARIABLE	Unsigned8	1	D	-	R	1 - 100	3.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
77	FAILED_PRI	Designates the alarming priority of the FAILED_ALM and also used as switch b/w FD and legacy PWA. If value is greater than or equal to 1 then PWA alerts will be active in device else device will have FD alerts.	VARIABLE	unsigned8	1	S	0	R/W	0 - 15	3.0
78	RECOMMENDED_ACTION	Enumerated list of recommended actions displayed with a device alert.	VARIABLE	unsigned16	2	D	-	R	0 = Uninitialized 1 = No action 6 = Factory configuration checksum invalid 7 = Factory configuration invalid 8 = Electronics Failure - Device 9 = Replace the Fieldbus Electronics Module Assembly 10 = Transmitter Initializing/Warming Up 11 = Reset the Device then Download the Device Configuration 12 = Sensor Communication Failure 13 = Low Power 14 = No Sensor Response 15 = Mass Flow Overrange 16 = Density Overrange 17 = No Left Pickoff/Right Pickoff Signal 18 = Temperature Overrange 19 = CM: Unable to Fit Curve Data 20 = Transmitter Not Characterized 21 = Calibration Failure 23 = Data Loss Possible (Totals) 24 = Drive Overrange 25 = PM: Temperature or Density Overrange 26 = Extrapolation Alert 27 = Meter Verification Failed 28 = Meter Verification Aborted 29 = Slug Flow 30 = Sensor Simulation Active 32 = Allow the procedure to complete 33 = Check Transducer Block Mode 34 = Simulation Active 39 = Simulated -- Factory configuration checksum invalid 40 = Simulated -- Factory configuration invalid 41 = Simulated -- Electronics Failure - Device 42 = Simulated -- Replace the Fieldbus Electronics Module Assembly 43 = Simulated -- Transmitter Initializing/Warming Up 44 = Simulated -- Reset the Device then Download the Device Configuration 45 = Simulated -- Sensor Communication Failure 46 = Simulated -- Low Power 47 = Simulated -- No Sensor Response	

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
									48 = Simulated -- Mass Flow Overrange 49 = Simulated -- Density Overrange+ 50 = Simulated -- No Left Pickoff/Right Pickoff Signal 51 = Simulated -- Temperature Overrange 52 = Simulated -- CM: Unable to Fit Curve Data 53 = Simulated -- Transmitter Not Characterized 54 = Simulated -- Calibration Failure 56 = Simulated -- Data Loss Possible (Totals) 57 = Simulated -- Drive Overrange 58 = Simulated -- PM: Temperature or Density Overrange 59 = Simulated -- Extrapolation Alert 60 = Simulated -- Meter Verification Failed 61 = Simulated -- Meter Verification Aborted 62 = Simulated -- Slug Flow 63 = Simulated -- Sensor Simulation Active 65 = Simulated -- Allow the procedure to complete 66 = Simulated -- Check Transducer Block Mode	3.0
79	FAILED_ALM	Alarm indicating a failure within a device which makes the device non-operational.	RECORD	DS-71	13	D	-	R/W		3.0
80	MAINT _ALM	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.	RECORD	DS-71	13	D	-	R/W		3.0
81	ADVISE _ALM	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.	RECORD	DS-71	13	D	-	R/W		3.0
82	FAILED_ENABLE	Enabled FAILED_ALM alarm conditions. Corresponds bit for bit to the FAILED_ACTIVE.A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
83	FAILED_MASK	Mask of Failure Alarm. Corresponds bit for bit to the FAILED_ACTIVE. A bit on means that the failure is masked out from alarming.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
84	FAILED_ACTIVE	Enumerated list of advisory conditions within a device. All open bits are free to be used as appropriate for each specific device.	ENUM	bit string	4	D	0	R	Same as OD Index 43	3.0
85	MAINT_PRI	Designates the alarming priority of the MAINT_ALM.	VARIABLE	unsigned8	1	S	0	R/W	0 - 15	3.0

Table C-1 Resource block parameters *continued*

OD Index	Parameter Mnemonic	Definition	Message Type	Data Type/ Structure	Size	Store/Rate (HZ)	Initial Value	Access	Enumerated List of Values	Release
86	MAINT_ENABLE	Enabled MAINT_ALM alarm conditions. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
87	MAINT _MASK	Mask of Maintenance Alarm. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the failure is masked out from alarming.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
88	MAINT _ACTIVE	Enumerated list of advisory conditions within a device. All open bits are free to be used as appropriate for each specific device	ENUM	bit string	4	D	0	R	Same as OD Index 43	3.0
89	ADVISE_PRI	Designates the alarming priority of the ADVISE_ALM.	VARIABLE	unsigned8	1	S	0	R/W	0 - 15	3.0
90	ADVISE_ENABLE	Enabled ADVISE_ALM alarm conditions. Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
91	ADVISE _MASK	Mask of Advisory Alarm.Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the failure is masked out from alarming.	ENUM	bit string	4	S	0	R	Same as OD Index 43	3.0
92	ADVISE _ACTIVE	Enumerated list of advisory conditions within a device. All open bits are free to be used as appropriate for each specific device	ENUM	bit string	4	D	0	R	Same as OD Index 43	3.0

(1) The initial value is based on transmitter software version 4.0. If the transmitter contains a later version of software, the initial value may be different.

C.2 Resource block views

Table C-2 lists the views for the resource block. The Fieldbus Foundation defines the views as:

- View 1 – View object defined to access the dynamic operating parameters of a block
- View 2 – View object defined to access the static operating parameters of a block.
- View 3 – View object defined to access **all** the dynamic parameters of a block.
- View 4 – View object defined to access static parameters not included in View 2.

The number in the cell represents the size of the parameter in bytes. Each view can only contain a total of 122 bytes of data. Each view must start with ST_REV.

Table C-2 Resource block views

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 3_1	View 4	View 4_1	View 4_2
1	ST_REV	2	2	2	2	2	2	2
2	TAG_DESC							
3	STRATEGY					2		
4	ALERT_KEY					1		
5	MODE_BLK	4		4				
6	BLOCK_ERR	2		2				
7	RS_STATE	1		1				
8	TEST_RW							
9	DD_RESOURCE							
10	MANUFAC_ID					4		
11	DEV_TYPE					2		
12	DEV_REV					1		
13	DD_REV					1		
14	GRANT_DENY		2					
15	HARD_TYPES					2		
16	RESTART							
17	FEATURES					2		
18	FEATURE_SEL		2					
19	CYCLE_TYPE					2		
20	CYCLE_SEL		2					
21	MIN_CYCLE_T					4		
22	MEMORY_SIZE					2		
23	NV_CYCLE_T		4					
24	FREE_SPACE		4					
25	FREE_TIME	4		4				
26	SHED_RCAS		4					
27	SHED_ROUT		4					
28	FAULT_STATE	1		1				
29	SET_FSTATE							
30	CLR_FSTATE							
31	MAX_NOTIFY					1		
32	LIM_NOTIFY		1					
33	CONFIRM_TIME		4					
34	WRITE_LOCK		1					
35	UPDATE_EVT							
36	BLOCK_ALM							
37	ALARM_SUM	8		8				
38	ACK_OPTION					2		
39	WRITE_PRI					1		
40	WRITE_ALM							
41	ITK_VER					2		
42	FD_VER					2		
43	FD_FAIL_ACTIVE	4		4				
44	FD_OFFSPEC_ACTIVE	4		4				
45	FD_MAINT_ACTIVE	4		4				
46	FD_CHECK_ACTIVE	4		4				

Table C-2 Resource block views *continued*

OD Index	Parameter Mnemonic	View 1	View 2	View 3	View 3_1	View 4	View 4_1	View 4_2
47	FD_FAIL_MAP					4		
48	FD_OFFSPEC_MAP					4		
49	FD_MAINT_MAP					4		
50	FD_CHECK_MAP					4		
51	FD_FAIL_MASK					4		
52	FD_OFFSPEC_MASK					4		
53	FD_MAINT_MASK					4		
54	FD_CHECK_MASK					4		
55	FD_FAIL_ALM							
56	FD_OFFSPEC_ALM							
57	FD_MAINT_ALM							
58	FD_CHECK_ALM							
59	FD_FAIL_PRI					1		
60	FD_OFFSPEC_PRI					1		
61	FD_MAINT_PRI					1		
62	FD_CHECK_PRI					1		
63	FD_SIMULATE			9				
64	FD_RECOMMEN_ACT	2		2				
65	FD_EXTENDED_ACTIVE	4		4				
66	FD_EXTENDED_MAP					4		
67	COMPATIBILITY_REV							
68	HARDWARE_REVISION							
69	SOFTWARE_REV							
70	PD_TAG						32	
71	DEV_STRING						32	
72	DEV_OPTIONS						4	
73	OUTPUT_BOARD_SN						4	
74	FINAL_ASSY_NUM						4	
75	DOWNLOAD_MODE							
76	HEALTH_INDEX			1				
77	FAILED_PRI							1
78	RECOMMENDED_ACTION				2			
79	FAILED_ALM							
80	MAINT _ALM							
81	ADVISE _ALM							
82	FAILED_ENABLE							4
83	FAILED_MASK							4
84	FAILED_ACTIVE				4			
85	MAINT_PRI							1
86	MAINT_ENABLE							4
87	MAINT _MASK							4
88	MAINT _ACTIVE				4			
89	ADVISE_PRI							1
90	ADVISE_ENABLE							4
91	ADVISE _MASK							4
92	ADVISE _ACTIVE				4			
	Totals	44	30	54	16	73	78	29

Appendix D
Flowmeter Installation Types and Components

D.1 Overview

This appendix provides illustrations of different flowmeter installations and components for the Model 2700 transmitter.

D.2 Installation diagrams

Model 2700 transmitters can be installed in four different ways:

- Integral
- 4-wire remote
- 9-wire remote
- Remote core processor with remote transmitter

See Figure D-1.

D.3 Component diagrams

Figure D-2 shows the transmitter and core processor components in integral installations.

Figure D-3 shows the transmitter components in 4-wire remote installations and remote core processor with remote transmitter installations.

Figure D-4 shows the transmitter/core processor assembly in 9-wire remote installations.

In remote core processor with remote transmitter installations, the core processor is installed stand-alone. See Figure D-5.

D.4 Wiring and terminal diagrams

In 4-wire remote and remote core processor with remote transmitter installations, a 4-wire cable is used to connect the core processor to the transmitter's mating connector. See Figure D-6.

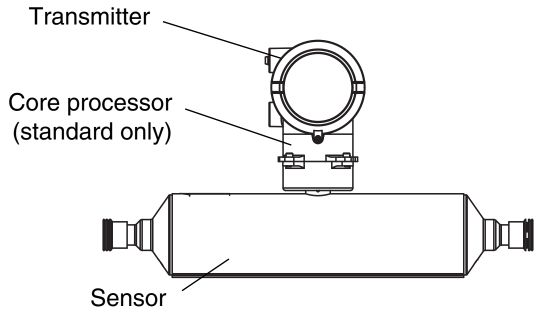
In 9-wire remote installations, a 9-wire cable is used to connect the junction box on the sensor to the terminals on the transmitter/core processor assembly. See Figure D-8.

Figure D-9 shows the transmitter's power supply terminals.

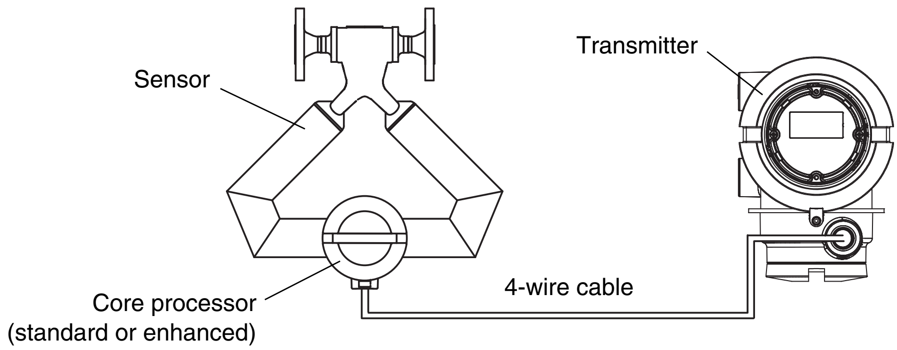
Figure D-9 shows the output terminals for the Model 2700 transmitter.

Figure D-1 Installation types

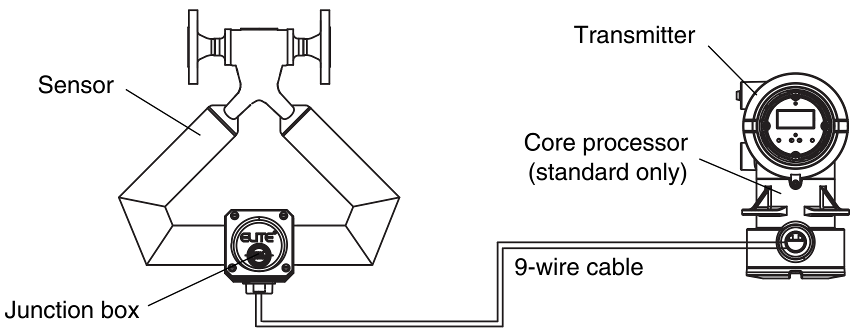
Integral



4-wire remote



9-wire remote



Remote core processor with remote transmitter

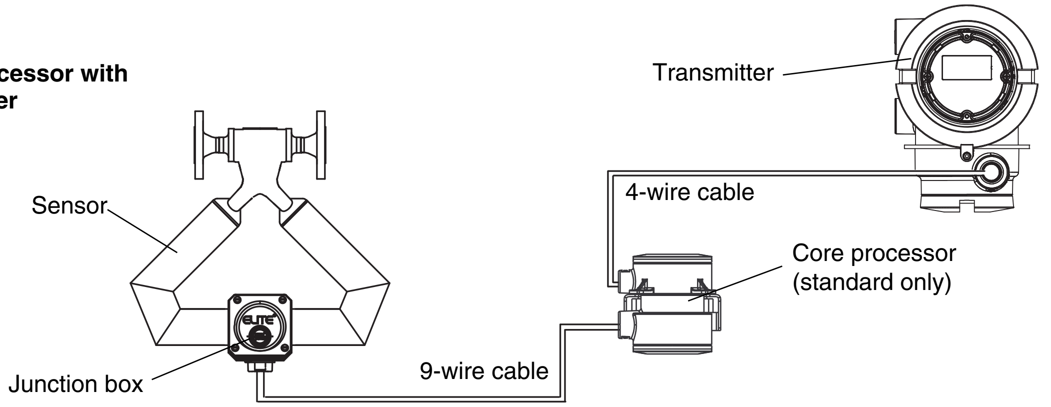


Figure D-2 Transmitter and core processor components – Integral installations

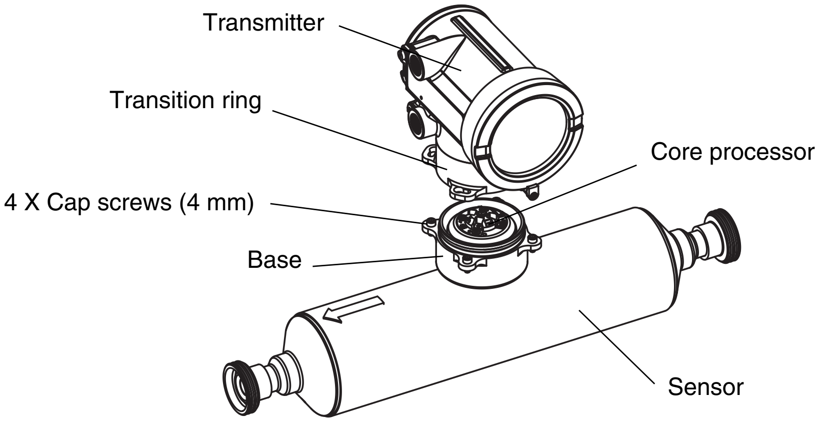


Figure D-3 Transmitter components, junction end-cap removed – 4-wire remote and remote core processor with remote transmitter installations

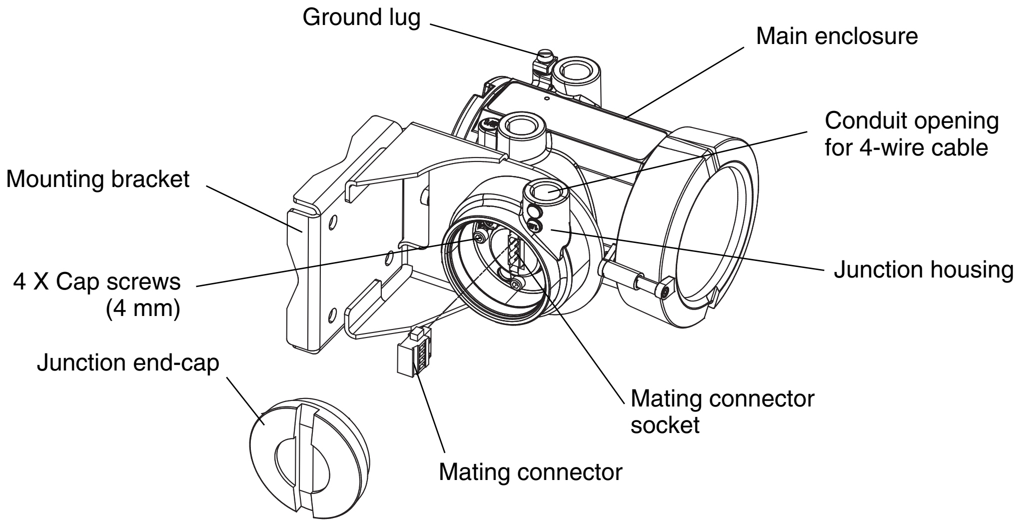


Figure D-4 Transmitter/core processor assembly exploded view – 9-wire remote installations

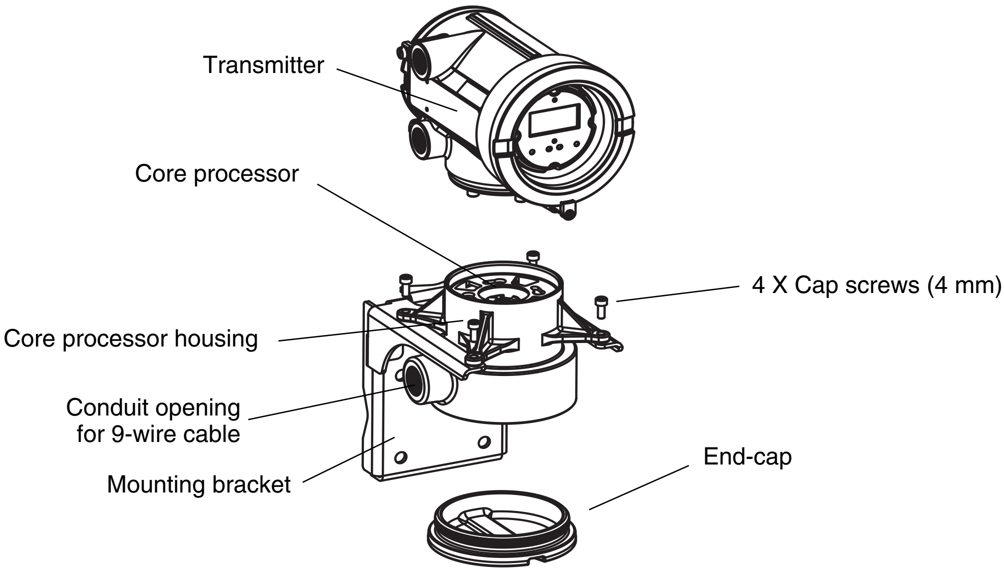


Figure D-5 Remote core processor components

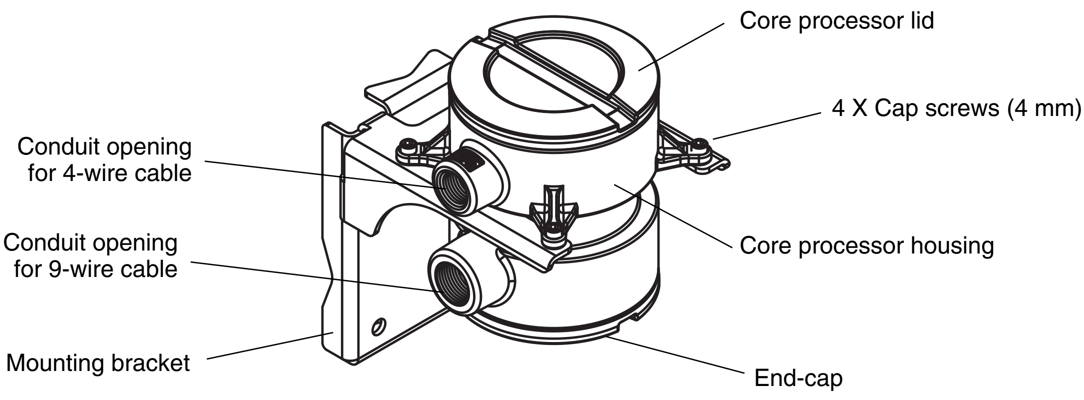


Figure D-6 4-wire cable between Model 2700 transmitter and standard core processor

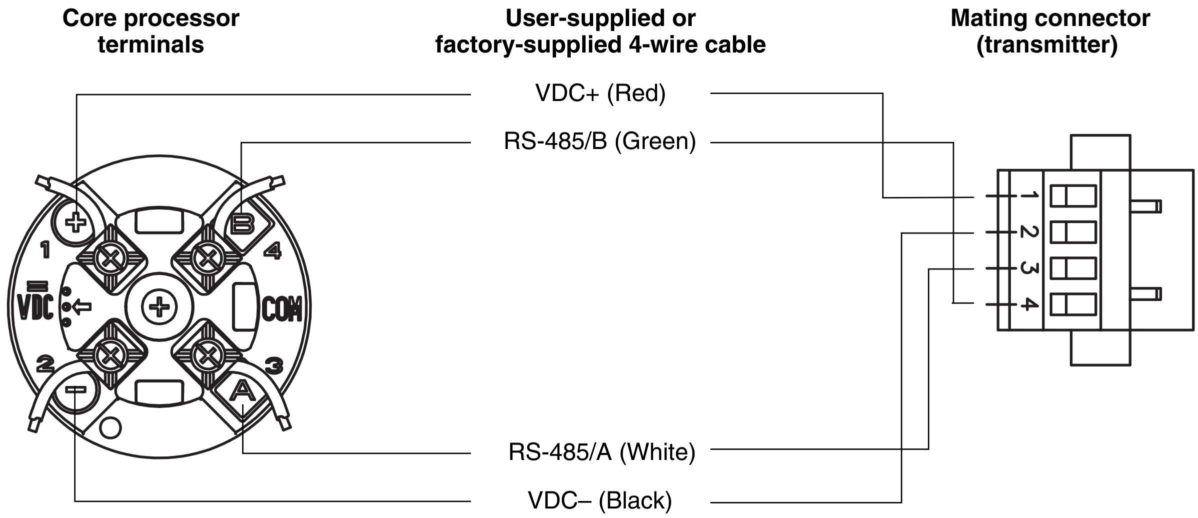


Figure D-7 4-wire cable between Model 2700 transmitter and enhanced core processor

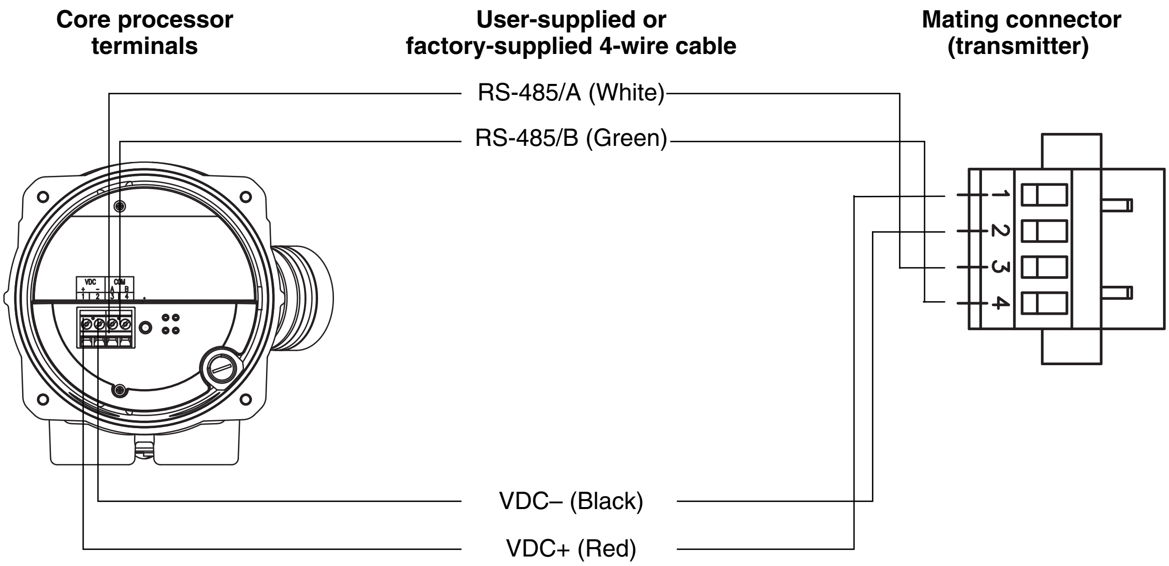


Figure D-8 **9-wire cable between sensor junction box and core processor**

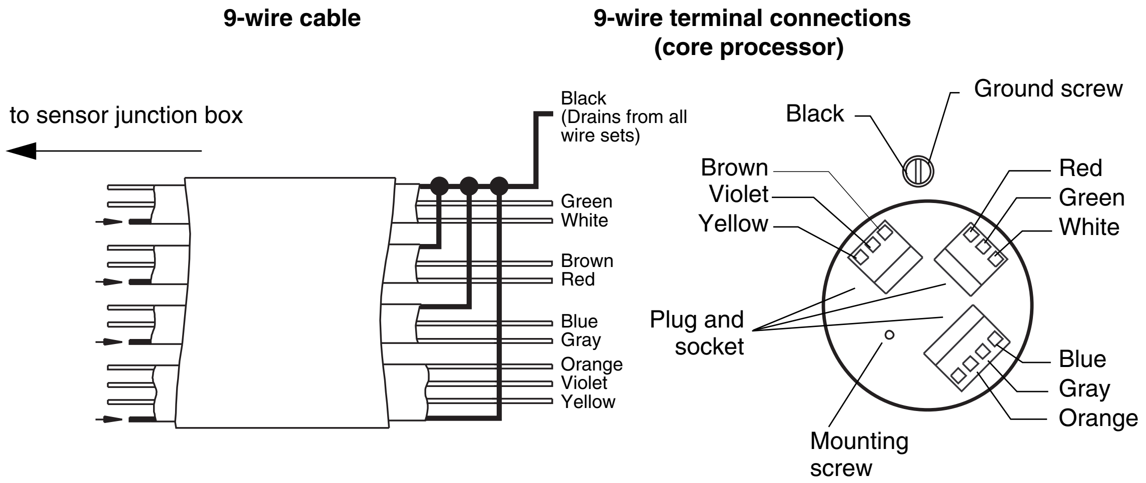
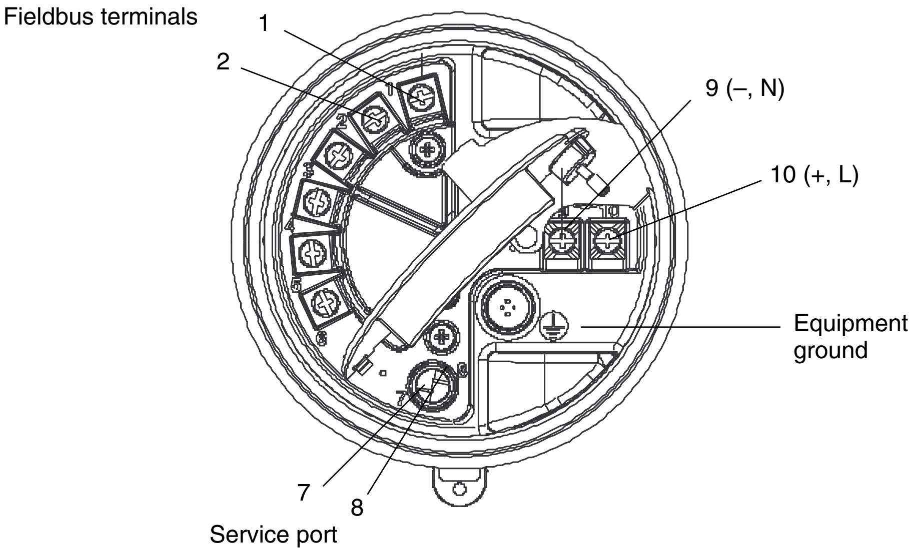


Figure D-9 **Output and power supply terminals**



Appendix E
Connecting with the Field Communicator

RB Reference

Diagrams

375 Communicator

ProLink

E.1 Overview

The Field Communicator is a handheld configuration and management tool for FOUNDATION fieldbus-compatible devices, including the Micro Motion Model 2700 transmitter. This appendix provides basic information for connecting the Field Communicator to your transmitter.

The instructions in this manual assume that users are already familiar with the Communicator and can perform the following tasks:

- Turn on the Communicator
- Navigate the Communicator menus
- Transmit and receive configuration information between the Communicator and FOUNDATION fieldbus-compatible devices
- Use the alpha keys to type information

If you are unable to perform the tasks listed above, consult the Communicator manual before attempting to use the Communicator. The documentation is available on the Micro Motion web site (www.micromotion.com).

Note: In this manual, procedures identified as performed with a fieldbus host can be accomplished with a Field Communicator.

E.2 Viewing the device descriptions

To access all of the features of the Model 2700 transmitter with FOUNDATION fieldbus, the Field Communicator must have the device description (DD) for version 6.x devices. DD files are available in the Products section of the Micro Motion web site (www.micromotion.com).

To view the Model 2700 device descriptions that are installed on your Field Communicator:

1. In the Foundation fieldbus application menu, choose **Utility**, then **Available Device Descriptions List**.
2. Expand the **Micro Motion, Inc.** branch, then expand the **2000** branch.
3. If you do not have a **Dev Rev 6** device description installed, you will need to obtain it in order to use the functionality described in this manual. Contact Micro Motion.

E.3 Connecting to a transmitter

The Field Communicator can be connected directly to a fieldbus segment. Figures E-1 and E-2 illustrate two examples for connecting the Communicator to a segment.

Connecting with the Field Communicator

Figure E-1 Bench connection example

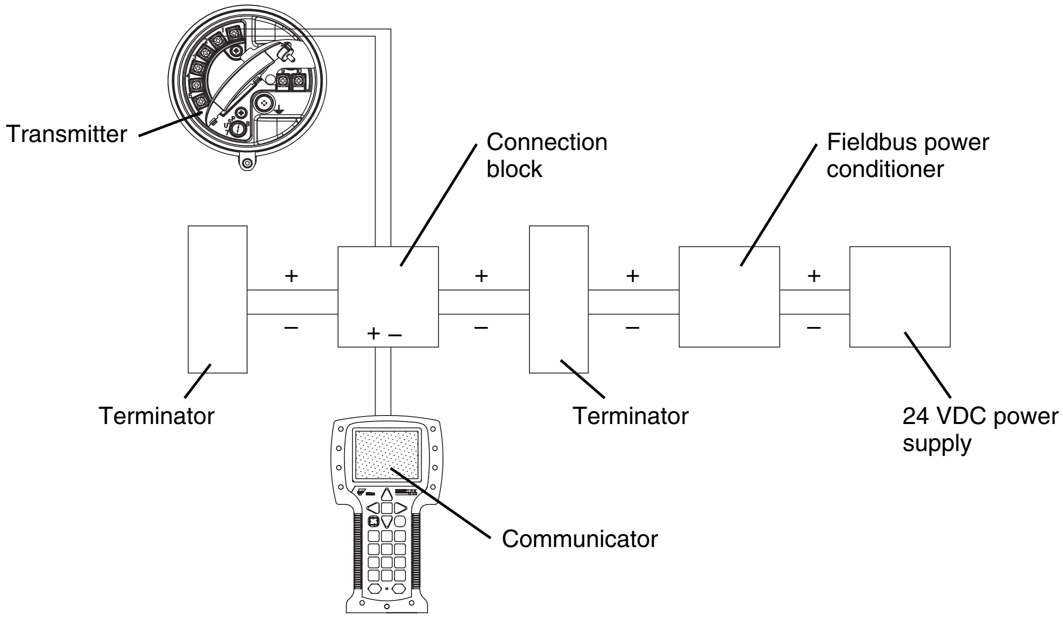
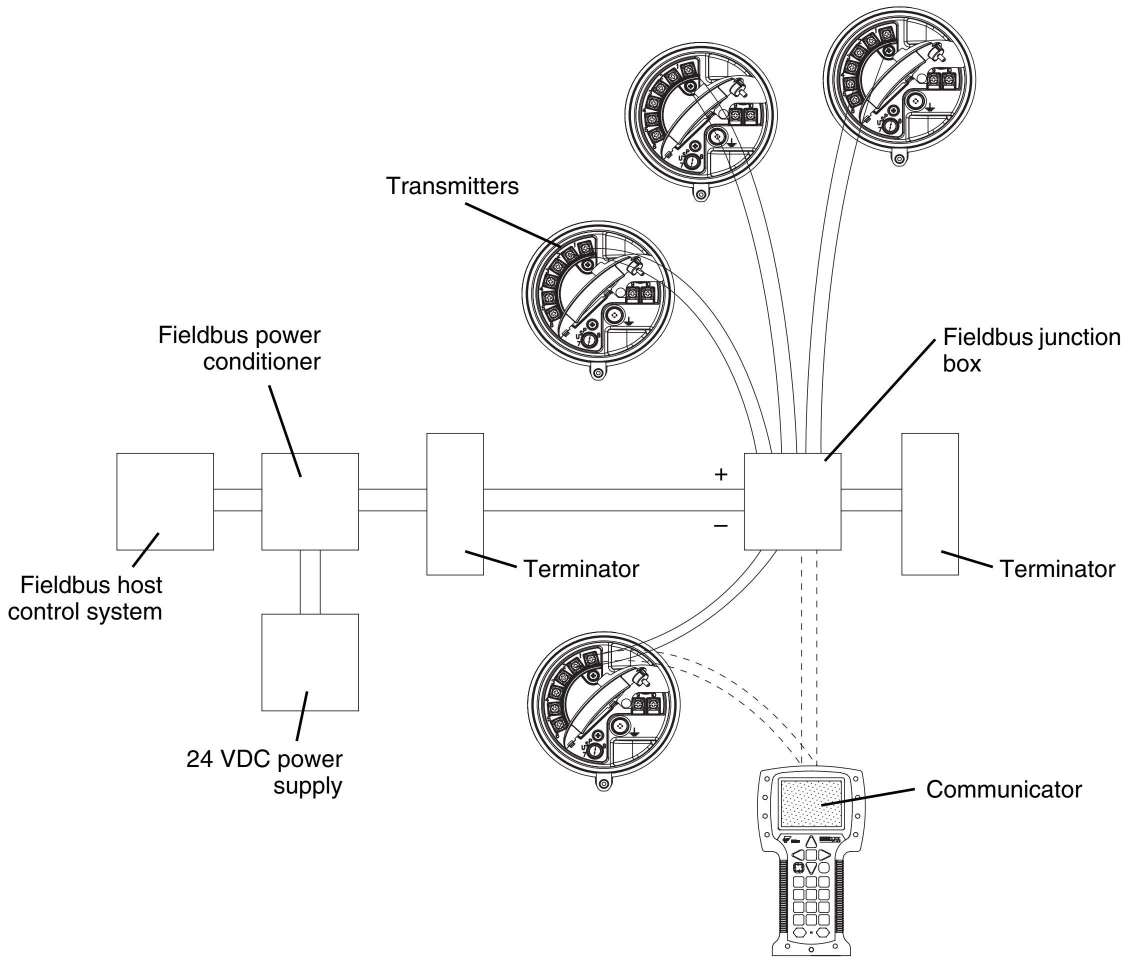


Figure E-2 Field connection example



RB Reference

Diagrams

375 Communicator

ProLink

Appendix F
Connecting with ProLink II or Pocket ProLink Software

F.1 Overview

ProLink II is a Windows-based configuration and management tool for Micro Motion transmitters. It provides complete access to transmitter functions and data.

This chapter provides basic information for connecting ProLink II to your transmitter. The following topics and procedures are discussed:

- Requirements (see Section F.2)
- Configuration upload/download (see Section F.3)
- Connecting to a Model 2700 transmitter (see Section F.4)

The instructions in this manual assume that users are already familiar with ProLink II software. For more information on using ProLink II, see the ProLink II manual.

F.2 Requirements

To use ProLink II with a Model 2700 transmitter, the following are required:

- ProLink II v2.0 or later for most basic functions
- ProLink II v2.91 or later for access to many advanced functions, such as Smart Meter Verification
- An RS-485 to RS-232 signal converter, to convert the PC port's signal to the signal used by the transmitter. For computers without serial ports, certain USB to RS-232 converters can be used in conjunction with the RS-232 to RS-485 converter. Both types of converter are available from Micro Motion.
- 25-pin to 9-pin adapter (if required by your PC)

Note: If you are using the enhanced core processor and you connect directly to the core processor's RS-485 terminals (see Appendix D) instead of to the transmitter, ProLink II v2.4 or later is required. This connection type is sometimes used for troubleshooting.

F.3 ProLink II configuration upload/download

ProLink II provides a configuration upload/download function which allows you to save configuration sets to your PC. This allows:

- Easy backup and restore of transmitter configuration
- Easy replication of configuration sets

Micro Motion recommends that all transmitter configurations be downloaded to a PC as soon as the configuration is complete.

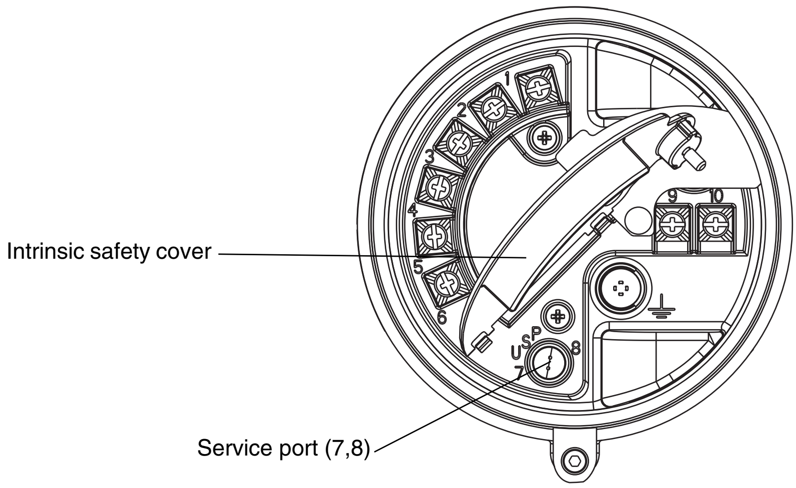
To access the configuration upload/download function:

1. Connect ProLink II to your transmitter as described in this chapter.
2. From the **File** menu:
   - To save a configuration file to a PC, use the **Load from Xmtr to File** option.
   - To restore or load a configuration file to a transmitter, use the **Send to Xmtr from File** option.

F.4 Connecting from a PC to a Model 2700 transmitter

You can temporarily connect a personal computer (PC) to the transmitter's service port. The service port is located within the transmitter wiring compartment, beneath the intrinsic safety cover. See Figure F-1.

Figure F-1 Service port



F.4.1 Connecting to the service port

To temporarily connect to the service port, which is located in the non-intrinsically safe power-supply compartment:

1. Attach the signal converter to the serial or USB port of your PC, using a 25-pin to 9-pin adapter if required.
2. Open the cover to the intrinsically safe wiring compartment.

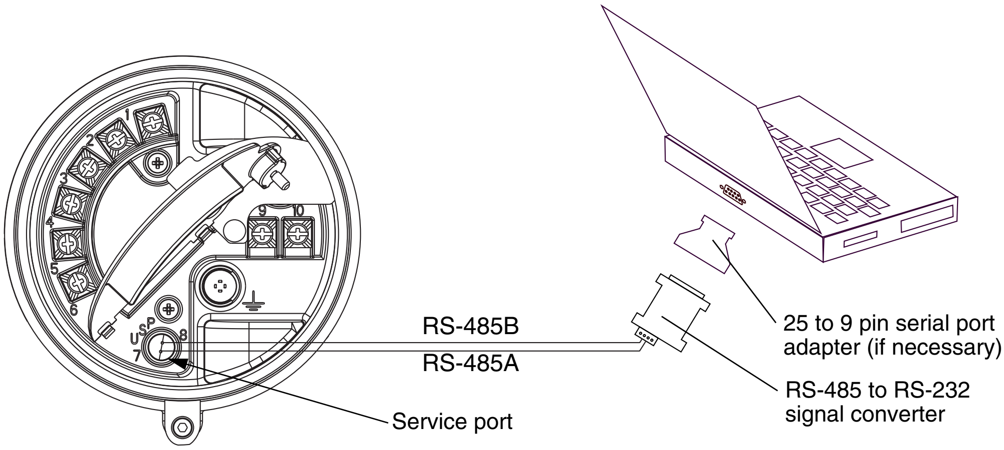
> **⚠ WARNING**
>
> **Opening the wiring compartment in a hazardous area can cause an explosion.**
>
> Because the wiring compartment must be open to make this connection, the service port should be used only for temporary connections, for example, for configuration or troubleshooting purposes.
>
> When the transmitter is in an explosive atmosphere, do not use the service port to connect to the transmitter.

3. Open the power supply compartment.

> **⚠ WARNING**
>
> **Opening the power supply compartment can expose the operator to electric shock.**
>
> To avoid the risk of electric shock, do not touch the power supply wires or terminals while using the service port.

4. Connect the signal converter leads to the service port terminals. See Figure F-2.

Figure F-2 Connecting to the service port



5. Start ProLink II. Choose **Connection > Connect to Device**. In the screen that appears, specify:
   - **Protocol**: Service Port
   - **COM Port**: as appropriate for your PC

   All other parameters are set to service port required values and cannot be changed.
6. Click **Connect**.
7. If an error message appears:
   a. Swap the leads between the two service port terminals and try again.
   b. Ensure that you are using the correct COM port.
   c. Check all the wiring between the PC and the transmitter.

F.5 ProLink II language

ProLink II can be configured for the following languages:

- English
- French
- German

To configure the ProLink II language, choose **Tools > Options**. In this manual, English is used as the ProLink II language.

Appendix G
Using the Display

G.1 Overview

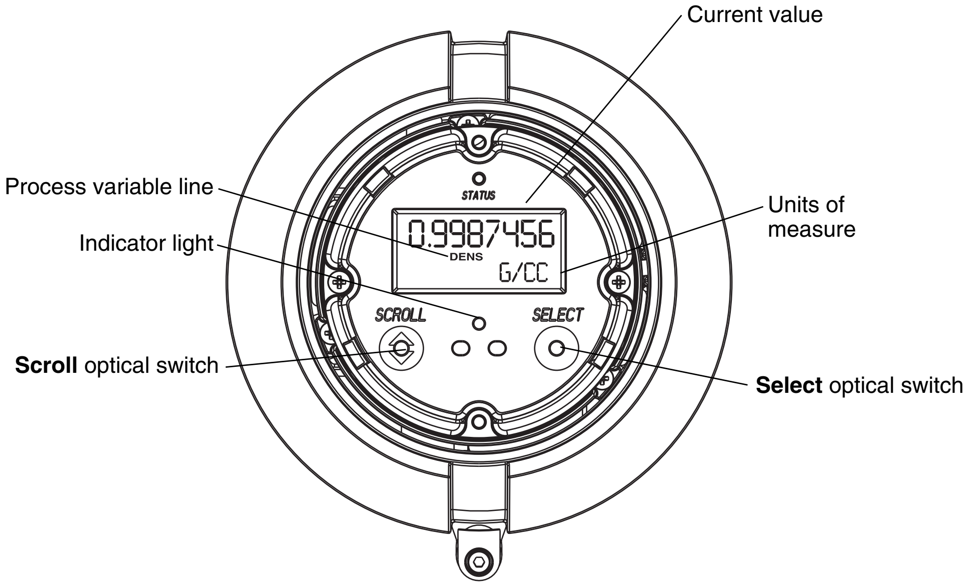
This appendix describes the basic use of the display and provides a menu tree for the display. You can use the menu tree to locate and perform display commands quickly.

Note that Model 2700 transmitters can be ordered with or without displays. Not all configuration and use functions are available through the display. If you need the added functionality, or if your transmitter does not have a display, you must use either a fieldbus host or ProLink II.

G.2 Components

Figure G-1 illustrates the display components.

Figure G-1 Display components



G.3 Using the optical switches

The **Scroll** and **Select** optical switches are used to navigate the display menus. To activate an optical switch, touch the lens in front of the optical switch or move your finger over the optical switch close to the lens. There are two optical switch indicators: one for each switch. When an optical switch is activated, the associated optical switch indicator is a solid red.

⚠ CAUTION

Attempting to activate an optical switch by inserting an object into the opening can damage the equipment.

To avoid damage to the optical switches, do not insert an object into the openings. Use your fingers to activate the optical switches.

G.4 Using the display

The display can be used to view process variable data or to access the transmitter menus for configuration or maintenance.

G.4.1 Display language

The display can be configured for the following languages:

- English
- French
- Spanish
- German

Due to software and hardware restrictions, some English words and terms may appear in the non-English display menus. For a list of the codes and abbreviations used on the display, see Table G-1.

For information on configuring the display language, see Section 4.18.6.

In this manual, English is used as the display language.

G.4.2 Viewing process variables

In ordinary use, the **Process variable** line on the LCD panel shows the configured display variables, and the **Units of measure** line shows the measurement unit for that process variable.

- See Section 4.18.5 for information on configuring the display variables.
- See Table G-1 for information on the codes and abbreviations used for display variables.

If more than one line is required to describe the display variable, the **Units of measure** line alternates between the measurement unit and the additional description. For example, if the LCD panel is displaying a mass inventory value, the **Units of measure** line alternates between the measurement unit (for example, **G**) and the name of the inventory (for example, **MASSI**).

Auto Scroll may or may not be enabled:

- If Auto Scroll is enabled, each configured display variable will be shown for the number of seconds specified for Scroll Rate.
- Whether Auto Scroll is enabled or not, the operator can manually scroll through the configured display variables by activating **Scroll**.

For more information on using the display to manage totalizers and inventories, see Chapter 5.

Display
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G.4.3 Using display menus

Note: The display menu system provides access to basic transmitter functions and data. It does not provide access to all functions and data. To access all functions and data, use a fieldbus host or ProLink II

To enter the display menu system:

1. Activate **Scroll** and **Select** simultaneously.
2. Hold **Scroll** and **Select** until the words **SEE ALARM** or **OFF-LINE MAINT** appear.

Note: Access to the display menu system may be enabled or disabled. If disabled, the OFF-LINE MAINT option does not appear. For more information, see Section 4.18.1.

If no optical switch activity occurs for two minutes, the transmitter will exit the off-line menu system and return to the process variable display.

To move through a list of options, activate **Scroll**.

To select from a list or to enter a lower-level menu, scroll to the desired option, then activate **Select**. If a confirmation screen is displayed:

- To confirm the change, activate **Select**.
- To cancel the change, activate **Scroll**.

To exit a menu without making any changes:

- Use the **EXIT** option if available.
- Otherwise, activate **Scroll** at the confirmation screen.

G.4.4 Display password

A password can be used to control access to either the off-line maintenance menu, the alarm menu, or both. The same code is used for both:

- If both passwords are enabled, the user must enter the password to access the top-level off-line menu. The user can then access either the alarm menu or the off-line maintenance menu without re-entering the password.
- If only one password is enabled, the user can access the top-level off-line menu, but will be prompted for the password when he or she attempts to access the alarm menu or the off-line maintenance menu (depending on which password is enabled). The user can access the other menu without a password.
- If neither password is enabled, the user can access all parts of the off-line menu without a password.

For information about enabling and setting the display password, refer to Section 4.18.

Note: If the petroleum measurement application is installed on your transmitter, the display password is always required to start, stop, or reset a totalizer, even if neither password is enabled. If the petroleum measurement application is not installed, the display password is never required for these functions, even if one of the passwords is enabled.

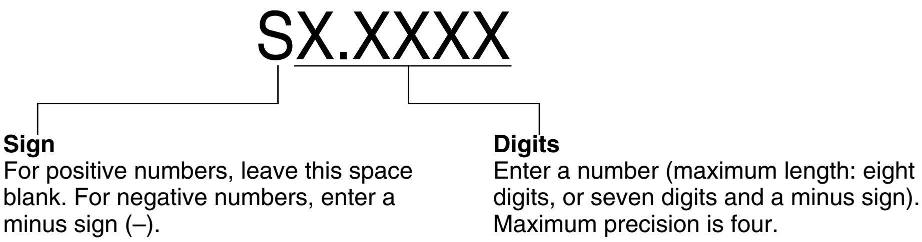
If a password is required, the word **CODE?** appears at the top of the password screen. Enter the digits of the password one at a time by using **Scroll** to choose a number and **Select** to move to the next digit.

If you encounter the display password screen but do not know the password, wait 30 seconds without activating any of the display optical switches. The password screen will timeout automatically and you will be returned to the previous screen.

G.4.5 Entering floating-point values with the display

Certain configuration values, such as meter factors or output ranges, are entered as floating-point values. When you first enter the configuration screen, the value is displayed in decimal notation (as shown in Figure G-2) and the active digit is flashing.

Figure G-2 Numeric values in decimal notation



To change the value:

1. **Select** to move one digit to the left. From the leftmost digit, a space is provided for a sign. The sign space wraps back to the rightmost digit.
2. **Scroll** to change the value of the active digit: **1** becomes **2**, **2** becomes **3**, ..., **9** becomes **0**, **0** becomes **1**. For the rightmost digit, an **E** option is included to switch to exponential notation.

To change the sign of a value:

1. **Select** to move to the space that is immediately left of the leftmost digit.
2. Use **Scroll** to specify – (for a negative value) or [blank] (for a positive value).

In decimal notation, you can change the position of the decimal point up to a maximum precision of four (four digits to the right of the decimal point). To do this:

1. **Select** until the decimal point is flashing.
2. **Scroll.** This removes the decimal point and moves the cursor one digit to the left.
3. **Select** to move one digit to the left. As you move from one digit to the next, a decimal point will flash between each digit pair.
4. When the decimal point is in the desired position, **Scroll.** This inserts the decimal point and moves the cursor one digit to the left.

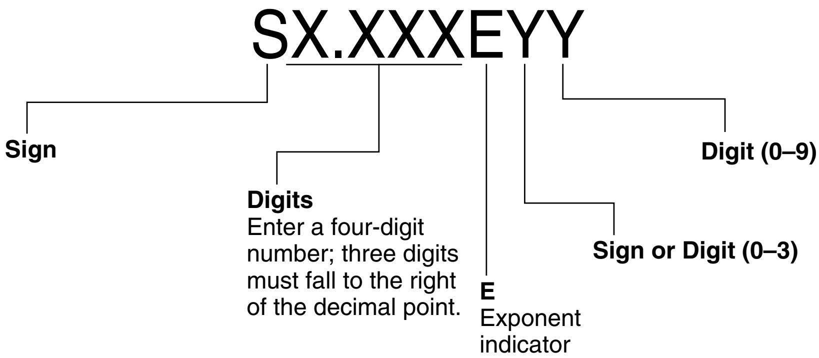
To change from decimal to exponential notation (see Figure G-3):

1. **Select** until the rightmost digit is flashing.
2. **Scroll** to **E**, then **Select**. The display changes to provide two spaces for entering the exponent.
3. To enter the exponent:
   a. **Select** until the desired digit is flashing.
   b. **Scroll** to the desired value. You can enter a minus sign (first position only), values between 0 and 3 (for the first position in the exponent), or values between 0 and 9 (for the second position in the exponent).
   c. **Select**.

Note: When switching between decimal and exponential notation, any unsaved edits are lost. The system reverts to the previously saved value.

Note: While in exponential notation, the positions of the decimal point and exponent are fixed.

Figure G-3 **Numeric values in exponential notation**



To change from exponential to decimal notation:

1. **Select** until the **E** is flashing.
2. **Scroll** to **d**.
3. **Select**. The display changes to remove the exponent.

To exit the menu:

- If the value has been changed, **Select** and **Scroll** simultaneously until the confirmation screen is displayed.
  - **Select** to apply the change and exit.
  - **Scroll** to exit without applying the change.
- If the value has not been changed, **Select** and **Scroll** simultaneously until the previous screen is displayed.

G.5 Abbreviations

The display uses a number of abbreviations. Table G-1 lists the abbreviations used by the display.

Table G-1 Display codes and abbreviations

Abbreviation	Definition
ACK ALARM	Acknowledge alarm
ACK ALL	Acknowledge all alarms
ADDR	Address
AUTO SCRLL	Auto scroll
AVE_D	Average density
AVE_T	Average temperature
BRD_T	Board temperature
BKLT	Backlight
CAL	Calibrate
CHANGE CODE	Change display password
CODE	Display password
CONC	Concentration
CONFG	Configure (or configuration)
CORE	Core processor
CUR Z	Current zero
DENS	Density
DGAIN	Drive gain
DISBL	Disable
DRIVE%	Drive gain
DSPLY	Display
ENABL	Enable
ENABLE ACK	Enable the ACK ALL function
ENABLE ALARM	Enable the alarm menu
ENABLE AUTO	Enable auto scroll
ENABLE OFFLN	Enable the offline menu
ENABLE PASSW	Enable the display password
ENABLE RESET	Enable resetting of totals
ENABLE START	Enable stopping/starting of totals
EXT_P	External pressure
EXT_T	External temperature
EXTRN	External
FAC Z	Factory zero
FCF	Flow calibration factor
FLDIR	Flow direction
GSV	Gas standard volume
GSV F	Gas standard volume flow
GSV I	Gas standard volume inventory
GSV T	Gas standard volume total
INTERN	Internal
LANG	Language
LOCK	Write protect
LPO_A	Left pickoff amplitude
LVOLI	Volume inventory
LZERO	Live zero flow
MAINT	Maintenance
MASS	Mass flow
MASSI	Mass inventory
MFLOW	Mass flow
MSMT	Measurement
MTR F	Meter factor
MTR_T	Case temperature (T-Series only)
NET M	CM net mass flow rate
NET V	CM net volume flow rate
NETMI	CM net mass inventory
NETVI	CM net volume inventory
OFFLN	Offline
PASSW	Password
PRESS	Pressure
PWRIN	Input voltage
r.	Revision
RDENS	Density at reference temperature
RPO_A	Right pickoff amplitude
SGU	Specific gravity units
SIM	Simulated
SPECL	Special
STD M	Standard mass flow rate
STD V	Standard volume flow rate
STDVI	Standard volume inventory
TCDENS	Temperature-corrected density
TCORI	Temperature-corrected inventory
TCORR	Temperature-corrected total
TCVOL	Temperature-corrected volume
TEMPR	Temperature
TUBEF	Raw tube frequency
VER	Version
VERFY	Verify
VFLOW	Volume flow
VOL	Volume flow
WRPRO	Write protect
WTAVE	Weighted average
XMTR	Transmitter

Appendix H
NE53 History

H.1 Overview

This appendix documents the change history of the Model 2700 transmitter with FOUNDATION fieldbus software.

H.2 Software change history

Table H-1 describes the change history of the transmitter software. Operating instructions are English versions. Instructions in other languages have different part numbers but matching revision letters.

Table H-1 Transmitter software change history

Date	Software version	Changes to software	Operating instructions
09/2000	1.0	Initial product release	20000326 Rev. A
06/2001	2.0	*Software expansion*	20000326 Rev. B
		Added support to configure the process variable units for mass flow, volume flow, density and temperature from the display.	
		Software adjustment	
		Clarified the interaction of the digital fault setting and the last measured value timeout.	
		Feature addition	
		Added backup link active scheduler (LAS).	
		Added PID function block.	
		Added analog output function block for pressure compensation.	
		Added support for pressure compensation to the transducer block.	
		Added drive gain as a selectable channel for AI blocks.	
		Added ability to enable fieldbus simulate mode through the service port.	
2/2002	2.2	*Software adjustment*	20000326 Rev. C
		Improved the handling of RS-485 communication via the service port.	
		Improved the user experience with the display.	
		Feature additions	
		Added protections against low-power conditions.	

Table H-1 Transmitter software change history *continued*

Date	Software version	Changes to software	Operating instructions
7/2004	3.x	*Software expansion*	20000326 Rev. D
		Software version information available via the display or Modbus.	
		Totalizers can be disabled in addition to start/stop.	
		Doubled the number of virtual communication relationships (VCRs).	
		Software adjustment	
		Improved the handling of AI block status when slug flow is detected.	
		Some fieldbus parameters made persistent across power resets.	
		Introduced finer-grained control over operator access to display functions.	
		Feature addition	
		Petroleum measurement application added.	
		Added gas standard volume functionality.	
		Enhanced density application added.	
		Added support for enabling fieldbus simulation mode via the display.	
		Added support for 32-character tagnames configurable via Modbus.	
		Added support for Analog Input Block configurable via Modbus.	
06/2007	4.0	*Software expansion*	20000326 Rev. E
		Added temperature and density units to API transducer block.	
		Additional configuration ability for the display.	
		Feature addition	
		Added configurable alarm severity.	
		Added more support for gas standard volume functionality.	
		Added meter verification as an option.	
		Added multiple display language selections.	
		Implemented PlantWeb Alerts II.	
		Added the ability to enable simulate mode through the Device Information Transducer Block.	
		Added default values for AI blocks: • AI1: mass flow in g/s • AI2: temperature in °C • AI3: density in g/cm^3 • AI4: volume flow in l/s	
01/2008	5.0	*Software adjustment*	20000326 Rev. EA
		Improved handling of Gas Standard Volume cutoffs.	
		Improved local display functionality for API and concentration measurement variables.	
		Feature addition	
		Added support for Meter Verification AMS Snap-On.	
		Added extra security for local display off-line menu access.	
03/2009	5.1	*Software adjustment*	20000326 Rev. EA
		Resolved non-volatile memory (NVM) reliability issue present in version 4.0 and 5.0 software.	

Table H-1 Transmitter software change history *continued*

Date	Software version	Changes to software	Operating instructions
06/2010	6.0	*Software adjustment*	20000326 Rev. EA
		Smart Meter Verification	
		Improved representation of gas volume on local display	
		Harmonized behavior of gas volume density parameter with other gas standard volume parameters	
07/2012	7.0	*Software adjustment*	20000326 Rev. EB
		Release of new firmware and hardware for MVD 2700 transmitter with Foundation Fieldbus tested for ITK6.0.1. The version of new firmware is 7.00 and hardware revision is 'AB'.	
		Feature addition	
		Two Analog Output (AO) function blocks. One AO block can be assigned to Pressure Compensation Variable Channel where as other AO block can be assigned to any of the Transducer Block Compensation Variable Channels.	
		One Discrete Input (DI) and one Discrete Output (DO) function blocks are added.	
		One channel for temperature compensated data is added in transducer block.	
		In Transducer block additional channels for Discrete Output variables are added. Those variables can be assigned to Discrete Output Block. • Start Sensor Zero. • Reset Mass Total • Reset API Reference (Standard) Volume Total • Reset All Totals • Reset ED Reference Volume Total • Reset ED Net Mass Total • Reset ED Net Volume Total • Start/Stop All Totals • Increment ED Curve • Reset Gas Standard Volume Total • Start Meter Verification in Continuous Measurement Mode	
		Live software download through Foundation Fieldbus segment is supported.	
		PlantWeb Field Diagnostic (FD) is supported. The diagnostic information is based on NAMUR NE 107 standard. AMS v12 will be supporting NE 107.	
		Link Master Functionality is supported.	
		Following functionality added: • Auto commission. • Auto Replacement.	

Table H-1 Transmitter software change history *continued*

Date	Software version	Changes to software	Operating instructions
		Following additional alarms are added: • A128 = Transmitter Factory configuration data invalid. • A129 = Transmitter factory configuration data checksum invalid	
		Fault Disconnection Electronics (FDE) feature is added to hardware. This feature prevents unwanted excessive current consumption in case of fault, in order to avoid impairment of operation of other devices in the system. (The increased DC current compared with the rated current is called “fault current”.)	
		Following Function Blocks are supported: • Resource Block = 1 • Transducer Block = 1 • Analog Input Blocks = 4 • Analog Output Blocks = 2 • Discrete Input Block = 1 • Discrete Output Block = 1 • PID Block = 1 • Integrator Block = 1	

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For the latest Micro Motion product specifications, view the PRODUCTS section of our web site at www.micromotion.com

Micro Motion Inc. USA
Worldwide Headquarters
7070 Winchester Circle
Boulder, Colorado 80301
T +1 303-527-5200
+1 800-522-6277
F +1 303-530-8459

Micro Motion Europe
Emerson Process Management
Neonstraat 1
6718 WX Ede
The Netherlands
T +31 (0) 318 495 555
F +31 (0) 318 495 556

Micro Motion Asia
Emerson Process Management
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T +65 6777-8211
F +65 6770-8003

Micro Motion United Kingdom
Emerson Process Management Limited
Horsfield Way
Bredbury Industrial Estate
Stockport SK6 2SU U.K.
T +44 0870 240 1978
F +44 0800 966 181

Micro Motion Japan
Emerson Process Management
1-2-5, Higashi Shinagawa
Shinagawa-ku
Tokyo 140-0002 Japan
T +81 3 5769-6803
F +81 3 5769-6844

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