Reference Manual
00809-0200-4101, Rev BA
October 2014

Rosemount 2051 Pressure Transmitter

with FOUNDATION™ fieldbus Protocol

ROSEMOUNT

www.rosemount.com

EMERSON.
Process Management

Rosemount 2051 Pressure Transmitter

⚠ WARNING

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

For technical assistance, contacts are listed below:

Customer Central
Technical support, quoting, and order-related questions.

United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific- 65 777 8211

Europe/ Middle East/ Africa - 49 (8153) 9390

North American Response Center
Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Emerson Process Management representative.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

Section 1: Introduction

Section 2: Configuration

Section 3: Hardware Installation

Section 4: Electrical Installation

Section 5: Operation and Maintenance

Section 6: Troubleshooting

Appendix A: Specifications and Reference Data

Appendix B: Product Certifications

Section 1 Introduction

1.1 Overview

This manual is for the Rosemount 2051 Pressure Transmitter with FOUNDATION™ fieldbus communications.

This manual only describes the topics required for installation, operation, configuration, and troubleshooting the FOUNDATION fieldbus transmitter.

1.2 Using this manual

The sections in this manual provide information on configuring, installing, operating and maintaining, troubleshooting, and calibrating 2051 Transmitters specifically for FOUNDATION fieldbus protocol.

Section 2: Configuration provides instruction on commissioning and operating 2051 Transmitters. Information on software functions, configuration parameters, and Online variables is also included.

Section 3: Hardware Installation contains mechanical installation instructions, and field upgrade options.

Section 4: Electrical Installation contains electrical installation instructions, and field upgrade options.

Section 5: Operation and Maintenance provides detailed information on calibrating the transmitter

Section 6: Troubleshooting provides troubleshooting techniques for the most common operating problems.

Appendix A: Specifications and Reference Data supplies reference and specification data, as well as ordering information.

Appendix B: Product Certifications contains intrinsic safety approval information, European ATEX directive information, and approval drawings.

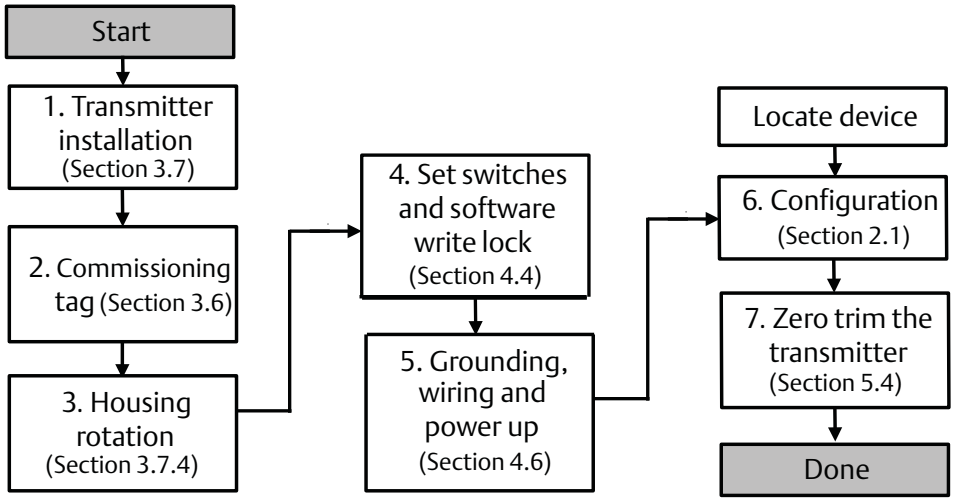
1.3 Models covered

The following 2051 Transmitters are covered by this manual:

- Rosemount 2051C Coplanar™ Pressure Transmitter
  - Measures differential and gage pressure up to 2000 psi (137,9 bar).
  - Measures absolute pressure up to 4000 psia (275,8 bar).
- Rosemount 2051T In-Line Pressure Transmitter
  - Measures gage/absolute pressure up to 10000 psi (689,5 bar).
- Rosemount 2051L Level Transmitter
  - Measures level and specific gravity up to 300 psi (20,7 bar).
- Rosemount 2051CF Series Flowmeter
  - Measures flow in line sizes from $^1/_2$-in. (15mm) to 96-in. (2400 mm).

1.4 FOUNDATION fieldbus installation flowchart

Figure 1-1. FOUNDATION fieldbus Installation Flowchart



1.5 Transmitter overview

The Rosemount 2051C Coplanar design is offered for Differential Pressure (DP), Gage Pressure (GP) and Absolute Pressure (AP) measurements. The Rosemount 2051C utilizes capacitance sensor technology for DP and GP measurements. The Rosemount 2051T and 2051CA utilize piezoresistive sensor technology for AP and GP measurements.

The major components of the Rosemount 2051 are the sensor module and the electronics housing. The sensor module contains the oil filled sensor system (isolating diaphragms, oil fill system, and sensor) and the sensor electronics. The sensor electronics are installed within the sensor module and include a temperature sensor and a memory module. The electrical signals from the sensor module are transmitted to the output electronics in the electronics housing. The electronics housing contains the output electronics board and the terminal block. The basic block diagram of the Rosemount 2051CD is illustrated in Figure 1-3 on page 3.

For the Rosemount 2051, pressure is applied to the isolating diaphragm(s). The oil deflects the sensor which then changes its capacitance or voltage signal. This signal is then changed to a digital signal by the Signal Processing. The microprocessor then takes the signals from the Signal Processing and calculates the correct output of the transmitter.

An optional 2-line LCD display can be ordered that connects directly to the interface board which maintains direct access to the signal terminals. The display indicates output and abbreviated diagnostic messages. A glass display cover is provided. The first line of eight characters displays the actual measured value, the second line of six characters displays the engineering units. The LCD display can also display diagnostic messages.

Figure 1-2. LCD Display

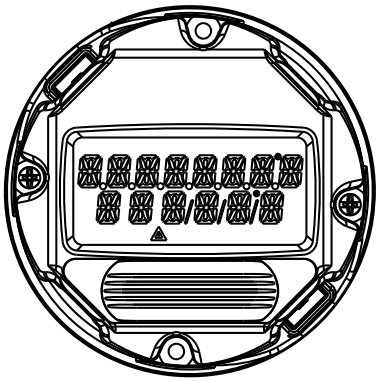
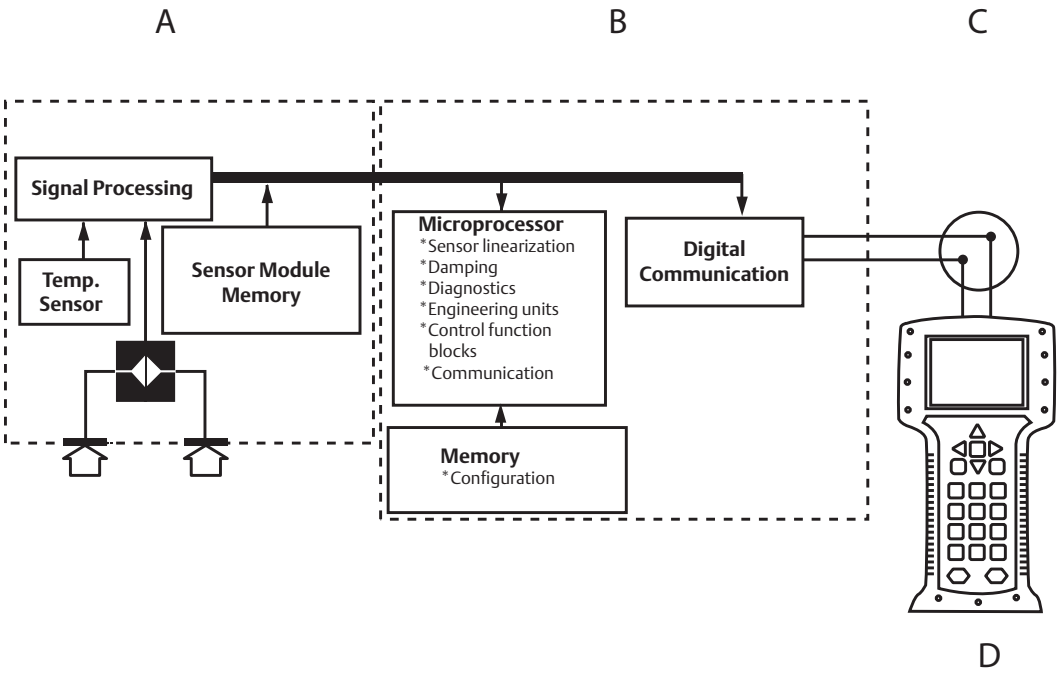


Figure 1-3. Block Diagram of Operation



A. Sensor Module
B. Electronics Board
C. FOUNDATION fieldbus Signal to Control System
D. Field Communicator

1.6 Service support

Within the United States, call the Emerson Process Management Instrument and Valve Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

For inquiries outside of the United States, contact the nearest Emerson Process Management representative for RMA instructions.

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. The product being returned will require a copy of the required Material Safety Data Sheet (MSDS) for each substance must be included with the returned goods.

Emerson Process Management Instrument and Valve Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

1.7 Host files

Before configuring the device, ensure the host has the appropriate Device Description (DD) or Device Type Manager (DTM™) file revision for this device. The device descriptor can be found on www.fieldbus.org. The DTM can be found at www.emersonprocess.com. The current release of the Rosemount 2051 with FOUNDATION fieldbus protocol is device revision 2. This manual is for revision 2.

1.8 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2 Configuration

2.1 Configuration overview

This section contains information on commissioning and tasks that should be performed on the bench prior to installation, as well as tasks performed after installation.

2.1.1 DD and DTM™ based interfaces

The 2051 Pressure Transmitter Rev 2 has both DD based and DTM based user interfaces available. All device configuration and maintenance tasks can be performed using either technology.

The DD capabilities supported will vary based on host supplier and host revision. Check with your host supplier to determine and obtain the appropriate DD for your situation. The type of DD your host supports may influence navigation between different functions, and the exact steps used to perform different tasks. The device menu tree has multiple ways to navigate between and perform tasks. Not all ways will be usable on all hosts, but at least one way will be usable on every host.

2.1.2 The device menu tree

Device information and device tasks are organized in a menu tree structure. The complete menu tree is shown in Figure 2-10. A partial menu tree covering the most common device tasks is shown in Figure 2-11.

2.1.3 Basic organization

Device information and tasks are organized into three different menu tree branches. They are Overview, Configure, and Service Tools. Information and tasks may be resident in more than a single branch of the menu tree.

The device menu tree is the landing screen for the Handheld user interface. The device menu tree is also permanently displayed on PC based user interfaces. On PC based user interfaces the menu tree can be expanded or collapsed as needed to facilitate navigation.

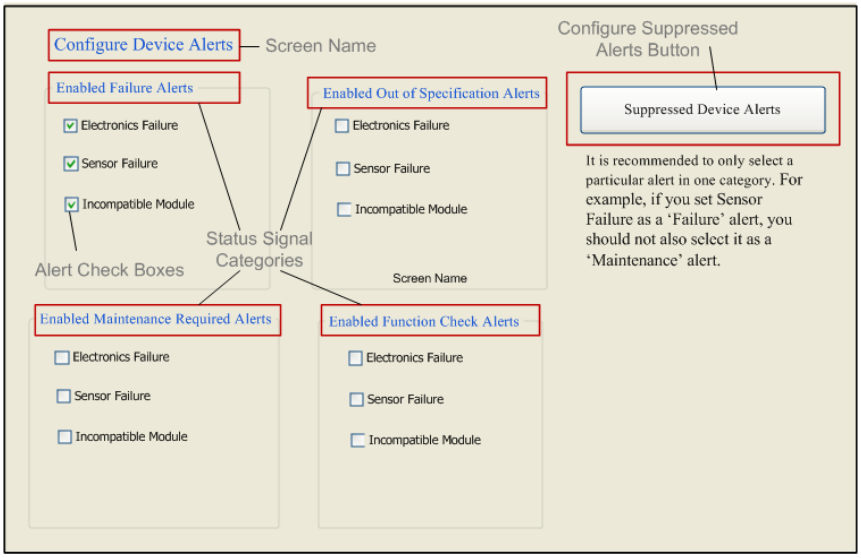
The same device menu tree applies for both handheld and PC based user interfaces. On the handheld, each menu tree entry has a dedicated screen (see Figure 2-3). On PC based user

interfaces, several menu tree entries may be displayed on a single screen with each menu tree entry used as the heading for a section of that screen (see Figure 2-2). The net result is the menu tree can be used to navigate all DD's and DTM's, however the user may need to perform actions on one screen, or several screens to perform the same task.

Figure 2-1. Configure Device Alerts-Multiple Screens

On devices with smaller screens the information and parameters necessary to complete a task may be divided into several screens. In this figure each category of alert to be configured has a dedicated screen shown. There are four total screens used for alert configuration.

Figure 2-2. Configure Device Alerts-Single Screen

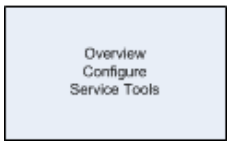


On this PC based configuration screen, alert configuration for all four alert categories is performed on a single screen.

2.1.4 The Home Screen

The home screen provides access to the three main branches of the menu tree. These branches are "Overview", "Configure", and "Service Tools". From this screen select any of the three main branches to access detailed device functionality.

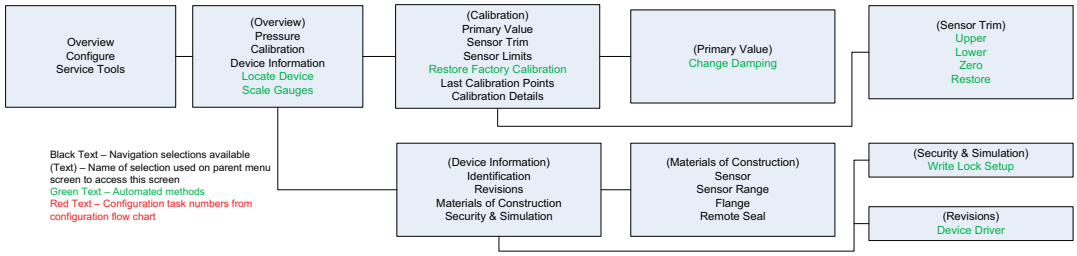
Figure 2-3. Home Screen Menu Tree Main Navigation Branches



2.1.5 Overview

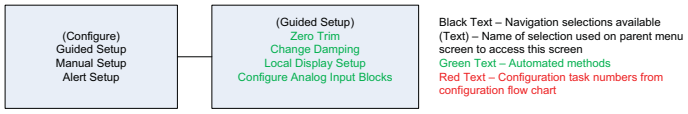
The overview branch of the menu tree provides device information and single keystroke shortcuts to view variables and device status, access device diagnostics, and perform basic calibration functions. The overview screen is the landing screen for PC based user interfaces.

Figure 2-4. Overview Section of the Menu Tree



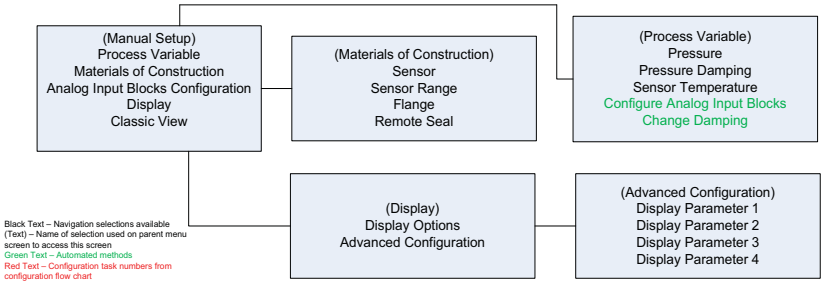
2.1.6 Configure

Figure 2-5. Guided Setup Branch of the Menu Tree



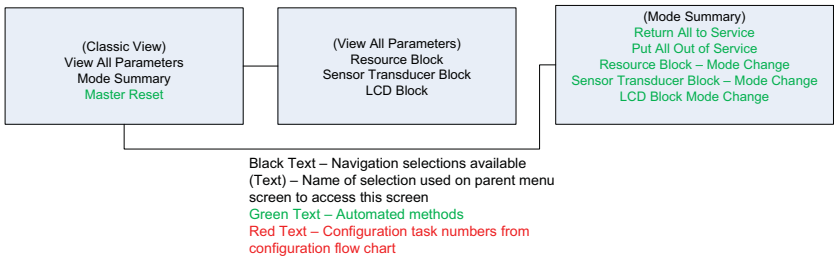
The Configure branch of the menu tree provides both guided setup and manual setup. Guided setup provides automated step by step methods for performing device configuration. Manual setup provides user editable screens where the user can perform a configuration task by selecting or entering the necessary parameters without step by step guidance.

Figure 2-6. Manual Setup Branch of the Menu Tree



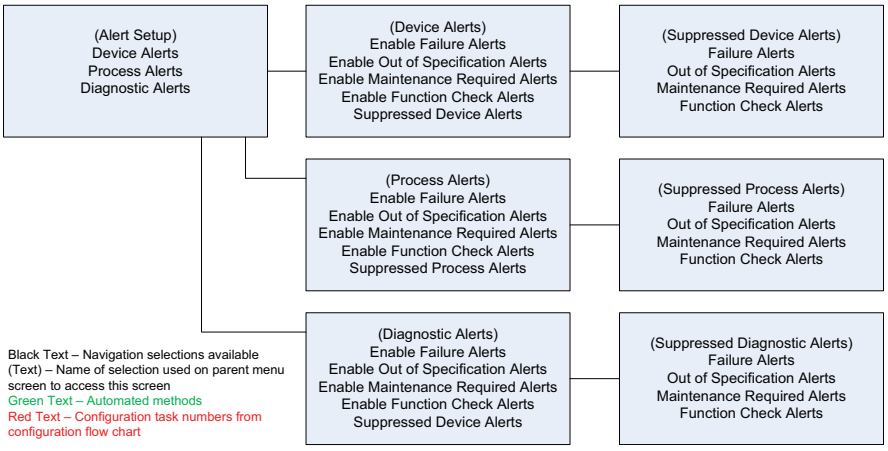
Manual Setup can take less time than guided setup if the user is familiar with the task to be performed. Manual Setup also allows users to edit specific parameters without needing to step through all the setup steps. If the user is not familiar with a specific task, Guided Setup is recommended so task steps are done in the correct order and all needed steps are performed.

Figure 2-7. Classic View of the Menu Tree



The Manual Setup branch also provides a view called 'classic view' which lists block parameters in a single scroll-down menu. Expert users may prefer this view for configuration as multiple configuration tasks can be performed without leaving the single menu screen.

Figure 2-8. Alert Setup Branch of the Menu Tree



The final Configure branch supports alert setup of NE107 alerts (The factory default Device Alerts), or PlantWeb® Alerts. Note that the diagnostics performed and the recommended actions for NE107 Alerts and PlantWeb Alerts are identical. The only difference is that NE107 alerts and PlantWeb Alerts annunciate the alerts using different categories.

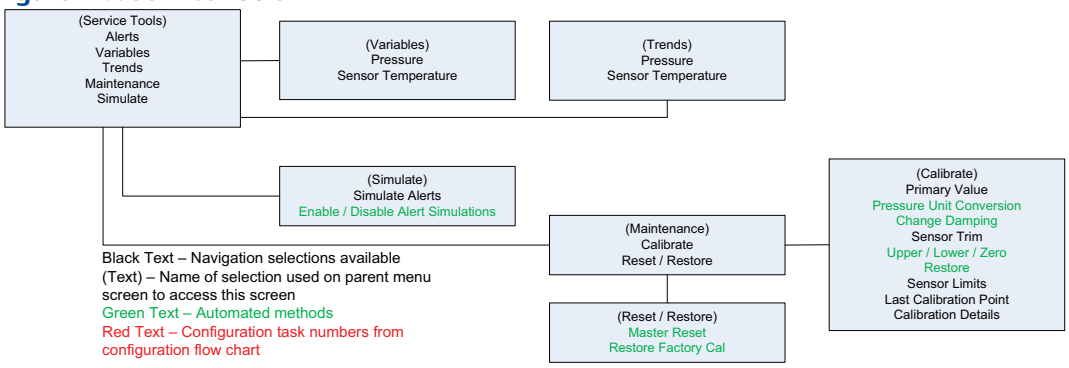
NE107 requires device manufacturers to provide a way for users to enable, suppress, and re-categorize alerts. The Rosemount 2051 organizes alerts as "Device Alerts", "Process Alerts", or "Diagnostic Alerts". NE107 alerts can be defined as any of four categories. They are "Failure Alerts", Out of Specification Alerts", Maintenance Required Alerts", and "Function Check Alerts". To minimize configuration tasks and time, the Rosemount 2051 ships from the factory with alerts enabled and pre-categorized. The use of factory default categories is recommended if the defaults meet plant standards, and there is no identified benefit to changing categories.

Note
The NE107 specification allows a single alert to be included in multiple categories. As a general practice this is not recommended as alarm management can become needlessly complex.

NE107 alerts can be suppressed. If an alert is configured to reside in multiple categories, it can be suppressed in some categories, but not others. To completely suppress an alert it must be suppressed in every category where it is configured.

2.1.7 Service Tools

Figure 2-9. Service Tools



The Service Tools branch of the menu tree allows users to perform typical device maintenance tasks, simulate alerts and parameters, and perform some configuration resets to return devices to as-manufactured settings.

Figure 2-10. Complete Menu Tree

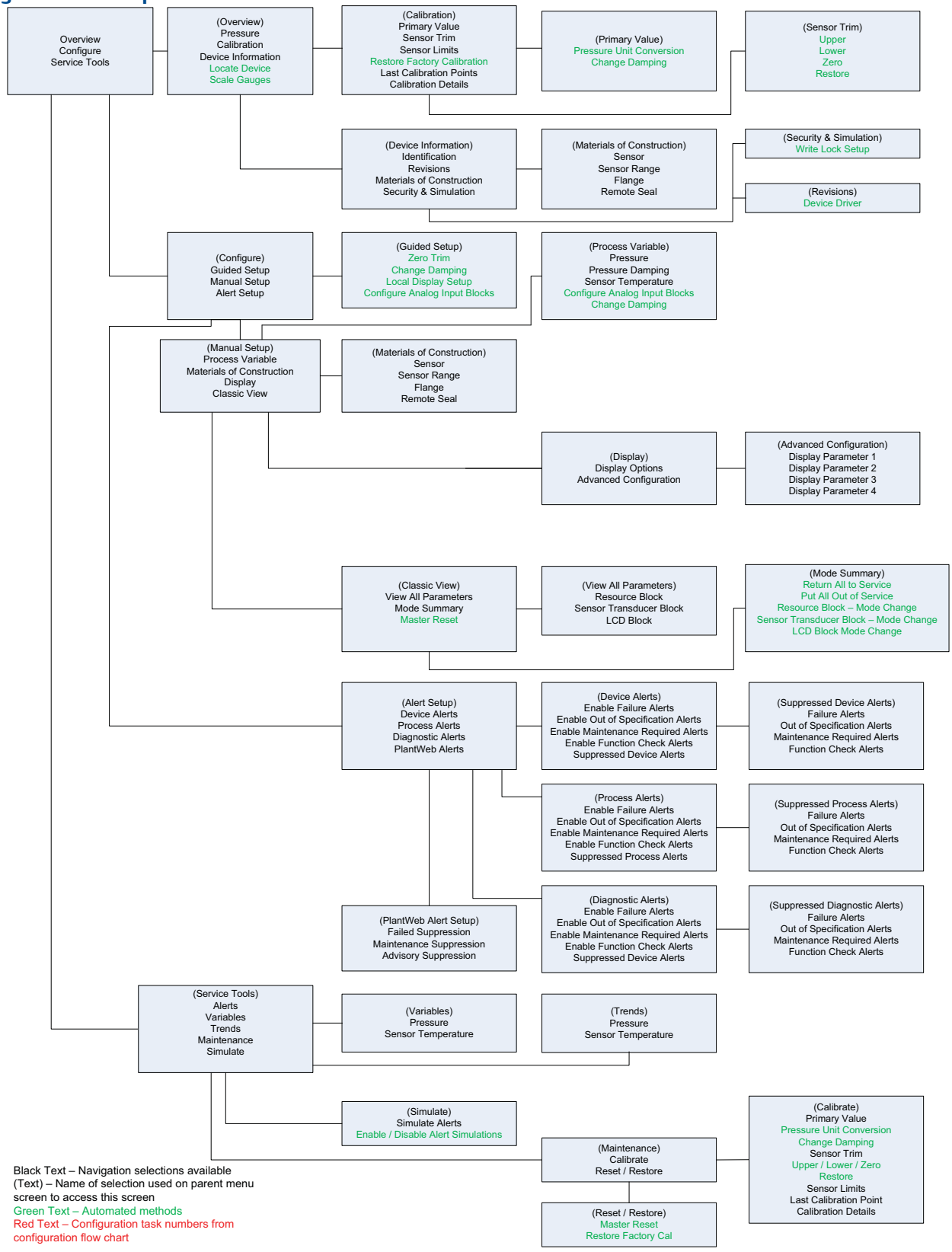
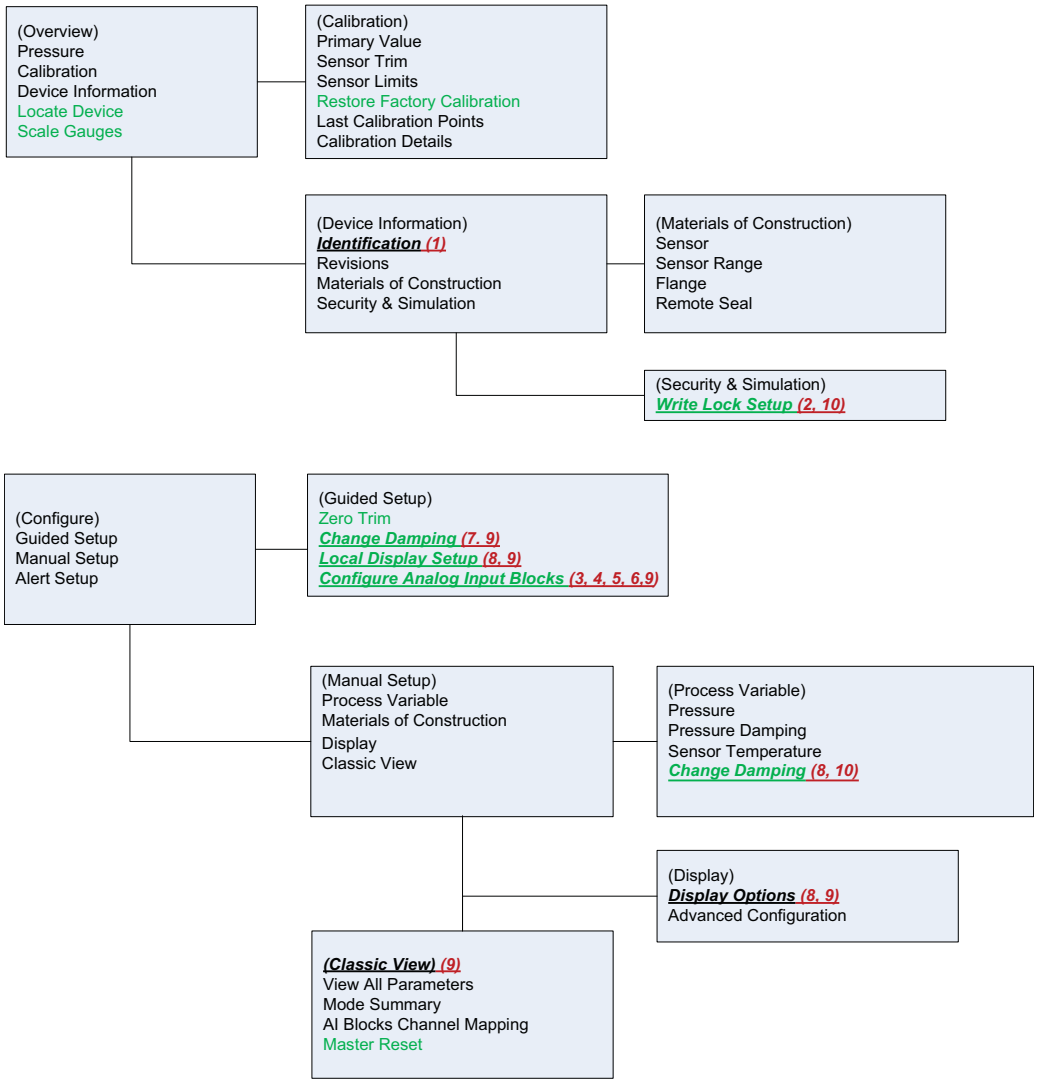


Figure 2-11. Partial Menu Tree



Black Text – Navigation selections available
(Text) – Name of selection used on parent menu screen to access this screen
Green Text – Automated methods
Red Text – Configuration task numbers from configuration flow chart

Note that some tasks can be performed from multiple locations on the menu tree. This is done to allow users to perform related tasks with a minimum of screen changes and keystrokes. The organization of the device menu tree is further described below.

2.1.8 Navigation

Navigation is performed by clicking on the navigation button labeled with the task the user wishes to perform. This takes the user to the next navigation screen, or the screen where the desired function is performed, or launches a guided configuration automated procedure.

Note that some tasks can be performed from several different locations in the menu tree. For example, a “Sensor Zero Trim” can be performed from the “Overview” branch, the “Configure, Guided Setup” branch, or the “Service Tools” branch. This allows users to perform multiple tasks while minimizing the total navigation required to access and use the desired functions.

Guided setup with automated task procedures (methods)

Guided Setup provides automated task procedures for tasks which require multiple steps to perform. Guided setup also provides notification of recommended actions such as suggesting the device user contact control room personnel to have the process loop placed in manual mode prior to configuration.

Guided Setup will generally proceed in three stages. The first is preparation. In this stage user notifications are given, and steps needed to prepare the device for task setup are performed. The second is task execution where the task is performed in a series of steps. Sometimes the number and sequence of steps is changed based on the values or parameters selected. This eliminates the need for the user to understand and track how each configuration choice may influence what can be done in succeeding steps. The third task is post-setup processing. In this step actions needed to return the device to operation, or gracefully cancel a task are performed.

Guided setup handles mode management as part of preparation and post processing. This means blocks that must be placed in manual or out of service mode for configuration will be placed in those modes, and upon completion of the configuration task, will return those blocks to the normal operating mode.

Guided setup will help the user complete tasks with the highest probability of success, and gracefully terminate partially completed tasks by returning device parameters to the values that existed before the terminated task was started. Users who are not very familiar with a device should consider using Guided Configuration first.

Manual setup with manual and automated task procedures

Manual Setup should be used by users who are familiar with the mode changes and configuration steps needed to complete a task and properly return the device to service. Manual Setup is also sometimes used where a single parameter needs to be changed, and the user doesn’t want to execute the full sequence of steps that are part of Guided Configuration.

Manual Setup can sometimes be performed in less time than Guided Setup, however Manual Setup doesn’t provide the comprehensive guidance or graceful task termination of Guided Setup. Users who are very familiar with tasks and wish to perform them in the least time should consider using Manual Setup.

2.1.9 Classic View

Classic View provides an alternate way to view parameters and perform manual setup. In the Classic View, the individual screens used for Manual Setup are replaced by a single scrollable list of parameters. The Classic View reduces screen to screen navigation to a minimum, but requires that the user know all the parameters which need to be used, and the order of those parameters, to perform each task. The user also needs to know how to manage modes, both to perform tasks, and to return devices to operation.

Expert users will use Classic View to review all block parameters, and to perform some configuration or service tasks. Classic View is NOT recommended for anyone who is not a device and FOUNDATION fieldbus expert.

Control function block configuration

The 2051 uses standard control function blocks. Configuration of these function blocks, and linking them into control strategies is performed on the control host using the configuration screens and tools specific to that control host. To configure control function blocks and use those in control strategies consult your control host users' documentation.

The 2051 device configuration tools support configuration of Analog Input Blocks as needed to select the channel and perform signal conditioning and scaling. The 2051 ships from the factory with Analog Input Block 1 linked to the Primary Variable of the transducer block, and scheduled to run. This is necessary to configure signal conditioning and scaling. The user is encouraged to use Analog Input Block 1 for the Primary Variable when configuring control strategies.

2.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 2051 Reference Manual for any restrictions associated with a safe installation.

- Before connecting a field communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an explosion-proof/flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

2.2.1 Confirm correct device driver

- Verify the latest Device Driver (DD/DTM) is loaded on your systems to ensure proper communications.

1. Download the latest DD at www.emersonprocess.com or www.fieldbus.org.
2. In the Browse by Member dropdown menu, select Rosemount business unit of Emerson Process Management.
3. Select desired product.
   a. Within Table 2-1, use the Device Revision numbers to find the correct Device Driver.

Table 2-1. Rosemount 2051 FOUNDATION fieldbus Device Revisions and Files

Device revision[1]	Host	Device driver (DD)[2]	Obtain at	Device driver (DTM)	Manual document number
2	All	DD4: DD Rev 1	www.fieldbus.org	www.emersonprocess.com	00809-0200-4101 Rev. BA or newer
	All	DD5: DD Rev 1	www.fieldbus.org		
	Emerson	AMS V 10.5 or higher: DD Rev 2	www.emersonprocess.com		
	Emerson	AMS V 8 to 10.5: DD Rev 1	www.emersonprocess.com		
	Emerson	375 / 475: DD Rev 2	www.fieldcommunicator.com		
1	All	DD4: DD Rev 4	www.fieldbus.org	www.emersonprocess.com	00809-0200-4101 Rev. AA
	All	DD5: NA	N/A		
	Emerson	AMS Rev 8 or higher: DD Rev 2	www.emersonprocess.com		
	Emerson	375 / 475: DD Rev 2	www.fieldcommunicator.com		

(1) FOUNDATION fieldbus device revision can be read using a FOUNDATION fieldbus capable configuration tool.
(2) Device driver file names use device and DD revision. To access functionality, the correct device driver must be installed on your control and asset management hosts, and on your configuration tools.

2.3 Device capabilities

2.3.1 Link active scheduler

The Rosemount 2051 can be designated to act as the backup Link Active Scheduler (LAS) in the event that the LAS is disconnected from the segment. As the backup LAS, the 2051 will take over the management of communications until the host is restored.

The host system may provide a configuration tool specifically designed to designate a particular device as a backup LAS.

2.3.2 Capabilities

Virtual Communication Relationship (VCRs)

There are a total of 20 VCRs. Two are permanent and 18 are fully configurable by the host system. Twenty-five link objects are available.

Network parameter	Value
Slot Time	6
Maximum Response Delay	4
Maximum Inactivity to Claim LAS Delay	47
Minimum Inter DLPDU Delay	7
Time Sync class	4 (1ms)
Maximum Scheduling Overhead	21
Per CLPDU PhL Overhead	4
Maximum Inter-channel Signal Skew	0
Required Number of Post-transmission-gab-ext Units	0
Required Number of Preamble-extension Units	1

Host timer recommendations

T1 = 96000
T2 = 9600000
T3 = 480000

Table 2-2. Block Execution Times

Block	Time (in ms)
Analog Input	20
PID	25
Arithmetic	20
Input Selection	20
Signal Characterizer	20
Integrator	20
Output Splitter	20
Control Selector	20

2.4 Node address

The transmitter is shipped at a temporary (248) address. This enables FOUNDATION fieldbus host systems to automatically recognize the device and move it to a permanent address.

2.5 General block information

2.5.1 FOUNDATION fieldbus function blocks

Reference information on the process control function blocks can be found in the Function Block manual document number 00809-0100-4783.

Resource block

The Resource block contains diagnostic, hardware and electronics information. There are no linkable inputs or outputs to the Resource Block.

Sensor transducer block

The Sensor Transducer Block contains sensor information including the sensor diagnostics and the ability to trim the pressure sensor or recall factory calibration.

LCD display transducer block

The LCD Display Transducer Block is used to configure the LCD display meter.

Analog input block

The Analog Input (AI) Function Block processes the measurements from the sensor and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The AI block is widely used for scaling functionality.

Note
The channel, Set XD_Scale, Set L_Type, and sometimes Set Out_Scale are typically configured by instrument personnel. Other AI block parameters, block links, and schedule are typically configured by the control systems configuration engineer.

Input selector block

The Input Selector (ISEL) Function Block can be used to select the first good, Hot Backup™, maximum, minimum, or average of as many as eight input values and place it at the output. The block supports signal status propagation.

Integrator block

The Integrator (INT) Function Block integrates one or two variables over time. The block compares the integrated or accumulated value to pre-trip and trip limits and generates discrete output signals when the limits are reached.

The Integrator Block is used as a totalizer. This block will accept up to two inputs, has six options how to totalize the inputs, and two trip outputs.

Arithmetic block

The Arithmetic (ARTH) Function Block provides the ability to configure a range extension function for a primary input. It can also be used to compute nine different arithmetic functions including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal characterizer block

The Signal Characterizer (SGCR) Function Block characterizes or approximates any function that defines an input/output relationship. The function is defined by configuring as many as twenty X,Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates. Two separate analog input signals can be processed simultaneously to give two corresponding separate output values using the same defined curve.

PID block

The PID Function Block combines all of the necessary logic to perform proportional/integral/derivative (PID) control. The block supports mode control, signal scaling and limiting, feed forward control, override tracking, alarm limit detection, and signal status propagation.

The block supports two forms of the PID equation: Standard and Series. You can choose the appropriate equation using the MATHFORM parameter. The Standard ISA PID equation is the default selection.

Control selector block

The Control Selector (CSEL) Function Block selects one of two or three inputs to be the output. The inputs are normally connected to the outputs of PID or other function blocks. One of the inputs would be considered Normal and the other two overrides.

Output splitter block

The Output Splitter (OSPL) Function Block provides the capability to drive two control outputs from a single input. It takes the output of one PID or other control block to control two valves or other actuators.

Index numbers

Table 2-3. Block Index Numbers

Block name	Revision 1	Revision 2
Resource Block	1000	1000
Sensor Transducer Block	1100	1100
Display Transducer Block	1200	1200
Analog Input Block	1400, 1500	1400, 1500
PID Block	1600	1600
Input Selector Block	1700	1700
Signal Characterizer Block	1800	1800
Arithmetic Block	1900	1900
Integrator Block	2000	2000
Control Selector Block	N/A	2100
Output Splitter Block	N/A	2200

Function Blocks with default block index numbers up to 1500 are permanent. Function Blocks with default block indexes 1600 and higher are instantiated and can be deleted by the user.

2.5.2 Modes

The Resource, Transducer, and all function blocks in the device have modes of operation. These modes govern the operation of the block. Every block supports both automatic (AUTO) and out of service (OOS) modes. Other modes may also be supported.

⚠ Changing modes

To change the operating mode, set the MODE_BLK.TARGET to the desired mode. After a short delay, the parameter MODE_BLK.ACTUAL should reflect the mode change if the block is operating properly. Appropriate resource, transducer, and Analog Input block mode changes are made by the automated procedures (Methods) for most configuration tasks.

Permitted modes

It is possible to prevent unauthorized changes to the operating mode of a block. To do this, configure MODE_BLK.PERMITTED to allow only the desired operating modes. It is recommended to always select OOS as one of the permitted modes.

Types of modes

For the procedures described in this manual, it will be helpful to understand the following modes:

AUTO

The functions performed by the block will execute. If the block has any outputs, these will continue to update. This is typically the normal operating mode.

Out of Service (OOS)

The functions performed by the block will not execute. If the block has any outputs, these will typically not update and the status of any values passed to downstream blocks will be “BAD”. To make some changes to the configuration of the block, change the mode of the block to OOS. When the changes are complete, change the mode back to AUTO.

MAN

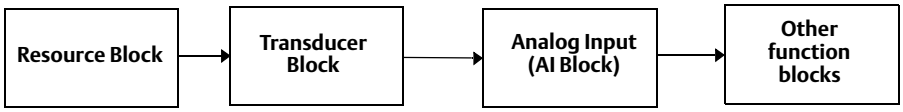
In this mode, variables that are passed out of the block can be manually set for testing or override purposes.

Other types of modes

Other types of modes are Cas, RCas, ROut, IMan and LO. Some of these may be supported by different function blocks in the Rosemount 2051. For more information, see the Function Block manual, document 00809-0100-4783.

Mode propagation

Note
When an upstream block is set to OOS, this will impact the output status of all downstream blocks. The figure below depicts the hierarchy of blocks:



2.5.3 Block instantiation

The Rosemount 2051 supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be defined to match specific application needs.The number of blocks that can be instantiated is only limited by the amount of memory within the device and the block types that are supported by the device. Instantiation does not apply to standard device blocks like the Resource, Sensor Transducer, and LCD Display Transducer Blocks.

Block instantiation is done by the host control system or configuration tool, but not all hosts are required to implement this functionality. Please refer to your specific host or configuration tool manual for more information.

2.5.4 Simulation

Simulation is the functionality of the AI block. There are two ways to simulate values as follows:

1. Change the mode of the block to manual and adjust the output value.
2. Enable simulation through the configuration tool and manually enter a value for the measurement value and its status (this single value will apply to all outputs).

In both cases, first set the ENABLE switch on the field device.

⚠ With simulation enabled, the actual measurement value has no impact on the OUT value or the status. The OUT values will all have the same value as determined by the simulate value.

2.6 Resource block

2.6.1 FEATURES and FEATURES_SEL

The FEATURES parameter is read only and defines which host accessible features are supported by the 2051. Below is a list of the FEATURES the 2051 supports. See Appendix A: Specifications and Reference Data for the complete list.

Reference the feature list in the parameter table in Appendix A: Specifications and Reference Data .

FEATURES_SEL is used to turn on any of the supported features that are found in the FEATURES parameter. The default setting of the Rosemount 2051 does not select any of these features. Choose one or more of the supported features if any.

UNICODE

All configurable string variables in the 2051, except tag names, are octet strings. Either ASCII or Unicode may be used. If the configuration device is generating Unicode octet strings, you must set the Unicode option bit.

REPORTS

The 2051 supports alert reports. The Reports option bit must be set in the features bit string to use this feature. If it is not set, the host must poll for alerts. If this bit is set, the transmitter will actively report alerts.

SOFT W LOCK and HARD W LOCK

Inputs to the security and write lock functions include the hardware security switch, the hardware and software write lock bits of the FEATURE_SEL parameter, and the WRITE_LOCK parameter.

The WRITE_LOCK parameter prevents modification of parameters within the device except to clear the WRITE_LOCK parameter. During this time, the block will function normally updating inputs and outputs and executing algorithms. When the WRITE_LOCK condition is cleared, a WRITE_ALM alert is generated with a priority that corresponds to the WRITE_PRI parameter.

The FEATURE_SEL parameter enables the user to select any one of the following: a hardware write lock, a software write lock, or no write lock capability. To enable the hardware security function, enable the HARD W LOCK bit in the FEATURE_SEL parameter. When this bit has been enabled the WRITE_LOCK parameter becomes read only and will reflect the state of the

hardware switch. In order to enable the software write lock, place the hardware write lock switch in the unlocked position. Then the SOFT W LOCK bit must be set in the FEATURE_SEL parameter. Once this bit is set, the WRITE_LOCK parameter may be set to “Locked” or “Not Locked.” Once the WRITE_LOCK parameter is set to “Locked” by either the software or the hardware lock, all user requested writes shall be rejected.

2.6.2 MAX_NOTIFY

The MAX_NOTIFY parameter value of 7 is the maximum number of alert reports that the resource can have sent without getting a confirmation from the host, corresponding to the amount of buffer space available for alert messages. The number can be set lower, to control alert flooding, by adjusting the LIM_NOTIFY parameter value. If LIM_NOTIFY is set to zero, then no alerts are reported.

2.6.3 Alerts/alarms

Note
See “Damping” on page 38 for Alert Configuration.

The 2051 Rev 2 pressure transmitter supports both PlantWeb Alerts and NE107 alerts. All alerts are configured, masked, and mapped as NE 107 Status Signals. If the control host is DeltaV version 11.5 or older alerts are automatically annunciated as PlantWeb Alerts. No user configuration is needed for this conversion.

The alerts and recommended actions should be used in conjunction with Section 6: Trouble-shooting. See “Resource block” on page 97for more information on resource block parameters.

The Resource Block will act as a coordinator for alerts. Depending on user configuration each device will have either three or four alert Parameters. If PlantWeb alerts are configured, the three alert parameters will be (FAILED_ALARM, MAINT_ALARM, and ADVISE_ALARM). If NE107 alerts are configured the four alert parameters will be (FD_FAIL_ACTIVE, FD_OFFSPEC_ACTIVE, FD_MAINT_ACTIVE, and FD_CHECK_ACTIVE).

Note
NE107 alerts and PlantWeb Alerts annunciate the same diagnostics and display the same recommended actions. The only difference in the alerts reported is the parameters used to annunciate the alert conditions. The default factory configuration has NE107 alerts enabled.

Alerts processing within the device

1. Diagnostics perform comprehensive checks and update status within the device. These status conditions allow the user to troubleshoot probable causes and take corrective actions.
2. The status conditions are then mapped into four status signals that can be used for annunciation on the segment to the host.
3. Before annunciation a check is made to determine if the user has masked any alert parameters. Any masked parameters will not be annunciated to the host, but will be visible using the device DD or DTM.
4. Unmasked alert conditions are annunciated by the appropriate status signal to the host.

PlantWeb Alerts and NE107 alerts are both processed using the steps described above, and annunciate the same consolidated status parameters.

Figure 2-12. NE107 Alert Processing Diagram

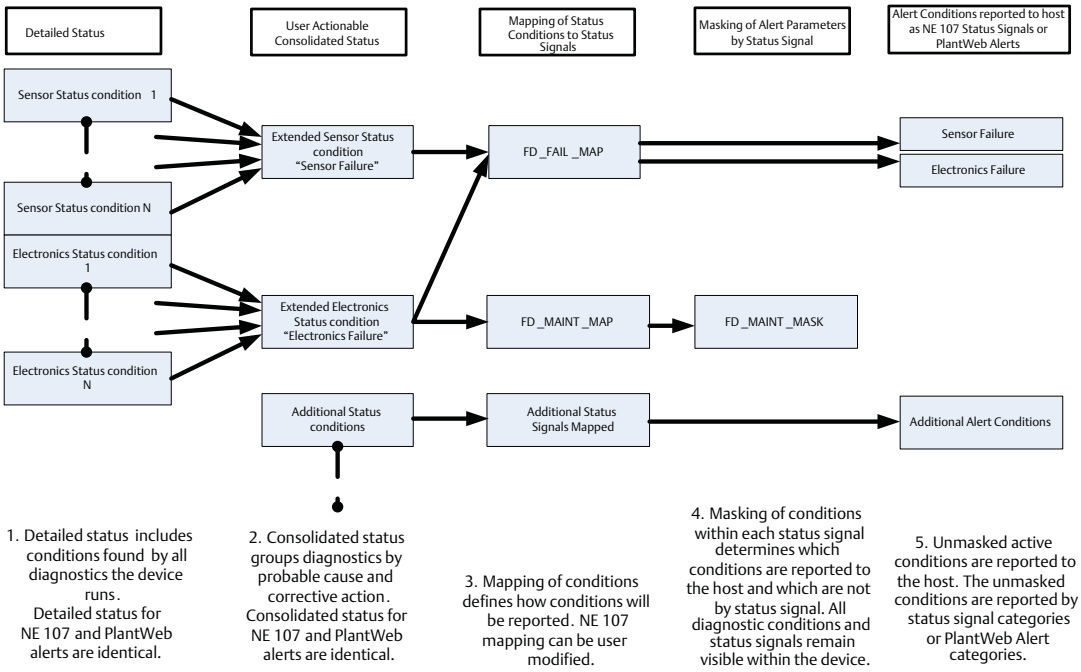
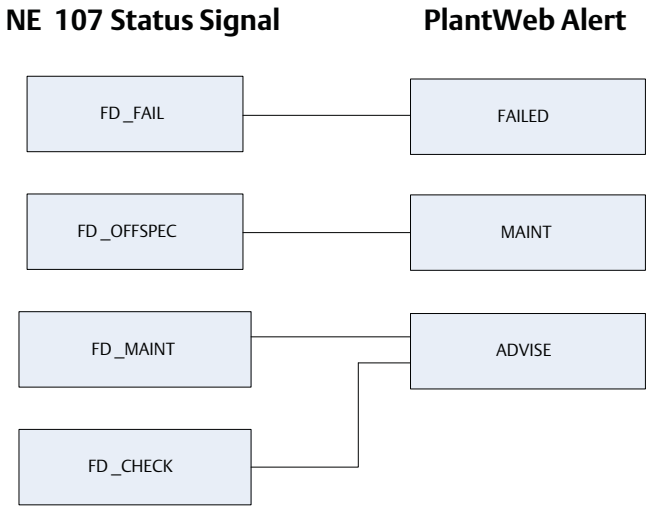


Figure 2-13. NE 107 Status Signal to PlantWeb Alert Mapping



The alert priority enumeration value

Alerts have priorities that determine if they occur, and where and how they are annunciated. NE107 Status Signals and PlantWeb Alerts use the same priorities and annunciate the same ways.

0 = Alerts will not occur. If there is an existing alert and the priority is changed from a number greater than zero to zero the alert will clear. Active device diagnostics are still shown within the Device Description even if the alert has been cleared.

1 = The associated alert is not sent as a notification. If the priority is above 1, then the alert must be reported.

2 = Reserved for alerts that do not require the attention of a plant operator, e.g. diagnostic and system alerts. Block alert, error alert, and update event have a fixed priority of 2.

3-7 = Increasing higher priorities - advisory alerts.

8-15 = Increasing higher priority - critical alerts.

NE107 alerts overview

NE107 alert parameters

NE107 has four alert parameters. They are in order from highest to lowest priority:

1. FD_FAIL_ACTIVE
2. FD_OFFSPEC_ACTIVE
3. FD_MAINT_ACTIVE
4. FD_CHECK_ACTIVE

Any of the seven alert conditions can be user configured to annunciate as any of the four alert parameters. Individual alert conditions can also be mapped into multiple alert parameters.

Alert parameter definitions and factory defaults

Note
All seven alert conditions are factory assigned to appropriate alert parameters. Change the parameter assignment of individual alert conditions only if needed.

Devices are shipped from the factory with all applicable alerts enabled. The factory default alert conditions reported in each parameter are:

1. FD_FAIL_ACTIVE
    a. Incompatible module
    b. Sensor failure
    c. Electronics failure

A FD_FAIL_ACTIVE alert indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the process variable may no longer be available and the device is in need of immediate repair.

2. FD_OFFSPEC_ACTIVE
    a. Pressure out of limits
    b. Sensor temperature out of limits

A FD_OFFSPEC_ACTIVE alert indicates that the device is experiencing pressure or temperature conditions that are outside the device operating range. This implies that the process variable may no longer be accurate. It also implies that if the condition is ignored the device will eventually fail.

3. FD_MAINT_ACTIVE
    a. Display update failure

A FD_MAINT_ACTIVE alert indicates the device is still functioning but an abnormal device condition exists. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

4. FD_CHECK_ACTIVE
    a. Function check

A FD_CHECK_ACTIVE alert indicates a transducer block is not in “Auto” mode. This may be due to configuration or maintenance activities.

Mapping alert conditions

Any of the alert conditions can be mapped into any of the NE107 alert parameters. This is done using the following parameters.

1. FD_FAIL_MAP assigns a condition to FD_FAIL_ACTIVE.
2. FD_OFFSPEC_MAP assigns a condition to FD_OFFSPEC_ACTIVE.
3. FD_MAINT_MAP assigns a condition to FD_MAINT_ACTIVE.
4. FD_CHECK_MAP assigns a condition to FD_CHECK_ACTIVE.

Masking alert conditions

Any combination of alert conditions can be masked. When a status signal is masked, it will not be annunciated to the host system but will still be active in the device and viewable in the device DD or DTM. The recommended action, FD_RECOMMEN_ACT will continue to show the recommended action for the most severe condition or conditions detected as determined by the condition priority. This allows maintenance personnel to view and correct device conditions without annunciating the conditions to operational staff. They are masked using the following parameters:

1. FD_FAIL_MASK to mask FD_FAIL_ACTIVE conditions
2. FD_OFFSPEC_MASK to mask FD_OFFSPEC_ACTIVE conditions
3. FD_MAINT_MASK to mask FD_MAINT_ACTIVE conditions
4. FD_CHECK_MASK to mask FD_CHECK_ACTIVE conditions

If a consolidated diagnostic condition is configured to annunciate in multiple status signal categories it can be masked in one or several status signal categories, but left active and annunciate in others. This provides significant flexibility but can lead to confusion when responding to alerts. Generally alert conditions are assigned to only a single status signal.

Alert priorities

NE107 alerts can have any of 16 different condition priorities ranging from the lowest priority of 0 to the highest priority of 15. This is done using the following parameters.

1. FD_FAIL_PRI to specify the priority of FD_FAIL_ACTIVE conditions
2. FD_OFFSPEC_PRI to specify the priority FD_OFFSPEC_ACTIVE conditions
3. FD_MAINT_PRI to specify the priority FD_MAINT_ACTIVE conditions
4. FD_CHECK_PRI to specify the priority FD_CHECK_ACTIVE conditions

Note
FOUNDATION fieldbus standards require that NE 107 alert priority is set to zero for all status signals at manufacturing.
Zero priority behavior shows any active device diagnostics in the DD or DTM but alerts are not generated based on the diagnostic conditions or published on the bus.
An alert priority of 2 or higher is required for every status signal category where status signals are to be published on the bus.
Check with your host provider to determine the alarm priorities assigned to each status signal category by your host. Manual configuration may be required.
DeltaV™ assigns a priority of two or higher. The priority is based on status signal category. The status signal priority determines the behavior of both real and simulated alerts.

2.6.4 PlantWeb alerts overview

Alerts are generated, mapped, and masked as NE 107 Status Signals. If PlantWeb alerts are required the NE 107 Status Signals are automatically converted to PlantWeb Alerts for annunciation and display. PlantWeb alerts have three alert parameters. They are in order from highest to lowest priority:

1. FAILED_ALM
2. MAINT_ALM
3. ADVISE_ALM

The eight alert conditions are factory configured to annunciate as one of the three specific alert parameters.

PlantWeb alert parameter conditions and factory defaults

Devices are shipped from the factory with all applicable alerts enabled. The alert conditions reported in each parameter are:

1. FAILED_ALM
    a. Incompatible module
    b. Sensor failure
    c. Electronics failure

A FAILED_ALM indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the process variable may no longer be available and the device is in need of immediate repair.

2. MAINT_ALM
    a. Pressure out of limits
    b. Sensor temperature out of limits

A MAINT_ALM indicates that the device is experiencing pressure or temperature conditions that are outside the device operating range. This implies that the process variable may no longer be accurate. It also implies that if the condition is ignored the device will eventually fail. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

3. ADVISE_ALM
    a. Function check
    b. Display update failure

An ADVISE_ALM indicates a transducer block is not in “Auto” mode. This may be due to configuration or maintenance activities. It can also indicate an abnormal process or device condition exists. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

PlantWeb alert priorities

PlantWeb alert priorities are configured in DeltaV. PlantWeb Alerts can have any of 16 different condition priorities ranging from the lowest priority of 0 to the highest priority of 15. This is done using the following parameters.

1. FAILED_PRI to specify the priority of FAILED_ALM
2. MAINT_PRI to specify the priority of MAINT_ALM
3. ADVISE_PRI to specify the priority of ADVISE_ALM

PlantWeb alert priority is configured using DeltaV and is not part of the Device Description functionality.

2.7 Basic device setup

Set all transmitter hardware adjustments during commissioning to avoid exposing the transmitter electronics to the plant environment after installation.

Note
The information contained within Section 2.7-Basic device setup is the same as in the Quick Start Guide. Reference Section 2.8-Analog Input (AI) function block through Section 2.9-Advanced device setup for more detailed configuration information.

2.7.1 Configure

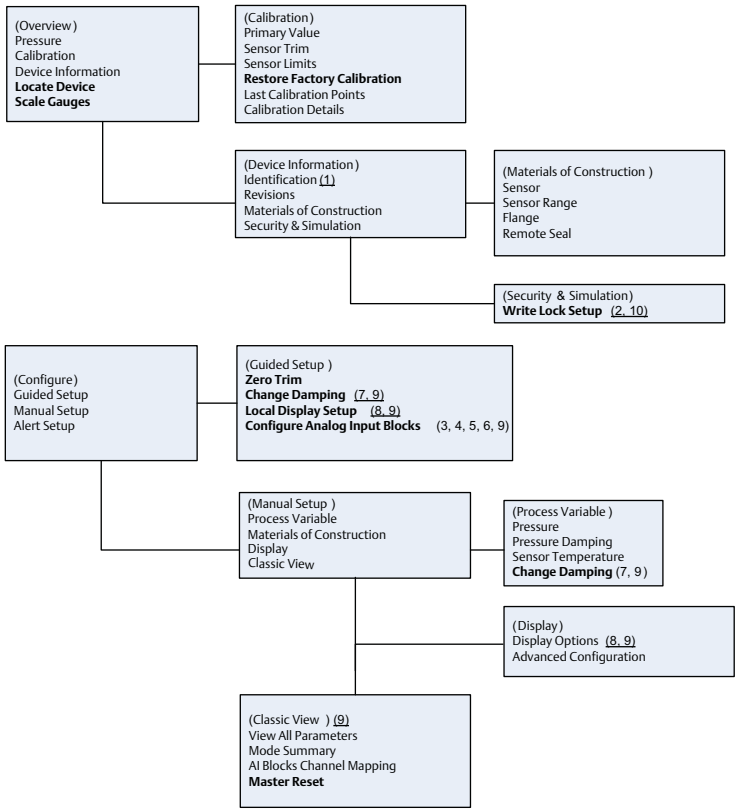
Each FOUNDATION fieldbus host or configuration tool has a different way of displaying and performing configurations. Some use Device Descriptions (DD) or DD methods for configuration and to display data consistently across platforms. There is no requirement that a host or configuration tool support these features. Use the following block examples to do basic configuration to the transmitter. For more advanced configurations, reference Section 2.8-Analog Input (AI) function block through Section 2.9-Advanced device setup in this manual.

Note
DeltaV users should use DeltaV Explorer for the Resource and Transducer blocks and Control Studio for the Function Blocks.

AI block quick configuration

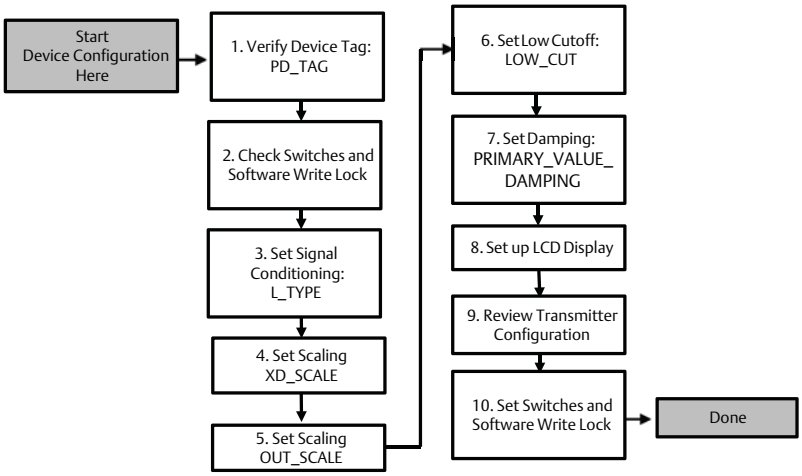
The screens used for each step are shown in Figure 2-14, Basic Configuration Menu Tree. In addition, step-by-step instructions for each step of AI block configuration are provided in Figure 2-14 on page 26.

Figure 2-14. Basic Configuration Menu Tree



Standard Text – Navigation selections available
(Text) – Name of selection used on parent menu screen to access this screen
Bold Text – Automated methods
Underlined Text -- Configuration task numbers from configuration flow chart

Figure 2-15. Configuration Flowchart



Before you begin

See Figure 2-14 to graphically view the step by step process for basic device configuration. Before beginning configuration you may need to verify the Device Tag or deactivate hardware and software write protection on the transmitter. To do this follow Step 1 through Step b below. Otherwise continue at "Section -AI block configuration " below.

1. To verify the device tag:
   a. Navigation: from the overview screen, select "Device Information" to verify the device tag.
2. To check the switches (see Figure 2-28):
   a. The write lock switch must be in the unlocked position if the switch has been enabled in software.
   b. To disable the Software Write Lock (devices ship from the factory with the software write lock disabled):
      - Navigation: from the overview screen, select "Device Information" and then select the "Security and Simulation" tab.
      - Perform "Write Lock Setup" to disable Software Write Lock.

Note
Place the control loop in "Manual" mode before beginning Analog Input Block configuration.

⚠ AI block configuration

Note
Always check and reconcile function block configuration (with the exception of Resource and Transducer blocks) after commissioning the transmitter to the control host. Function block configuration, including AI blocks, made prior to device commissioning to the control host may not be saved to the control host database during the commissioning process. In addition, the control host may download configuration changes to the transmitter as part of the commissioning process.

Note
Changes to the AI block configuration performed after the transmitter is commissioned are typically performed using the control host configuration software. Consult your host system documentation to see if the AI Block guided configuration method provided in the DD or DTM should be used after the device has been commissioned.

Note
For DeltaV users, final AI block configuration and AI block configuration changes should only be made using the DeltaV Explorer.

1. To use guided setup:
   a. Navigate to Configure, then Guided Setup.
   b. Select “AI Block Unit Setup”.

Note
Guided setup will automatically go through each step in the proper order.

Note
For convenience, AI Block 1 is pre-linked to the transmitter primary variable and should be used for this purpose. AI Block 2 is pre-linked to the transmitter sensor temperature. The control host, and some asset management hosts can reconfigure the factory assigned links and assign the primary variable and sensor temperature to other AI blocks.

- Channel 1 is the primary variable.
- Channel 2 is the sensor temperature.

Note
Step 3 through Step 6 are all performed in a single step by step method under guided setup, or on a single screen using manual setup.

Note
If the L_TYPE selected in Step 2 is “Direct”, Step 3, Step 4 and Step 5 are not needed. If the L_TYPE selected is “Indirect”, Step 5 is not needed. If guided setup is used any unneeded steps will automatically be skipped.

2. To select the Signal Conditioning “L_TYPE” from the drop down menu:
   a. Select L_TYPE: “Direct” for pressure measurements using the device default units.
   b. Select L_TYPE: “Indirect” for other pressure or level units.
   c. Select L_TYPE: “Indirect Square Root” for flow units.
3. To set “XD_SCALE” to the 0% and 100% scale points (the transmitter range):
   a. Select the XD_SCALE_UNITS from the drop down menu.
   b. Enter the XD_SCALE 0% point. This may be elevated or suppressed for level applications.
   c. Enter the XD_SCALE 100% point. This may be elevated or suppressed for level applications.
   d. If L_TYPE is “Direct”, the AI Block may be placed in AUTO mode to return the device to service. Guided Setup does this automatically.

4. If L_TYPE is “Indirect” or “Indirect Square Root”, set “OUT_SCALE” to change engineering units.
   a. Select the OUT_SCALE UNITS from the drop down menu.
   b. Set the OUT_SCALE low value. This may be elevated or suppressed for level applications.
   c. Set the OUT_SCALE high value. This may be elevated or suppressed for level applications.
   d. If L_TYPE is “Indirect”, the AI Block may be placed in AUTO mode to return the device to service. Guided Setup does this automatically.
5. If L_TYPE is “Indirect Square Root”, a “LOW FLOW CUTOFF” function is available.
   a. Enable LOW FLOW CUTOFF.
   b. Set the LOW_CUT VALUE in XD_SCALE UNITS.
   c. The AI Block may be placed in AUTO mode to return the device to service. Guided Setup does this automatically.
6. Change damping.
   a. To use guided setup:
      - Navigate to Configure, Guided Setup, and select “Change Damping”.

Note
Guided Setup will automatically go through each step in the proper order.

      - Enter the desired damping value in seconds. The permitted range of values is 0.4 to 60 seconds.

   b. To use manual setup:
      - Navigate to Configure, Manual Setup, Process Variable, and select “Change Damping”.
      - Enter the desired damping value in seconds. The permitted range of values is 0.4 to 60 seconds.
7. Configure optional LCD display (if installed).
   a. To use guided setup:
      - Navigate to Configure, Guided Setup, and select “Local Display Setup”.

Note
Guided setup will automatically go through each step in the proper order.

      - Check the box next to each parameter to be displayed to a maximum of four parameters. The LCD display will continuously scroll through the selected parameters.

   b. To use manual setup:
      - Navigate to Configure, Manual Setup, and select “Local Display Setup”.
      - Check each parameter to be displayed. The LCD display will continuously scroll through the selected parameters.

8. Review transmitter configuration and place in service.
    a. To review the transmitter configuration navigate using the manual setup navigation sequences for “AI Block Unit Setup”, “Change Damping”, and “Set up LCD Display”.
    b. Change any values as necessary.
    c. Return to the “Overview” screen.
    d. If Mode is “Not in Service”, click on the “Change” button, and then click on “Return All to Service”.

Note
If hardware or software write protection is not needed, Step 9 can be skipped.

9. Set switches and software write lock.
    a. Check switches (see Figure 4-2).

Note
The write lock switch can be left in the locked or unlocked position. The simulate enable/disable switch may be in either position for normal device operation.

Enable software write lock

1. Navigate from the overview screen.
    a. Select “Device Information”.
    b. Select the “Security and Simulation” tab.
2. Perform “Write Lock Setup” to enable Software Write Lock.

2.8 Analog Input (AI) function block

2.8.1 Configure the AI block

Note
Always check and reconcile function block configuration (with the exception of Resource and Transducer blocks) after commissioning the transmitter to the control host. unction block configuration, including AI blocks, made prior to device commissioning to the control host may not be saved to the control host database during the commissioning process. In addition, the control host may download configuration changes to the transmitter as part of the commissioning process.

Note
Changes to the AI block configuration performed after the transmitter is commissioned are typically performed using the control host configuration software. Consult your host system documentation to see if the AI Block guided configuration method provided in the DD or DTM should be used after the device has been commissioned.

Note
For DeltaV users, final AI block configuration and AI block configuration changes should only be made using the DeltaV Explorer.

⚠ A minimum of four parameters are required to configure the AI Block. The parameters are described below with example configurations shown at the end of this section.

CHANNEL

Select the channel that corresponds to the desired sensor measurement. The 2051 measures both pressure (channel 1) and sensor temperature (channel 2).

Table 2-4. I/O Channel Definitions

Channel number	Channel description
1	Pressure in AI.XD_SCALE units
2	Sensor temperature in AI.XD_SCALE units

L_TYPE

The L_TYPE parameter defines the relationship of the sensor measurement (pressure or sensor temperature) to the desired output of the AI Block (e.g. pressure, level, flow, etc.). The relationship can be direct, indirect, or indirect square root.

Direct

Select direct when the desired output will be the same as the sensor measurement (pressure or sensor temperature).

Indirect

Select indirect when the desired output is a calculated measurement based on the sensor measurement (e.g. a pressure measurement is made to determine level in a tank). The relationship between the sensor measurement and the calculated measurement will be linear.

Indirect square root

Select indirect square root when the desired output is an inferred measurement based on the sensor measurement and the relationship between the sensor measurement and the inferred measurement is square root (e.g. flow).

XD_SCALE and OUT_SCALE

The XD_SCALE and OUT_SCALE each include three parameters: 0%, 100%, and, engineering units. Set these based on the L_TYPE:

L_TYPE is direct

When the desired output is the measured variable, set the XD_SCALE to the “Primary_Value_Range”. This is found in the Sensor Transducer Block. Set OUT_SCALE to match XD_SCALE.

L_TYPE is indirect

When an inferred measurement is made based on the sensor measurement, set the XD_SCALE to represent the operating range that the sensor will see in the process. Determine the inferred measurement values that correspond to the XD_SCALE 0 and 100% points and set these for the OUT_SCALE.

L_TYPE is indirect square root

When an inferred measurement is made based on the sensor measurement AND the relationship between the inferred measurement and sensor measurement is square root, set the XD_SCALE to represent the operating range that the sensor will see in the process. Determine the inferred measurement values that correspond to the XD_SCALE 0 and 100% points and set these for the OUT_SCALE.

Parameters	Enter data				
Channel	1=Pressure, 2=Sensor Temp				
L-Type	Direct, Indirect, or Square Root				
XD_Scale	Scale and Engineering Units				
Note Select only the units that are supported by the device.	Pa	bar	torr @ 0 °C	ft H_20 @ 4°C	m H_20 @ 4 °C
	kPa	mbar	kg/cm^2	ft H_20 @ 60 °F	mm Hg @ 0 °C
	mPa	psf	kg/m^2	ft H_20 @ 68 °F	cm Hg @ 0 °C
	hPa	Atm	in H_20 @ 4°C	mm H_20 @ 4 °C	in Hg @ 0 °C
	Deg C	psi	in H_20 @ 60 °F	mm H_20 @ 68 °C	m Hg @ 0 °C
	Deg F	g/cm^2	in H_20 @ 68 °F	cm H_20 @ 4 °C	
Out_Scale	Scale and Engineering Units				

Note
When the engineering units of the XD_SCALE are selected, this causes the engineering units of the PRIMARY_VALUE_RANGE in the Transducer Block to change to the same units. THIS IS THE ONLY WAY TO CHANGE THE ENGINEERING UNITS IN THE SENSOR TRANSDUCER BLOCK, PRIMARY_VALUE_RANGE parameter.

Configuration examples

Pressure transmitter

Situation #1

A pressure transmitter with a range of 0 – 100 psi.

Solution

Table 2-5 lists the appropriate configuration settings.

Table 2-5. Analog Input function block configuration for a typical pressure transmitter

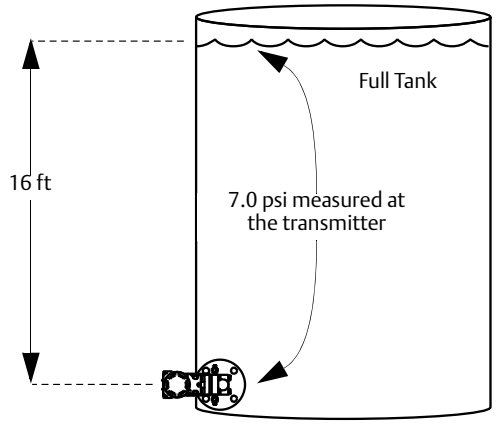
Parameter	Configured values
L_TYPE	Direct
XD_SCALE	Primary_Value_Range
OUT_SCALE	Primary_Value_Range
Channel	1 - pressure

Pressure transmitter used to measure level in an open tank

Situation #2

The level of an open tank is to be measured using a pressure tap at the bottom of the tank. The maximum level at the tank is 16 ft. The liquid in the tank has a density that makes the maximum level correspond to a pressure of 7.0 psi at the pressure tap (see Figure 2-16).

Figure 2-16. Situation #2 Diagram



Solution to Situation #2

The table below lists the appropriate configuration settings.

Analog Input function block configuration for a pressure transmitter used in level measurement (situation #1).

Parameter	Configured values
L_TYPE	Indirect
XD_SCALE	0 to 7 psi
OUT_SCALE	0 to 16 ft
Channel	1 - pressure

Output calculation for Situation #2

When the L_Type is configured as Indirect, the OUT parameter is calculated as:

$$OUT = \frac{PV - XD\_SCALE\_0\%}{XD\_SCALE\_100\% - XD\_SCALE\_0\%} * (OUT\_SCALE\_100\% - OUT\_SCALE\_0\%) + OUT\_SCALE\_0\%$$

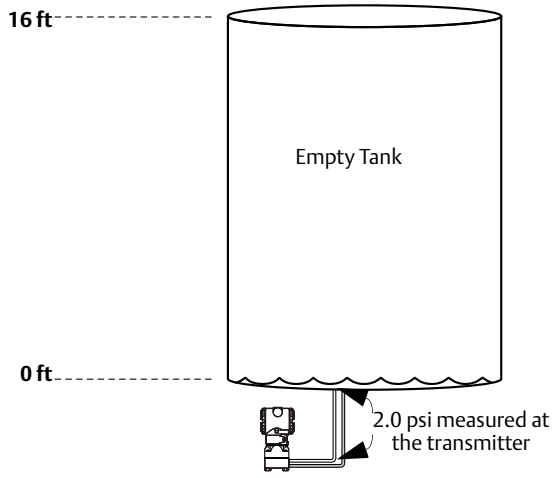
In this example, when PV is 5 psi, then the OUT parameter will be calculated as follows:

$$OUT = \frac{5\ psi - 0\ psi}{7\ psi - 0\ psi} * (16\ ft. - 0\ ft.) + 0\ ft. = 11.43\ ft.$$

Situation #3

The transmitter in situation #3 is installed below the tank in a position where the liquid column in the impulse line, with an empty tank, is equivalent to 2.0 psi (see Figure 2-17).

Figure 2-17. Situation #3 Diagram



Solution to situation #3

The table below lists the appropriate configuration settings.

Analog Input function block configuration for a pressure transmitter used in level measurement (Situation #3).

Parameter	Configured values
L_TYPE	Indirect
XD_SCALE	2 to 9 psi
OUT_SCALE	0 to 16 ft
Channel	1 - pressure

In this example, when the PV is 4 psi, OUT will be calculated as follows:

$$OUT = \frac{4\ psi - 2\ psi}{9\ psi - 2\ psi} * (16\ ft. - 0\ ft.) + 0\ ft. = 4.57\ ft.$$

Differential pressure transmitter to measure flow

Situation #4

The liquid flow in a line is to be measured using the differential pressure across an orifice plate in the line. Based on the orifice specification sheet, the differential pressure transmitter was calibrated for 0 to 20 inH_20 for a flow of 0 to 800 gal/min.

Solution

The table below lists the appropriate configuration settings.

Parameter	Configured values
L_TYPE	Indirect Square Root
XD_SCALE	0 to 20 in.H_2O
OUT_SCALE	0 to 800 gal/min.
Channel	1 - pressure

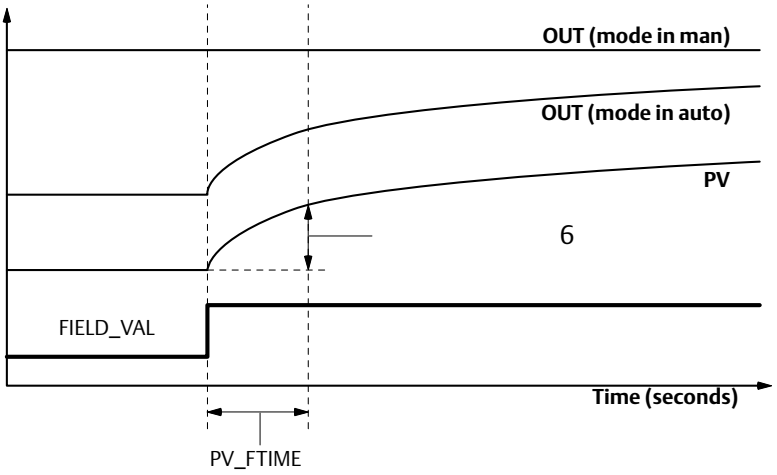
$$Out = \sqrt{\frac{PV - XDSCALE0}{XDSCALE100}}(OUTSCALE100 - OUTSCALE0) + OUTSCALE0$$

$$OUT = \sqrt{\frac{8inH_2O - 0inH_2O}{20inH_2O - 0inH_2O}}\ (800gal/min. - 0gal/min.) + 0gal/min. = 505.96gal/min.$$

Filtering

⚠ The filtering feature changes the response time of the device to smooth variations in output readings caused by rapid changes in input. Adjust the filter time constant (in seconds) using the PV_FTIME parameter. Set the filter time constant to zero to disable the filter feature.

Figure 2-18. Analog Input PV_FTIME filtering Diagram



Low cutoff

⚠ When the converted input value is below the limit specified by the LOW_CUT parameter, and the Low Cutoff I/O option (IO_OPTS) is enabled (True), a value of zero is used for the converted value (PV). This option is useful to eliminate false readings when the differential pressure measurement is close to zero, and it may also be useful with zero-based measurement devices such as flowmeters.

Note
Low Cutoff is the only I/O option supported by the AI block. Set the I/O option in **Manual** or **Out of Service** mode only.

Process alarms

Process alarms are part of the process loop control strategy. They are configured in the control host. Process alarm configuration is not included in the configuration menu tree. See your control host documentation for information on configuration of process alarms. Process Alarm detection is based on the OUT value. Configure the alarm limits of the following standard alarms:

- High (HI_LIM)
- High high (HI_HI_LIM)
- Low (LO_LIM)
- Low low (LO_LO_LIM)

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV span can be set using the ALARM_HYS parameter. The priority of each alarm is set in the following parameters:

- HI_PRI
- HI_HI_PRI
- LO_PRI
- LO_LO_PRI

Alarm priority

Alarms are grouped into five levels of priority:

Priority number	Priority description
0	The alarm condition is not used.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator.
3-7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8-15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

Status options

Status Options (STATUS_OPTS) supported by the AI block are shown below:

Propagate fault forward

If the status from the sensor is *Bad*, *Device failure or Bad, Sensor failure*, propagate it to *OUT* without generating an alarm. The use of these sub-status in *OUT* is determined by this option. Through this option, the user may determine whether alarming (sending of an alert) will be done by the block or propagated downstream for alarming.

Uncertain if limited

Set the output status of the Analog Input block to *Uncertain* if the measured or calculated value is limited.

BAD if limited

Set the output status to *Bad* if the sensor is violating a high or low limit.

Uncertain if Man mode

Set the output status of the Analog Input block to *Uncertain* if the actual mode of the block is *Man*.

Note
The instrument must be in *Out of Service* mode to set the status option.

Advanced features

The AI Function Block provides added capability through the addition of the following parameters:

ALARM_TYPE

ALARM_TYPE allows one or more of the process alarm conditions detected by the AI function block to be used in setting its OUT_D parameter.

OUT_D

OUT_D is the discrete output of the AI function block based on the detection of process alarm condition(s). This parameter may be linked to other function blocks that require a discrete input based on the detected alarm condition.

2.9 Advanced device setup

2.9.1 Overall configuration

Configuration tasks will be listed in alphabetical order. Each task will start with navigation per the menu tree navigation diagram, to an appropriate configuration starting screen. Next individual configuration steps will be listed. In many cases the steps can be used for either guided or manual configuration. Specific parameter names and valid input ranges are located in Appendix “A”.

The summary of the sections are as follows:

- Section 2.9.2-Damping
- Section 2.9.3-Gauge scaling
- Section 2.9.4-Local display (LCD display)
- Section 2.9.5-Mode
- Section 2.9.6-Alert configuration NE107 and PlantWeb
- Section 2.9.7-Alert simulation
- Section 2.9.8-Write lock

Note
Many configuration tasks can be initiated from more than one appropriate configuration starting screen. This manual will describe configuration from one starting screen only. The starting screen used in the manual should not be interpreted as the preferred starting screen.

Note
Physical layout of the parameters on the screen may be different for different configuration tools. The parameters, parameter names, and operations performed will be consistent regardless of screen layout.

Note
Before performing any configuration or service task contact the control room and have the loop placed in manual mode. When configuration or service tasks are complete, contact the control room so appropriate return to automatic control can take place.

2.9.2 Damping

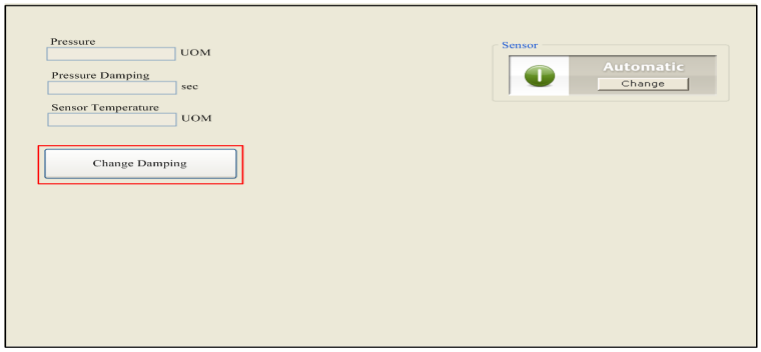
Note
Damping, gauge scaling, calibration, and sensor trims are performed in the Sensor Transducer Block. For block oriented user interfaces, configure Damping in the Sensor Transducer Block.

Menu Navigation: <Configure>, <Manual Setup>, <Process Variable>

Damping can be changed using the Overview, Configure, or Service Tools branches of the menu tree. All perform the same function. The Configure branch is used here.

Navigate to the Process Variables screen and click on the 'Change Damping' button. An automated task procedure called a 'Method' will guide the user through changing the damping. Alternately an operator or configuration engineer can change the damping from the control system Analog Input Block configuration screens. Consult your control system documentation for more information.

Figure 2-19. Process Variables Screen



The 'Change Damping' button shown in Figure 2-19 above starts an automated procedure called a Method which allows damping to be changed.

The sequence of steps used is:

1. The device will be placed 'out of service'.
2. Enter the new damping value in seconds.
3. The device will be returned to 'Auto' mode.

2.9.3 Gauge scaling

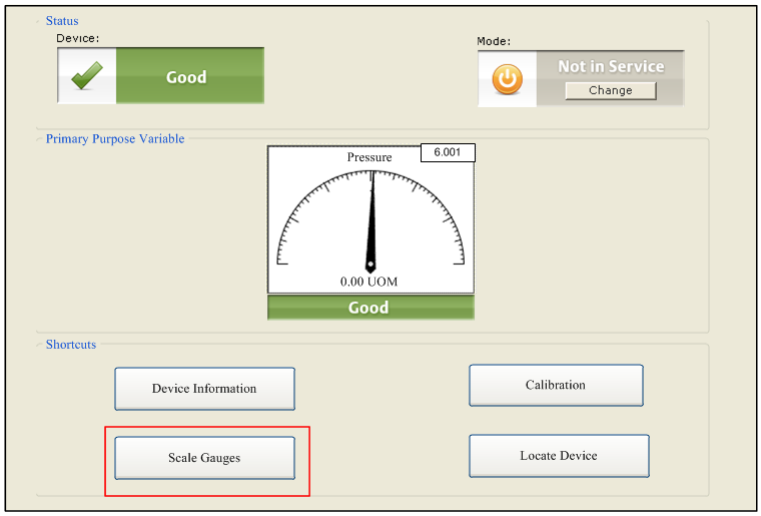
Menu Navigation: <Overview>

Scale Gauges is used to change the scaling displayed on the Gauges used to view variables. From the Overview screen, click on the 'Scale Gauges' button. An automated task procedure called a 'Method' will guide the user through scaling the Gauges.

The sequence of steps used is:

1. Enter the desired value for the lower range of the pressure gauge.
2. Enter the desired value for the upper range of the pressure gauge.

Figure 2-20. Overview Screen



The 'Scale Gauges' button shown in Figure 2-20 above starts an automated procedure called a method which allows the user to change the scaling on the gauge.

2.9.4 Local display (LCD display)

Note
Local Display setup is performed in the LCD display transducer block. For block oriented user interfaces, perform local display configuration in the LCD display transducer block.

Menu Navigation: <Configure>, <Manual Setup>, <Display>

The Local Display can be configured using 'Guided Setup' or 'Manual Setup'.

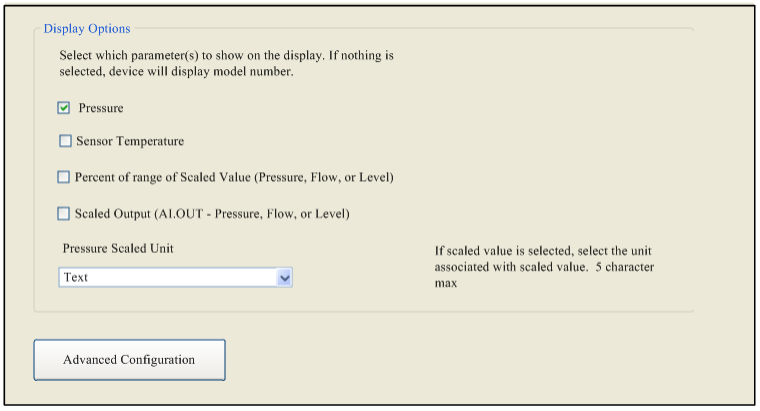
Basic display setup

Basic Display Setup provides a check - the - box way for the user to configure up to four parameters to display on the LCD display. These parameters are displayed on a rotating basis.

The sequence of steps used is:

1. Check the box next to each parameter the LCD display should display.
2. If 'Scaled Output' is selected, use the 'Pressure Scaled Unit' dropdown menu to select units.

Figure 2-21. Local Display Basic Configuration Screen



The screen shown in Figure 2-21 above allows the user to select parameters to be displayed on the LCD display by checking the box next to each parameter. Clicking on the 'Advanced Configuration' button accesses more display configuration options.

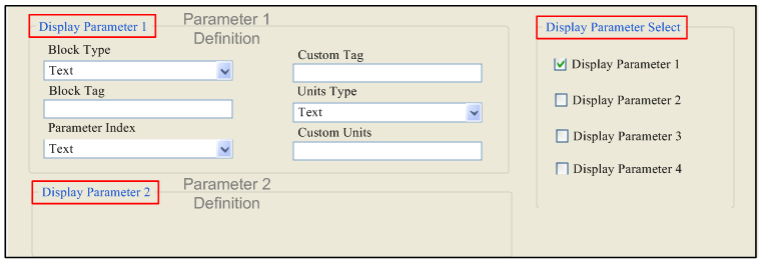
Advanced display setup

Menu Navigation: <Configure>, <Manual Setup>, <Display>, <Advanced Configuration>

Advanced Display Setup provides a fill in the blanks screen where the user can configure parameters from any function block in the device to be displayed on the LCD display. Setup is a two-step process. First, each of up to four parameters is defined. To define a parameter the user selects the 'Block Type', 'Parameter Index', and 'Units Type' from dropdown menus. The user can enter 'Block Tag', 'Custom Tag', and 'Custom Units'.

Once all desired parameters have been defined, the second step is parameters are selected for display by checking the box in the 'Display Parameter Select' area.

Figure 2-22. LCD Display Advanced Configuration Screen



The screen shown in Figure 2-22 above provides the capability to define parameters for display beyond those defined in 'Basic Configuration'. Configuration fields for Parameters 2, 3, and 4 are provided but not shown in the image.

Note
The LCD display can be configured to display a mix of basic and advanced parameters.

2.9.5 Mode

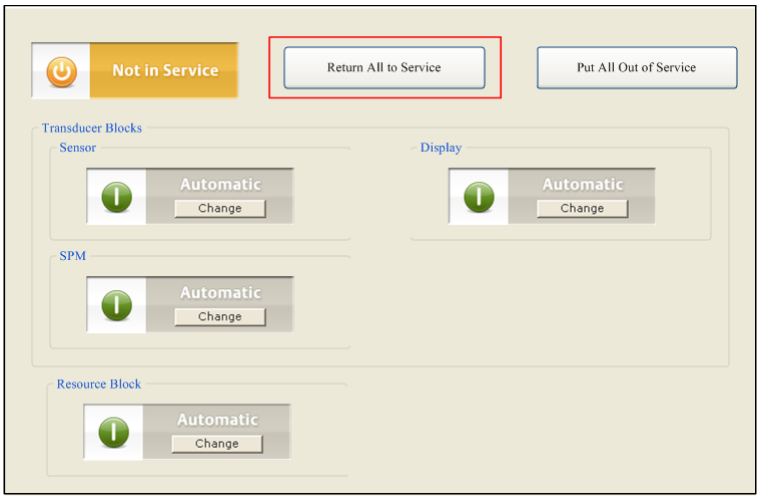
Note
Each block has modes. For block oriented user interfaces modes must be managed individually in each block.

Menu Navigation: <Configure>, <Manual Setup>, <Classic View>, <Mode Summary>

FOUNDATION fieldbus blocks have modes. Modes propagate, so if a block is in out-of-service mode, for example, other blocks linked to it may not function as anticipated. The 2051 DD's and DTM's have automated procedures that manage transducer, resource, and analog input block modes, placing them out of service to allow configuration, then returning them to auto mode when the configuration task is completed or canceled. If tasks are done using manual procedures, the user is responsible for managing modes.

The 'Mode Summary' function displays the active mode for all resource and transducer blocks, and allows the user to change modes of those blocks individually, or collectively. This is most frequently used to 'Return All to Service'. Analog input modes are managed from the analog input block configuration screens, or from the control host.

Figure 2-23. Mode Summary Screen



The screen shown in Figure 2-23 above shows the modes of all resource and transducer blocks, and provides a mechanism to individually or collectively take blocks out of service and return them to automatic mode.

2.9.6 Alert configuration NE107 and PlantWeb

The objective of alerts is to inform users of conditions of interest, and guide the user to effective corrective actions. The Rosemount 2051 Revision 2 Pressure Transmitter with FOUNDATION fieldbus communications provides alerts in both NE107 format and PlantWeb Alerts format. The detailed diagnostics performed and the consolidated status which is annunciated are the same for both NE107 and PlantWeb Alerts.

Note
Alerts are located in the Resource block. For block oriented user interfaces, configure NE107 and PlantWeb alerts, alert suppression, and alert simulation in the Resource Block.

Menu Navigation: <Configure>, <Alert Setup>, <Device Alerts OR Process Alerts OR Diagnostic Alerts OR PlantWeb Alerts>

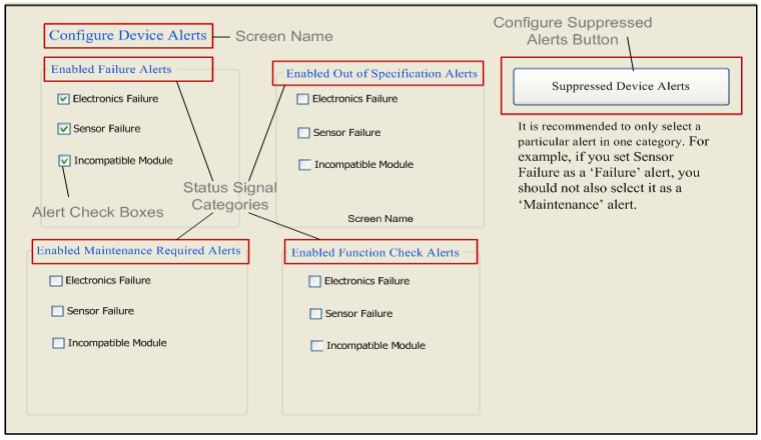
Note
Device Alerts, Process Alerts, and Diagnostic Alerts are configured the same way. One example will be shown.

Note
Device Alerts Suppression, Process Alerts Suppression, and Diagnostic Alerts Suppression are configured the same way. One example will be shown.

NE107 Alerts category configuration

NE107 alerts are divided into Device Alerts, Process Alerts, or Diagnostics Alerts. Each alert type has a dedicated configuration screen, and a dedicated Suppress Alerts screen. The Configure Device Alerts Screen is used here. See "Alerts/alarms" on page 20 for more information on the conditions of each. The alerts are categorized as Failure alerts, Out of Specification alerts, Maintenance - Required alerts, and Function Check alerts. Each category contains the same list of Device Alerts and check boxes. Alerts are assigned to a category by checking the check box next to the alert. This activates the alert in that category. Alerts can be assigned to more than a single category by checking the same alert check box in multiple categories. This is not recommended as alarms can proliferate increasing the complexity of alarm management and delaying corrective action. Use of the factory default alert categories is recommended.

Figure 2-24. Configure Device Alerts Screen



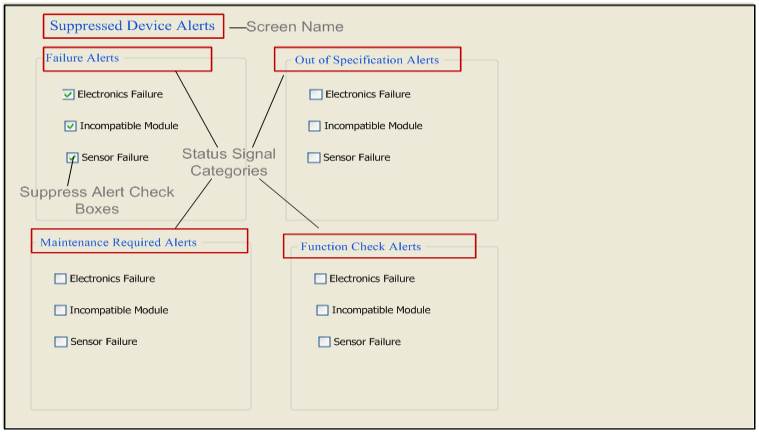
The screen shown in Figure 2-24 above is where the alerts are assigned by checking the box next to the desired alert in the desired category.

Alerts suppression

Menu Navigation: <Configure>, <Alert Setup>, <Device Alerts OR Process Alerts OR Diagnostic Alerts>

Once alerts have been configured they can be suppressed. To suppress alerts click on the 'Suppressed Device Alerts' button on the configuration screen. Alerts can be suppressed by checking the check box next to the alert. This suppresses the alert in that category. Alerts can be suppressed by category if the alert is configured to multiple categories. This allows alerts to be selectively suppressed. To stop suppressing an alert, click on the checked box suppressing the alert.

Figure 2-25. NE107 Suppressed Device Alerts Screen



The screen shown in Figure 2-25 above is where alerts are suppressed by checking the box next to the alert to be suppressed.

PlantWeb alerts configuration

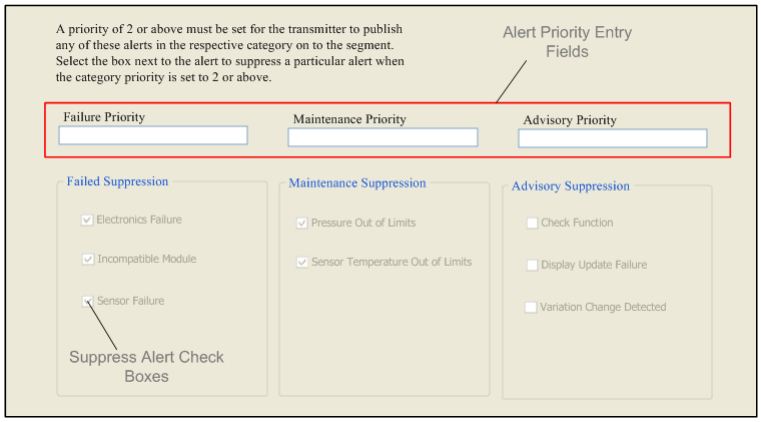
PlantWeb alerts are automatically configured during the NE 107 alert configuration process. There is not a separate process for configuration of PlantWeb alerts.

PlantWeb alerts suppression

Menu Navigation: <Configure>, <Alert Setup>, <PlantWeb Alerts>

There are two methods to suppress PlantWeb Alerts. The first is to assign an alert category, Failed, Maintenance, or Advisory, a priority of 0 or 1. This will suppress all alerts in that category. The second is to suppress individual alerts using NE 107 Alert suppression.

Figure 2-26. PlantWeb Alerts Suppression Screen



The screen shown in Figure 2-26 above allows categories of alerts or individual alerts to be suppressed.

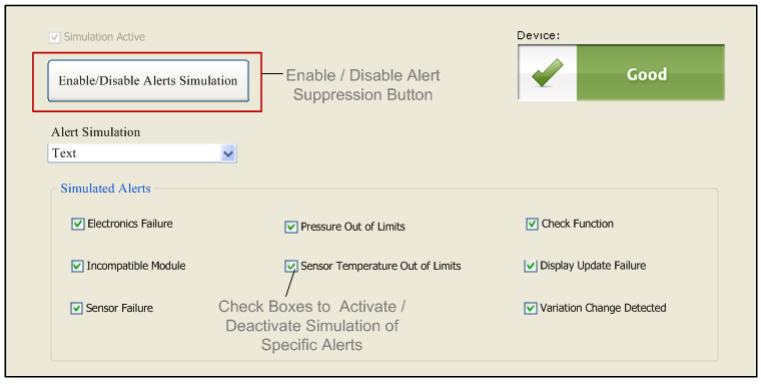
2.9.7 Alert simulation

Alert Simulation provides the capability to simulate configured NE107 or PlantWeb alerts. NE107 Alerts and PlantWeb Alerts show the same consolidated status derived from the same diagnostics so the single Alert Simulation is used for both. Alert Simulation is typically used for training or to verify alert configuration.

Menu Navigation: <Service Tools>, <Simulate>

To enable alert simulation click the 'Enable/Disable Alerts Simulation' button. When simulate is active it will display on the screen. Once Alerts Simulation is active individual alerts can be simulated by checking the check box next to the desired alert condition. The device status indication located on the upper right corner of the screen will change to show the device status associated with the simulated alert. The simulated status will be displayed everywhere device status is displayed. Alert Simulation is Enabled and Disabled using an automated procedure called a 'Method'.

Figure 2-27. Enable/Disable Alert Simulation Screen



The screen shown in Figure 2-27 above enables/disables overall alert simulation capability and allows individual alerts to be selected for simulation.

The sequence of steps to Enable Alert Simulation is:

1. A screen displays stating 'Alert Simulation is disabled.'
2. The screen presents the question 'Do you want to enable alerts simulation? Below this sentence are two radio buttons labeled 'Yes' and 'No'. Select the **Yes** radio button.

The sequence of steps to Disable Alert Simulation is:

1. A screen is displayed stating 'Alert Simulation is enabled.'
2. The screen presents the question 'Do you want to disable alerts simulation? Below this sentence are two radio buttons labeled 'Yes' and 'No'. Select the **Yes** radio button.

2.9.8 Write lock

Note
Write lock functions are performed in the Resource Block. For block oriented user interfaces, perform write lock management in the Resource Block.

Menu Navigation: <Overview>, <Device Information>, <Security and Simulation>

An automated task procedure called a "Method" will guide the user through Write Lock setup. Write lock permits users to configure, enable, and disable the various write lock options. Write lock can be implemented as a hardware lock or a software lock. If it is implemented as a hardware lock the position of the hardware lock switch on the 2051 electronics board will determine if device writes are permitted. Hardware write lock is typically used to prevent writes from a remote location. Software write lock is used to prevent local or remote writes unless the write lock is disabled.

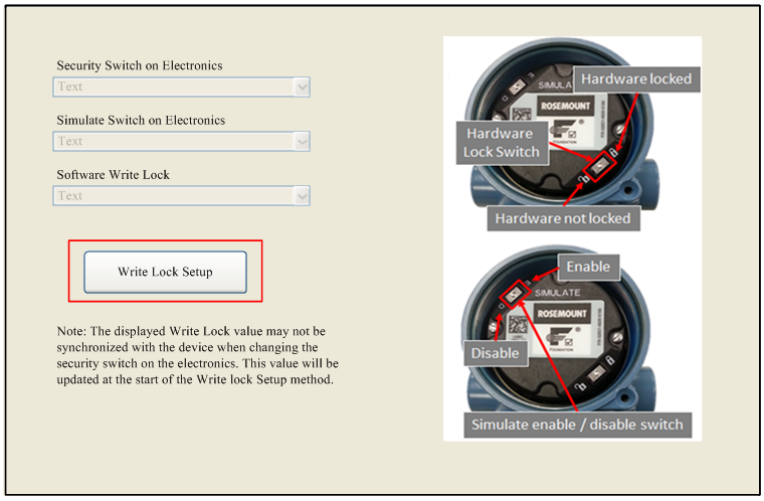
When the write lock procedure is initiated, it first informs the user if write lock is currently enabled, and if it is configured as hardware or software write lock.

If Hardware write lock is enabled the physical switch on the electronics board must be set in the unlocked position to enable changes, including changes to write lock, to be permitted.

If software write lock is enabled follow the on-screen instructions to enable changes.

The selection of the hardware or software write lock is done by clicking on the radio button next to the desired option.

Figure 2-28. Security and Simulation Display Screen



The screen shown in Figure 2-28 above allows users to see if the device has simulation active, to see if any form of write lock is active, and to configure hardware and software write lock.

Section 3 Hardware Installation

3.1 Overview

The information in this section covers installation considerations for the Rosemount 2051 with FOUNDATION™ fieldbus protocols. A Quick Start Guide (document number 00825-0200-4101) is shipped with every transmitter to describe recommended pipe-fitting and wiring procedures for initial installation. Dimensional drawings for each 2051 variation and mounting configuration are included on "Dimensional drawings" on page 138.

Note
For transmitter disassembly and reassembly refer to "Disassembly procedures" on page 86, and "Reassembly procedures" on page 88.

3.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Information that raises potential safety issues is indicated with a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

3.2.1 Warnings

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 2051 Reference Manual for any restrictions associated with a safe installation.

- Before connecting a HART® communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

Replacement equipment or spare parts not approved by Emerson Process Management for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.

- Use only bolts supplied or sold by Emerson Process Management as spare parts.
- Refer to page 193 for a complete list of spare parts.

Improper assembly of manifolds to traditional flange can damage sensor module.

- For safe assembly of manifold to traditional flange, bolts must break back plane of flange web (i.e., bolt hole) but must not contact sensor module housing.

3.3 Considerations

Measurement accuracy depends upon proper installation of the transmitter and impulse piping. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. Also, consider the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation.

Important

Install the enclosed pipe plug (found in the box) in unused conduit opening with a minimum of five threads engaged to comply with explosion-proof requirements. For tapered threads, install the plug wrench tight.

For material compatibility considerations, see document number 00816-0100-3045 on www.emersonprocess.com/rosemount.

3.4 Mechanical considerations

Note
For steam service or for applications with process temperatures greater than the limits of the transmitter, do not blow down impulse piping through the transmitter. Flush lines with the blocking valves closed and refill lines with water before resuming measurement.

Note
When the transmitter is mounted on its side, position the Coplanar flange to ensure proper venting or draining. Mount the flange as shown in Figure 3-8 on page 56, keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

3.5 Environmental considerations

Best practice is to mount the transmitter in an environment that has minimal ambient temperature change. The transmitter electronics temperature operating limits are –40 to 185 °F (–40 to 85 °C). Refer to Appendix A: Specifications and Reference Data that lists the sensing element operating limits. Mount the transmitter so that it is not susceptible to vibration and mechanical shock and does not have external contact with corrosive materials.

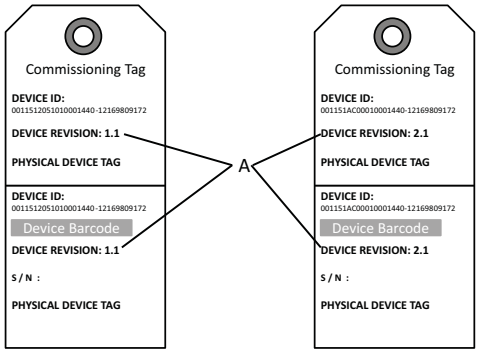
3.6 Tagging

3.6.1 Commissioning tag

The 2051 has been supplied with a removable commissioning tag that contains both the Device ID (the unique code that identifies a particular device in the absence of a device tag) and a space to record the device tag (PD_TAG) (the operational identification for the device as defined by the Piping and Instrumentation Diagram [P&ID]).

When commissioning more than one device on a fieldbus segment, it can be difficult to identify which device is at a particular location. The removable tag, provided with the transmitter, can aid in this process by linking the Device ID to its physical location. The installer should note the physical location of the transmitter on both the upper and lower location of the commissioning tag. The bottom portion should be torn off for each device on the segment and used for commissioning the segment in the control system.

Figure 3-1. Commissioning Tag



A. Device revision

3.6.2 Transmitter tag

If permanent tag is ordered:

- Transmitter is tagged in accordance with customer requirements
- Tag is permanently attached to the transmitter

Software (PD_TAG)

- If permanent tag is ordered, the PD Tag contains the permanent tag information up to 32 characters.
- If permanent tag is NOT ordered, the PD Tag contains the transmitter serial number.

3.7 Installation procedures

3.7.1 Mount the transmitter

Process flange orientation

Mount the process flanges with sufficient clearance for process connections. For safety reasons, place the drain/vent valves so the process fluid is directed away from possible human contact when the vents are used. In addition, consider the accessibility for a testing or calibration input.

Note
Most transmitters are calibrated in the horizontal position. Mounting the transmitter in any other position will shift the zero point to the equivalent amount of liquid head pressure caused by the varied mounting position. To reset zero point, refer to "Trim the pressure signal" on page 80.

Terminal side of electronics housing

Mount the transmitter so the terminal side is accessible. Clearance of 0.75-in. (19 mm) is required for cover removal. Use a conduit plug on the unused side of the conduit opening.

Circuit side of electronics housing

Provide 0.75 in. (19 mm) of clearance for units without an LCD display. Provide 3 in. (76 mm) of clearance for units installed with LCD display.

Cover installation

Always ensure a proper seal by installing the electronics housing covers so that metal contacts metal. Use Rosemount O-rings.

Mounting brackets

Rosemount 2051 Transmitters may be panel-mounted or pipe-mounted through an optional mounting bracket. Refer to Table 3-1 for the complete offering and see Figure 3-2 through Figure 3-5 on pages 51 and 52 for dimensions and mounting configurations.

Table 3-1. Mounting Brackets

2051 brackets										
	Process connections			Mounting			Materials			
Option code	Coplanar	In-line	Traditional	Pipe mount	Panel mount	Flat panel mount	CS bracket	SST bracket	CS bolts	SST bolts
B4	X	X	N/A	X	X	X	N/A	X	N/A	X
B1	N/A	N/A	X	X	N/A	N/A	X	N/A	X	N/A
B2	N/A	N/A	X	N/A	X	N/A	X	N/A	X	N/A
B3	N/A	N/A	X	N/A	N/A	X	X	N/A	X	N/A
B7	N/A	N/A	X	X	N/A	N/A	X	N/A	N/A	X
B8	N/A	N/A	X	N/A	X	N/A	X	N/A	N/A	X
B9	N/A	N/A	X	N/A	N/A	X	X	N/A	N/A	X
BA	N/A	N/A	X	X	N/A	N/A	N/A	X	N/A	X
BC	N/A	N/A	X	N/A	N/A	X	N/A	X	N/A	X

Figure 3-2. Mounting Bracket Option Code B4

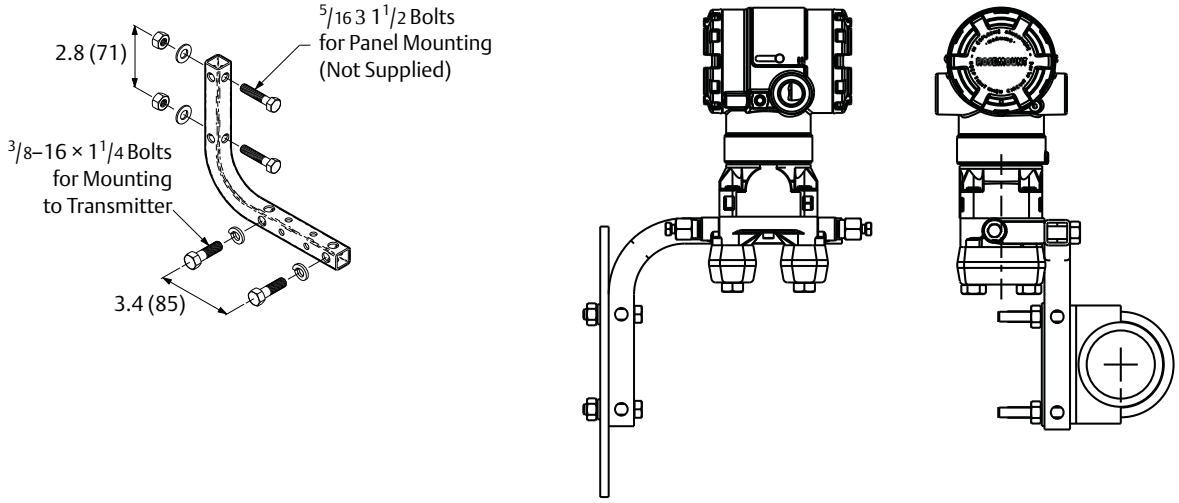


Figure 3-3. Mounting Bracket Option Codes B1, B7, and BA

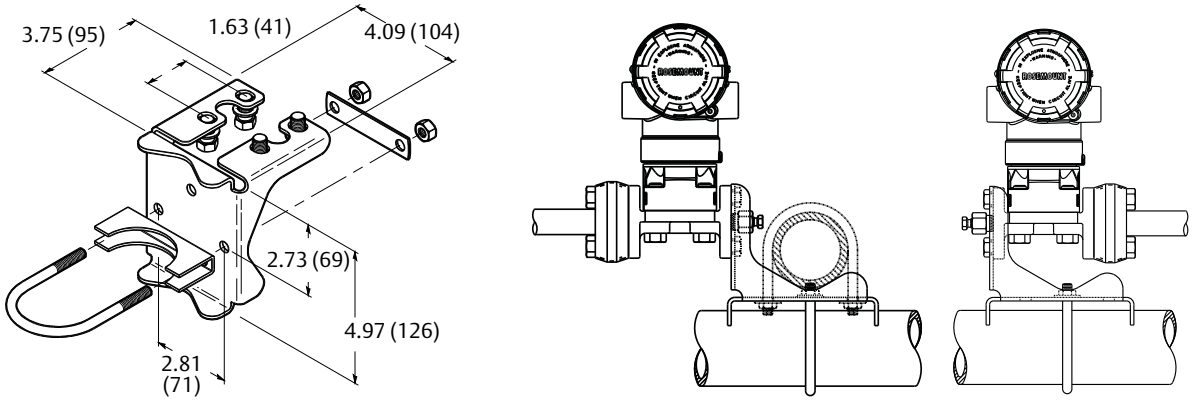


Figure 3-4. Panel Mounting Bracket Option Codes B2 and B8

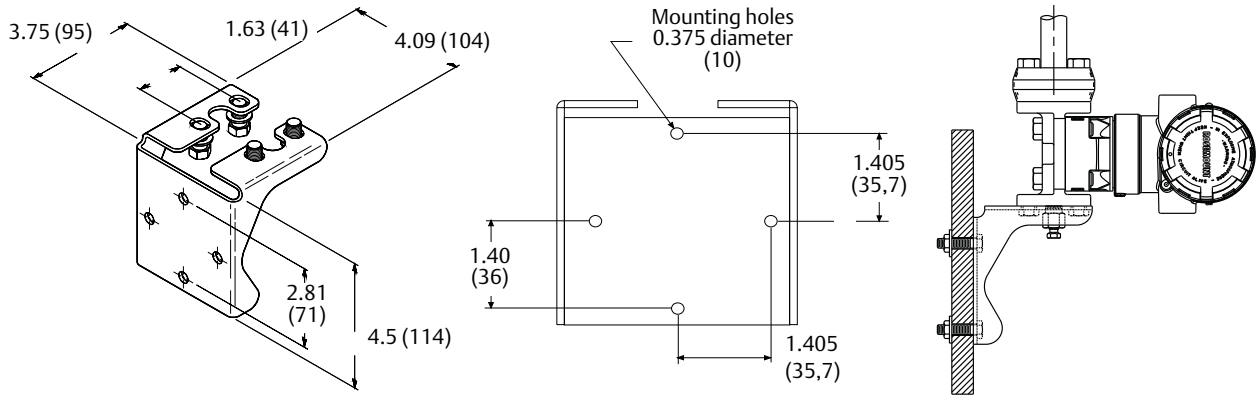
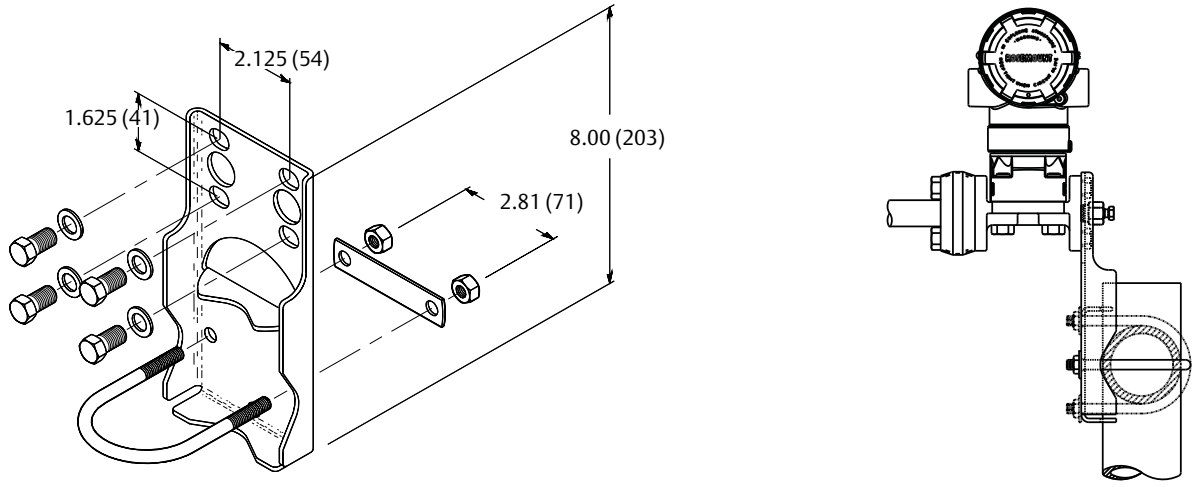


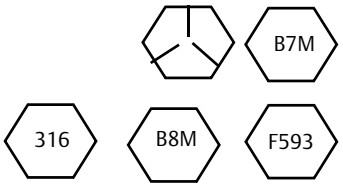
Figure 3-5. Flat Mounting Bracket Option Codes B3 and BC



Dimensions are in inches (millimeters).

Flange bolts

The 2051 is shipped with a coplanar flange installed with four 1.75-in. (44 mm) flange bolts. See Figure 3-6 on page 54 and Figure 3-7 on page 54. Stainless steel bolts are coated with a lubricant to ease installation. Carbon steel bolts do not require lubrication. No additional lubricant should be applied when installing either type of bolt. Bolts are identified by their head markings:



Carbon Steel (CS) Head Markings

Stainless Steel (SST) Head Markings

* The last digit in the F593_ head marking may be any letter between A and M.

Bolt installation

Only use bolts supplied with the 2051 or provided by Emerson Process Management as spare parts. When installing the transmitter to one of the optional mounting brackets, torque the bolts to 125 in-lb. (0,9 N-m). Use the following bolt installation procedure:

1. Finger-tighten the bolts.
2. Torque the bolts to the initial torque value using a crossing pattern.
3. Torque the bolts to the final torque value using the same crossing pattern.

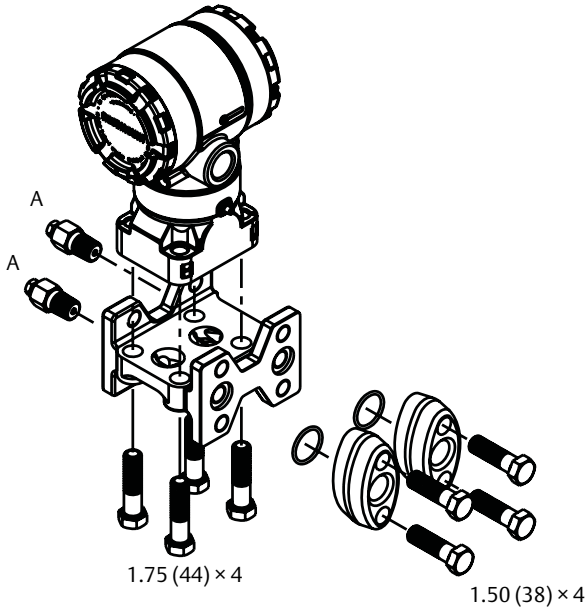
Torque values for the flange and manifold adapter bolts are as follows:

Table 3-2. Bolt Installation Torque Values

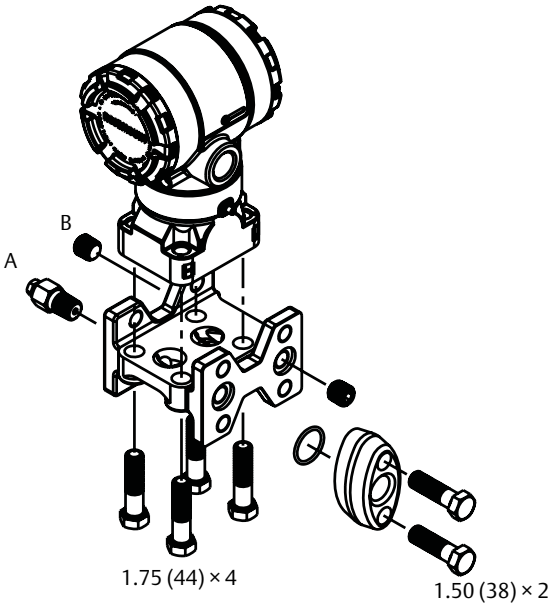
Bolt material	Initial torque value	Final torque value
CS-ASTM-A449 Standard	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
316 SST—Option L4	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)
ASTM-A-193-B7M—Option L5	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
ASTM-A-193 Class 2, Grade B8M—Option L8	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)

Figure 3-6. Traditional Flange Bolt Configurations

DIFFERENTIAL TRANSMITTER



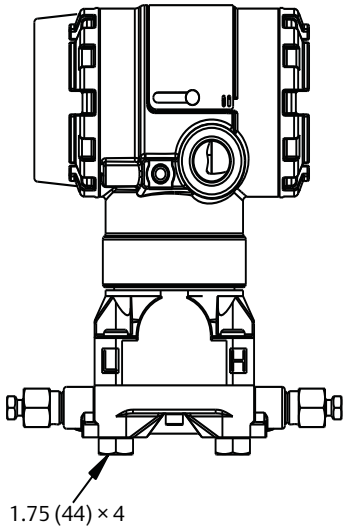
GAGE TRANSMITTER



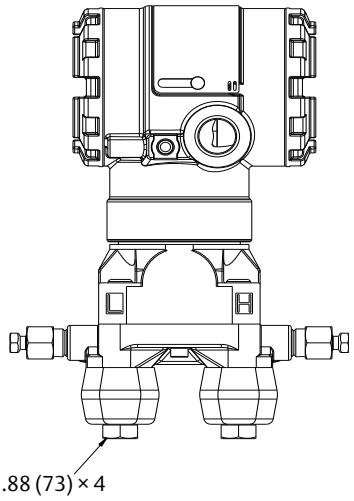
A. Drain/vent
B. Plug
Dimensions are in inches (millimeters).

Figure 3-7. Mounting Bolts and Bolt Configurations for Coplanar Flange

TRANSMITTER WITH FLANGE BOLTS



TRANSMITTER WITH FLANGE ADAPTERS AND FLANGE/ADAPTER BOLTS



Dimensions are in inches (millimeters).

Description	Size in inches (mm)
Flange Bolts	1.75 (44)
Flange/Adapter Bolts	2.88 (73)
Manifold/Flange Bolts	2.25 (57)
Note: Rosemount 2051T transmitters are direct mount and do not require bolts for process connection.	

3.7.2 Impulse piping

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are six possible sources of impulse piping error: pressure transfer, leaks, friction loss (particularly if purging is used), trapped gas in a liquid line, liquid in a gas line, and density variations between the legs.

The best location for the transmitter in relation to the process pipe is dependent on the process. Use the following guidelines to determine transmitter location and placement of impulse piping:

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1 in./foot (8 cm/m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 in./foot (8 cm/m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Make sure both impulse legs are the same temperature.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When using a sealing fluid, fill both piping legs to the same level.
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe. Avoid purging through the transmitter.
- Keep corrosive or hot (above 250 °F [121 °C]) process material out of direct contact with the sensor module and flanges.
- Prevent sediment deposits in the impulse piping.
- Maintain equal leg of head pressure on both legs of the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.

Mounting requirements

Impulse piping configurations depend on specific measurement conditions. Refer to Figure 3-8 for examples of the following mounting configurations:

Liquid flow measurement

- Place taps to the side of the line to prevent sediment deposits on the process isolators.
- Mount the transmitter beside or below the taps so gases vent into the process line.
- Mount drain/vent valve upward to allow gases to vent.

Gas flow measurement

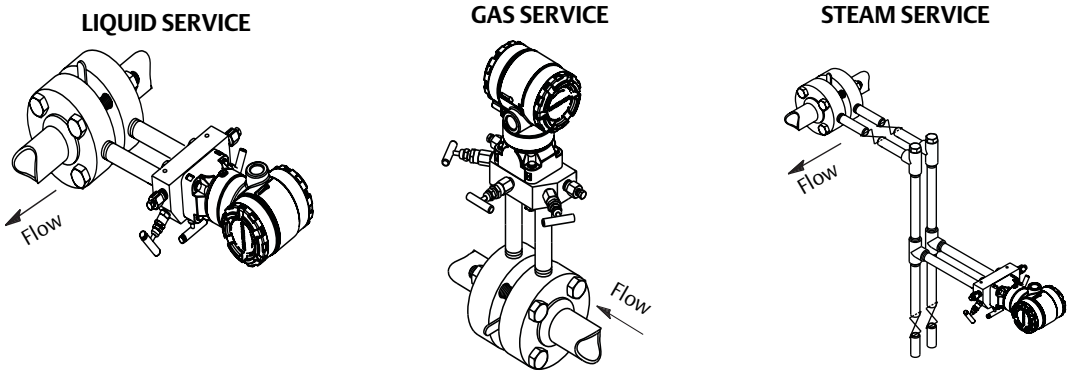
- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps so to drain liquid into the process line.

Steam flow measurement

- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that impulse piping will remain filled with condensate.
- In steam service above 250 °F (121 °C), fill impulse lines with water to prevent steam from contacting the transmitter directly and to ensure accurate measurement start-up.

Note
For steam or other elevated temperature services, it is important that temperatures at the process connection do not exceed the transmitter's process temperature limits. See "Temperature limits" on page 131 for details.

Figure 3-8. Installation Examples



3.7.3 Process connections

Coplanar or traditional process connection

⚠ Install and tighten all four flange bolts before applying pressure, or process leakage will result. When properly installed, the flange bolts will protrude through the top of the sensor module housing. Do not attempt to loosen or remove the flange bolts while the transmitter is in service.

⚠ Flange adapters

Rosemount 2051DP and GP process connections on the transmitter flanges are $^{1}/_{4}$–18 NPT. Flange adapters are available with standard $^{1}/_{2}$–14 NPT Class 2 connections. The flange adapters allow users to disconnect from the process by removing the flange adapter bolts. Use plant-approved lubricant or sealant when making the process connections. Refer to "Mount the transmitter" on page 50 for the distance between pressure connections. This distance may be varied $\pm^{1}/_{8}$ in. (3.2 mm) by rotating one or both of the flange adapters.

To install adapters to a coplanar flange, perform the following procedure:

1. Remove the flange bolts.
2. Leaving the flange in place, move the adapters into position with the O-ring installed.

3. Clamp the adapters and the coplanar flange to the transmitter sensor module using the larger of the bolts supplied.

4. Tighten the bolts. Refer to "Flange bolts" on page 53 for torque specifications.

Whenever you remove flanges or adapters, visually inspect the PTFE O-rings. Replace with O-ring designed for Rosemount transmitter if there are any signs of damage, such as nicks or cuts. Undamaged O-rings may be reused. If you replace the O-rings, retorque the flange bolts after installation to compensate for cold flow. Refer to the process sensor body reassembly procedure in Section 6: Troubleshooting.

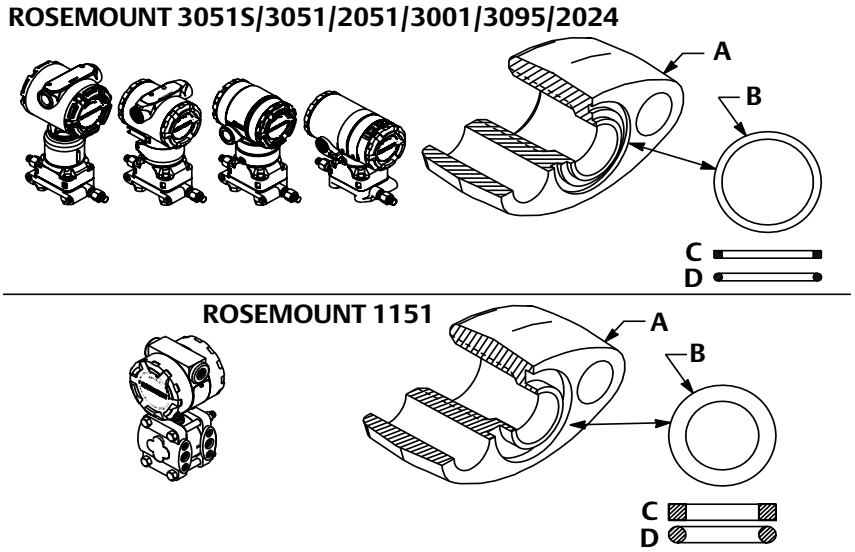
O-rings

The two styles of Rosemount flange adapters (Rosemount 1151 and Rosemount 3051/2051/2024/3095) each require a unique O-ring (see Figure 3-9). Use only the O-ring designed for the corresponding flange adapter.

Figure 3-9. O-rings

⚠ WARNING

Failure to install proper flange adapter O-rings may cause process leaks, which can result in death or serious injury. The two flange adapters are distinguished by unique O-ring grooves. Only use the O-ring that is designed for its specific flange adapter, as shown below.



A. Flange Adapter
B. O-ring
C. PTFE Based
D. Elastomer

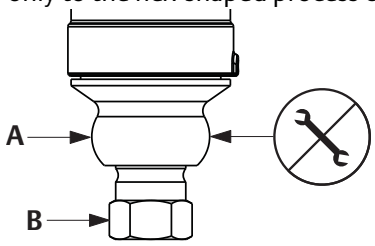
⚠ When compressed, PTFE O-rings tend to "cold flow," which aids in their sealing capabilities.

Note
PTFE O-rings should be replaced if the flange adapter is removed.

Inline process connection

⚠ WARNING

Do not apply torque directly to the sensor module. Rotation between the sensor module and the process connection can damage the electronics. To avoid damage, apply torque only to the hex-shaped process connection.

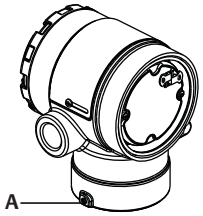


A. Sensor module
B. Process connection

3.7.4 Housing rotation

To improve field access to wiring or to better view the optional LCD display:

Figure 3-10. Housing Rotation



A. Housing Rotation Set Screw ($^{5}/_{64}$-inch)

1. Loosen the housing rotation set screw using a $^{5}/_{64}$-in. hex wrench.
2. Rotate the housing clockwise to the desired location.
3. If the desired location cannot be achieved due to thread limit, rotate the housing counterclockwise to the desired location (up to 360° from thread limit).
4. Re-tighten the housing rotation set screw to no more than 7 in-lbs when desired location is reached.

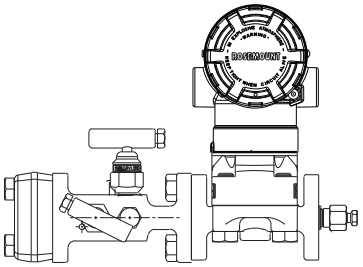
3.8 Hazardous locations certifications

⚠ Individual transmitters are clearly marked with a tag indicating the approvals they carry. Transmitters must be installed in accordance with all applicable codes and standards to maintain these certified ratings. Refer to "Product certifications" on page 200 for information on these approvals.

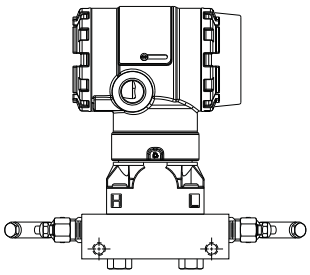
3.9 Rosemount 305, 306, and 304 Manifolds

The 305 Integral Manifold is available in two designs: Traditional and Coplanar. The traditional 305 Integral Manifold can be mounted to most primary elements with mounting adapters in the market today. The 306 Integral Manifold is used with the 2051T In-Line Transmitters to provide block-and-bleed valve capabilities of up to 10000 psi (690 bar).

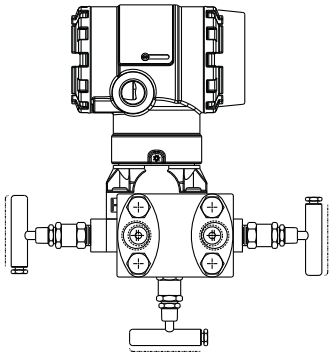
Figure 3-11. Manifolds



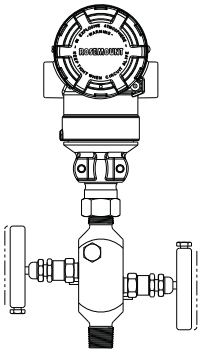
2051C AND 304 CONVENTIONAL



2051C AND 305 INTEGRAL COPLANAR



2051C AND 305 INTEGRAL TRADITIONAL



2051T AND 306 IN-LINE

3.9.1 Rosemount 305 Integral Manifold installation procedure

To install a 305 Integral Manifold to a 2051 Transmitter:

⚠ 1. Inspect the PTFE sensor module O-rings. Undamaged O-rings may be reused. If the O-rings are damaged (if they have nicks or cuts, for example), replace with O-rings designed for Rosemount transmitter.

Important
If replacing the O-rings, take care not to scratch or deface the O-ring grooves or the surface of the isolating diaphragm while you remove the damaged O-rings.

2. Install the Integral Manifold on the sensor module. Use the four 2.25-in. manifold bolts for alignment. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See "Flange bolts" on page 53 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the sensor module housing.

3. If the PTFE sensor module O-rings have been replaced, the flange bolts should be re-tightened after installation to compensate for cold flow of the O-rings.

Note
Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate mounting effects.

3.9.2 Rosemount 306 Integral Manifold installation procedure

The 306 Manifold is for use only with a 2051T In-Line Transmitter.

⚠ Assemble the 306 Manifold to the 2051T In-Line Transmitter with a thread sealant.

3.9.3 Rosemount 304 Conventional Manifold installation procedure

To install a 304 Conventional Manifold to a 2051 Transmitter:

1. Align the Conventional Manifold with the transmitter flange. Use the four manifold bolts for alignment.

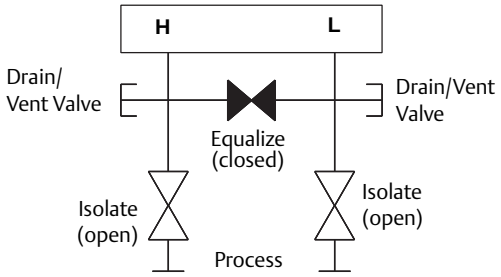
2. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See"Flange bolts" on page 53 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the sensor module housing.

3. Leak-check assembly to maximum pressure range of transmitter.

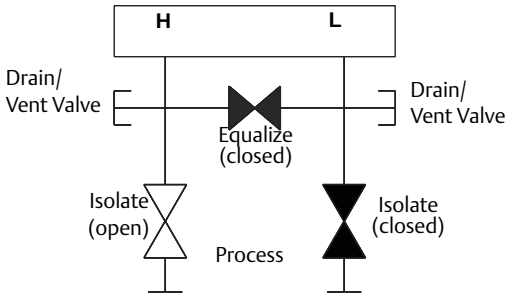
3.9.4 Integral manifold operation

Three-valve configuration shown.

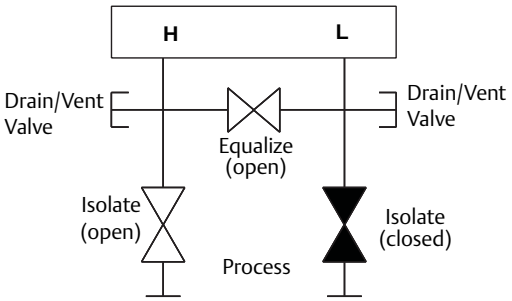
In normal operation the two isolate valves between the process and instrument ports will be open and the equalizing valve(s) will be closed.



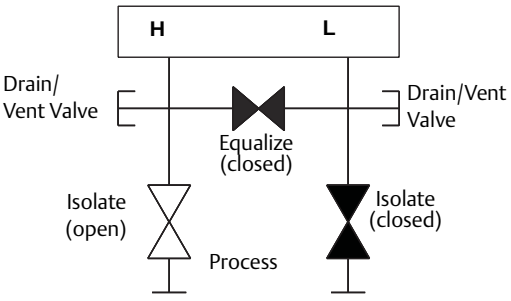
To zero the 2051, close the isolate valve to the low pressure (downstream side) of the transmitter first.



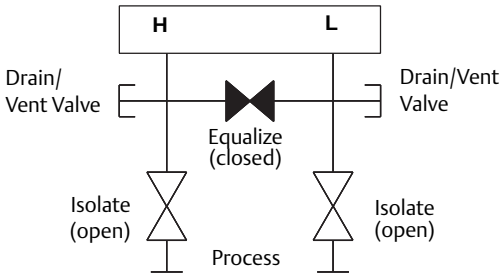
Next, open the center (equalize) valve(s) to equalize the pressure on both sides of the transmitter.



The manifold valves are now in the proper configuration for zeroing the transmitter. To return the transmitter to service, close the equalizing valve(s) first.

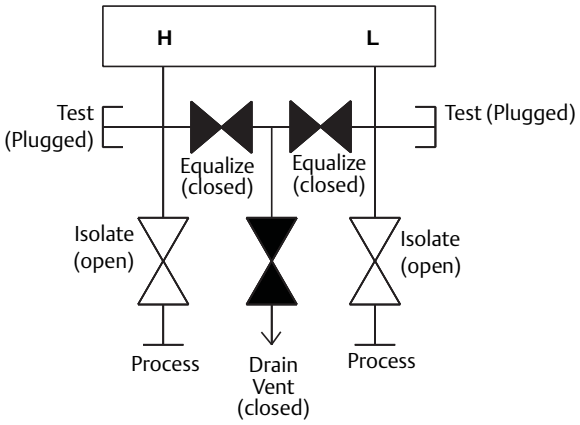


Next, open the isolate valve on the low pressure side of the transmitter.

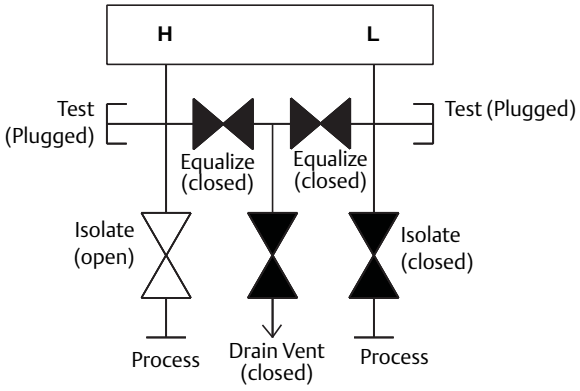


Five-valve Natural Gas configurations shown:

In normal operation, the two block valves between the process and instrument ports will be open, and the equalizing valves will be closed.

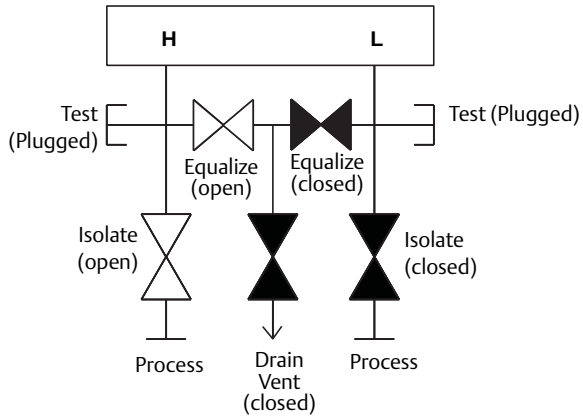


To zero the Rosemount 2051, first close the block valve on the low pressure (downstream) side of the transmitter.

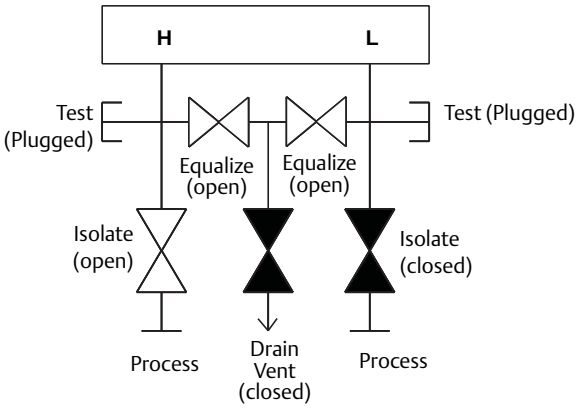


Note
Do not open the low side equalize valve before the high side equalize valve. Doing so will overpressure the transmitter.

Open the equalize valve on the high pressure (upstream) side of the transmitter.



Open the equalize valve on the low pressure (downstream) side of the transmitter. The manifold is now in the proper configuration for zeroing the transmitter.



3.10 Liquid level measurement

Differential pressure transmitters used for liquid level applications measure hydrostatic pressure head. Liquid level and specific gravity of a liquid are factors in determining pressure head. This pressure is equal to the liquid height above the tap multiplied by the specific gravity of the liquid. Pressure head is independent of volume or vessel shape.

3.10.1 Open vessels

A pressure transmitter mounted near a tank bottom measures the pressure of the liquid above.

Make a connection to the high pressure side of the transmitter, and vent the low pressure side to the atmosphere. Pressure head equals the liquid's specific gravity multiplied by the liquid height above the tap.

Zero range suppression is required if the transmitter lies below the zero point of the desired level range. Figure 3-12 shows a liquid level measurement example.

3.10.2 Closed vessels

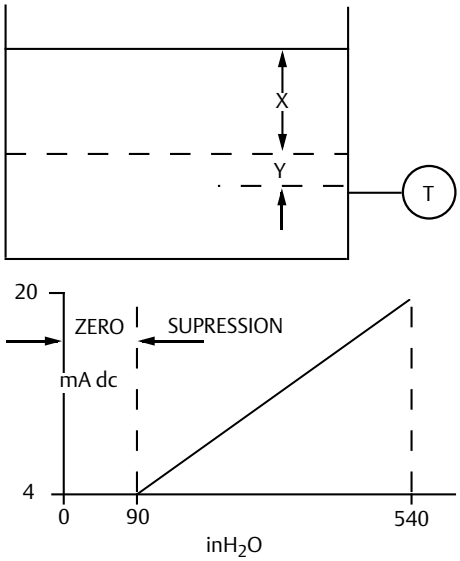
Pressure above a liquid affects the pressure measured at the bottom of a closed vessel. The liquid specific gravity multiplied by the liquid height plus the vessel pressure equals the pressure at the bottom of the vessel.

To measure true level, the vessel pressure must be subtracted from the vessel bottom pressure. To do this, make a pressure tap at the top of the vessel and connect this to the low side of the transmitter. Vessel pressure is then equally applied to both the high and low sides of the transmitter. The resulting differential pressure is proportional to liquid height multiplied by the liquid specific gravity.

Dry leg condition

Low-side transmitter piping will remain empty if gas above the liquid does not condense. This is a dry leg condition. Range determination calculations are the same as those described for bottom-mounted transmitters in open vessels, as shown in Figure 3-12.

Figure 3-12. Liquid Level Measurement Example



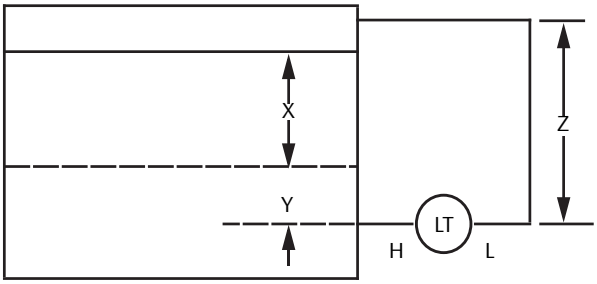
Let X equal the vertical distance between the minimum and maximum measurable levels (500 in.).
Let Y equal the vertical distance between the transmitter datum line and the minimum measurable level (100 in.).
Let SG equal the specific gravity of the fluid (0.9).
Let h equal the maximum head pressure to be measured in inches of water.
Let e equal head pressure produced by Y expressed in inches of water.
Let Range equal e to e + h.
Then h=(X)(SG)
=500 x 0.9
=450 inH_2O
e=(Y)(SG)
=100 x 0.9
=90 inH_2O
Range =90 to 540 inH_2O

Wet leg condition

Condensation of the gas above the liquid slowly causes the low side of the transmitter piping to fill with liquid. The pipe is purposely filled with a convenient reference fluid to eliminate this potential error. This is a wet leg condition.

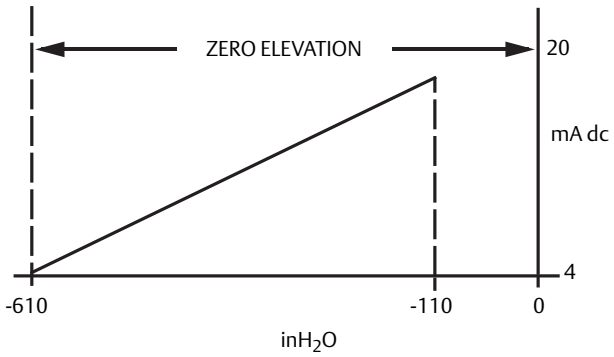
The reference fluid will exert a head pressure on the low side of the transmitter. Zero elevation of the range must then be made.

Figure 3-13. Wet Leg Example



Let **X** equal the vertical distance between the minimum and maximum measurable levels (500 in.).
Let **Y** equal the vertical distance between the transmitter datum line and the minimum measurable level (50 in.).
Let **z** equal the vertical distance between the top of the liquid in the wet leg and the transmitter datum line (600 in.).
Let $\mathbf{SG_1}$ equal the specific gravity of the fluid (1.0).
Let $\mathbf{SG_2}$ equal the specific gravity of the fluid in the wet leg (1.1).
Let **h** equal the maximum head pressure to be measured in inches of water.
Let **e** equal the head pressure produced by Y expressed in inches of water.
Let **s** equal head pressure produced by z expressed in inches of water.
Let **Range** equal **e – s** to **h + e – s**.

Then h = $\mathbf{(X)(SG_1)}$
= 500 x 1.0
= 500 in H_2O
e = $\mathbf{(Y)(SG_1)}$
= 50 x 1.0
= 50 inH_2O
s = $\mathbf{(z)(SG_2)}$
= 600 x 1.1
= 660 inH_20
Range = **e – s to h + e – s.**
= 50 – 660 to 500 + 50 – 660
= –610 to –110 inH_20

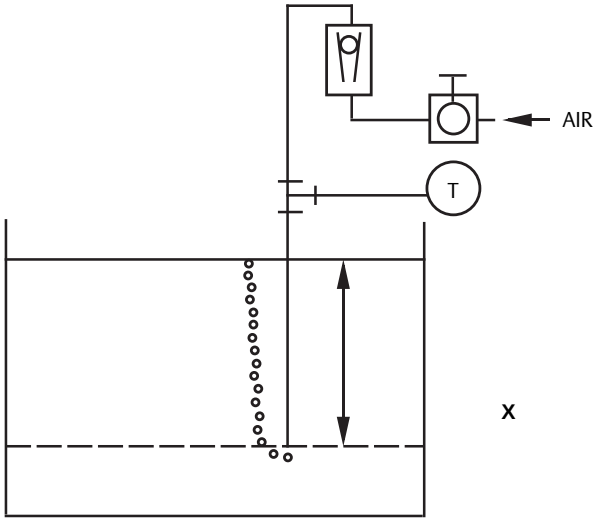


Bubbler system in open vessel

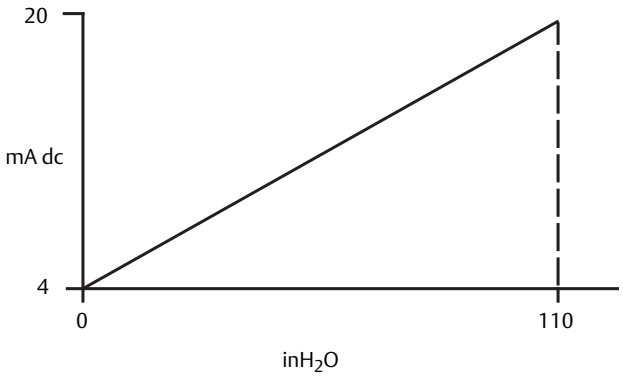
A bubbler system that has a top-mounted pressure transmitter can be used in open vessels. This system consists of an air supply, pressure regulator, constant flow meter, pressure transmitter, and a tube that extends down into the vessel.

Bubble air through the tube at a constant flow rate. The pressure required to maintain flow equals the liquid's specific gravity multiplied by the vertical height of the liquid above the tube opening. Figure 3-14 shows a bubbler liquid level measurement example.

Figure 3-14. Bubbler Liquid Level Measurement Example



Let **X** equal the vertical distance between the minimum and maximum measurable levels (100 in.).
Let **SG** equal the specific gravity of the fluid (1.1).
Let **h** equal the maximum head pressure to be measured in inches of water.
Let **Range** equal **zero** to **h**.
Then h = **(X)(SG)**
= 100 x 1.1
= 110 inH_2O
Range = 0 to 110 inH_2O



Section 4 Electrical Installation

4.1 Overview

The information in this section covers installation considerations for the Rosemount 2051. A Quick Start Guide is shipped with every transmitter to describe pipe-fitting, wiring procedures and basic configuration for initial installation.

Note
For transmitter disassembly and reassembly refer to sections "Disassembly procedures" on page 86, and "Reassembly procedures" on page 88.

4.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 2051 Reference Manual for any restrictions associated with a safe installation.

- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

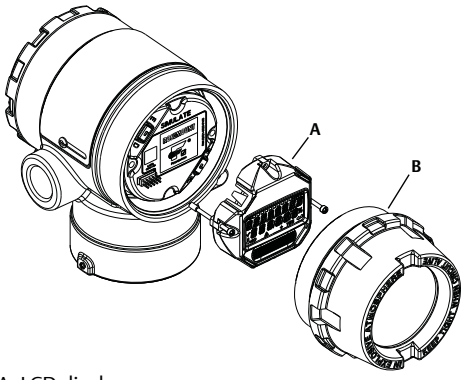
Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

4.3 LCD display

Transmitters ordered with the LCD display option (M5) are shipped with the display installed. Installing the display on an existing 2051 Transmitter requires a small instrument screwdriver. Carefully align the desired display connector with the electronics board connector. If connectors don't align, the display and electronics board are not compatible.

Figure 4-1. LCD Display Assembly



A. LCD display
B. Cover

4.3.1 Rotating LCD display

⚠ 1. Secure the loop to manual control and remove power to transmitter.

2. Remove transmitter housing cover.

3. Remove screws from the LCD display and rotate to desired orientation.

   a. Insert 10 pin connector into the display board for the correct orientation. Carefully align pins for insertion into the output board.

4. Re-insert screws.

5. Reattach transmitter housing cover; it is recommended the cover be tightened until there is no gap between the cover and housing to comply with explosion proof requirements.

6. Re-attach power and return loop to automatic control.

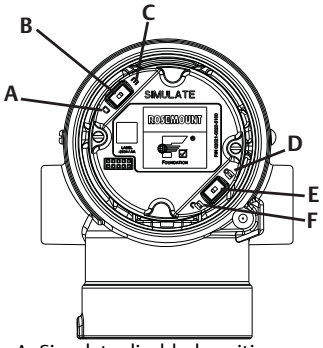
4.4 Configuring transmitter security and simulation

There are two security methods with the Rosemount 2051 Transmitter, use of the security switch and software configured security using (see "Enable software write lock" on page 30).

Use of the security switch is described below.

- Security switch

Figure 4-2. Simulate and Security Switches



A. Simulate disabled position
B. Simulate switch
C. Simulate enabled position (default)
D. Security locked position
E. Security switch
F. Security unlocked position (default)

4.4.1 Setting security switch

Set Simulate and Security switch configuration before installation as shown in Figure 4-2.

- The simulate switch enables or disables simulated alerts and simulated AI Block status and values. The default simulate switch position is enabled.
- The Security switch allows (unlocked symbol) or prevents (locked symbol) any configuration of the transmitter.
  - Default security is off (unlocked symbol).
  - The security switch can be enabled or disabled in software.

Use the following procedure to change the switch configuration:

⚠ 1. If the transmitter is installed, secure the loop, and remove power.

2. Remove the housing cover opposite the field terminal side. Do not remove the instrument cover in explosive atmospheres when the circuit is live.

3. Slide the security and simulate switches into the preferred position.

⚠ 4. Reattach transmitter housing cover; it is recommended the cover be tightened until there is no gap between the cover and housing to comply with explosion proof requirements.

4.4.2 Setting simulate switch

The SIMULATE switch is located on the electronics. It is used in conjunction with the transmitter simulate software to simulate process variables and/or alerts and alarms. To simulate variables and/or alerts and alarms, the SIMULATE switch must be moved to the ENABLE position and the software enabled through the host. To disable simulation, the switch must be in the DISABLE position or the software simulate parameter must be disabled through the host.

4.5 Electrical considerations

Note
Make sure all electrical installation is in accordance with national and local code requirements.

⚠ CAUTION

Do not run signal wiring in conduit or open trays with power wiring or near heavy electrical equipment.

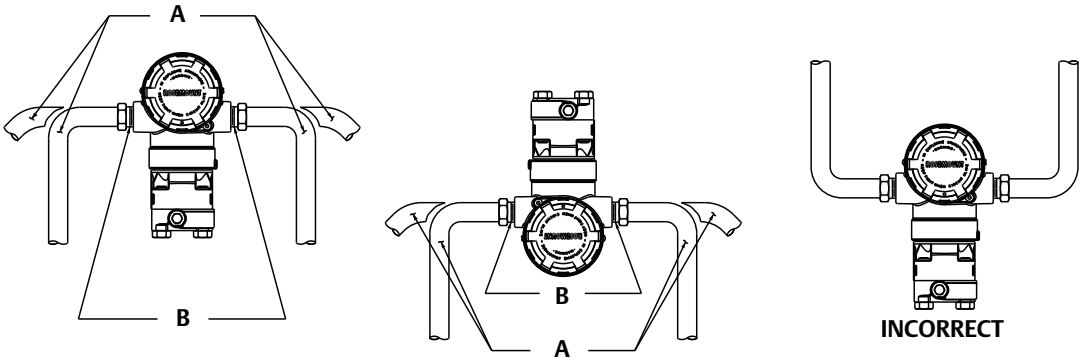
4.5.1 Conduit installation

⚠ CAUTION

If all connections are not sealed, excess moisture accumulation can damage the transmitter. Make sure to mount the transmitter with the electrical housing positioned downward for drainage. To avoid moisture accumulation in the housing, install wiring with a drip loop, and ensure the bottom of the drip loop is mounted lower than the conduit connections of the transmitter housing.

Recommended conduit connections are shown in Figure 4-3.

Figure 4-3. Conduit Installation Diagrams



A. Possible conduit line positions
B. Sealing compound

4.5.2 Power supply for FOUNDATION fieldbus

Power supply

The transmitter requires between 9 and 32 V dc (9 and 30 V dc for intrinsic safety, and 9 and 17.5 V dc for FISCO intrinsic safety) to operate and provide complete functionality.

Power conditioner

A fieldbus segment requires a power conditioner to isolate the power supply, filter, and decouple the segment from other segments attached to the same power supply.

4.6 Wiring

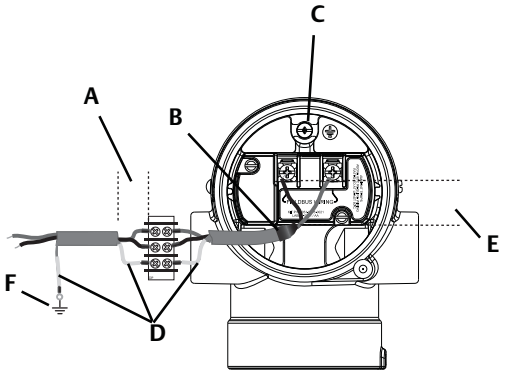
4.6.1 Transmitter wiring

Wiring and power supply requirements can be dependent upon the approval certification. As with all FOUNDATION™ fieldbus requirements, a conditioned power supply and terminating resistors are required for proper operation. The standard 2051 Pressure Transmitter terminal block is shown in Figure 4-5. The terminals are not polarity sensitive. The transmitter requires 9-32 Vdc to operate. Type A FOUNDATION fieldbus wiring 18 awg twisted shielded pair is recommended. Do not exceed 5000 ft (1500 m) total segment length.

Note
Avoid running instrument cable next to power cables in cable trays or near heavy electrical equipment.

It is important that the instrument cable shield be:
- trimmed close and insulated from touching the transmitter housing
- continuously connected throughout the segment
- connected to a good earth ground at the power supply end

Figure 4-4. Wiring Terminals



A. Minimize distance
B. Trim shield and insulate
C. Protective Grounding Terminal (do not ground cable shield at the transmitter)
D. Insulate Shield
E. Minimize distance
F. Connect Shield Back to the Power Supply Ground

Perform the following procedure to make wiring connections:

⚠ 1. Remove the housing cover on terminal compartment side. Do not remove the cover in explosive atmospheres when the circuit is live. Signal wiring supplies all power to the transmitter.

2. Plug and seal unused conduit connection on the transmitter housing to avoid moisture accumulation in the terminal side.

4.6.2 Grounding the transmitter

Signal cable shield grounding

Signal cable shield grounding is summarized in Figure 4-4 on page 71. The signal cable shield and unused shield drain wire must be trimmed and insulated, ensuring that the signal cable shield and drain wire do not come in contact with the transmitter case. See “Transmitter case grounding” on page 73 for instructions on grounding the transmitter case. Follow the steps below to correctly ground the signal cable shield.

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. Grounding terminations are provided on the outside of the electronics housing and inside the terminal compartment. These grounds are used when transient protect terminal blocks are installed or to fulfill local regulations.

1. Remove the field terminals housing cover.

2. Connect the wiring pair and ground as indicated in “Wiring” on page 71.

   a. Trim the cable shield as short as practical and insulate from touching the transmitter housing.

Note
Do NOT ground the cable shield at the transmitter; if the cable shield touches the transmitter housing, it can create ground loops and interfere with communications.

   b. Continuously connect the cable shields to the power supply ground.

   c. Connect the cable shields for the entire segment to a single good earth ground at the power supply.

Note
Improper grounding is the most frequent cause of poor segment communications.

3. Replace the housing cover. It is recommended that the cover be tightened until there is no gap between the cover and the housing.

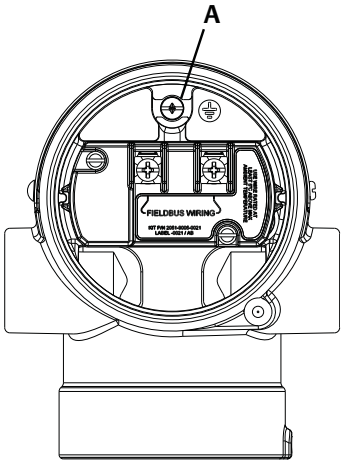
4. Plug and seal unused conduit connections.

Transmitter case grounding

Always ground the transmitter case in accordance with national and local electrical codes. The most effective transmitter case grounding method is a direct connection to earth ground with minimal impedance. Methods for grounding the transmitter case include:

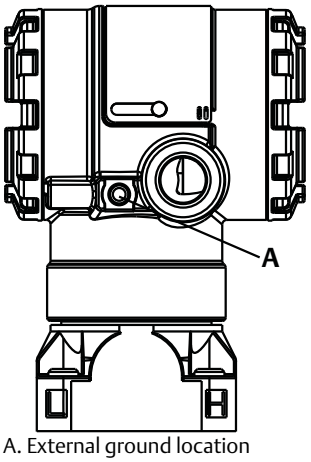
- Internal ground connection: The internal ground connection screw is inside the FIELD TERMINALS side of the electronics housing. This screw is identified by a ground symbol (⏚). The ground connection screw is standard on all Rosemount 2051 Transmitters. Refer to Figure 4-5 on page 73.
- External ground connection: The external ground connection is located on the exterior of the transmitter housing. Refer to Figure 4-6 on page 73. This connection is only available with option V5 and T1.

Figure 4-5. Internal Ground Connection



A. Internal ground location

Figure 4-6. External Ground Connection (Option V5 or T1)



A. External ground location

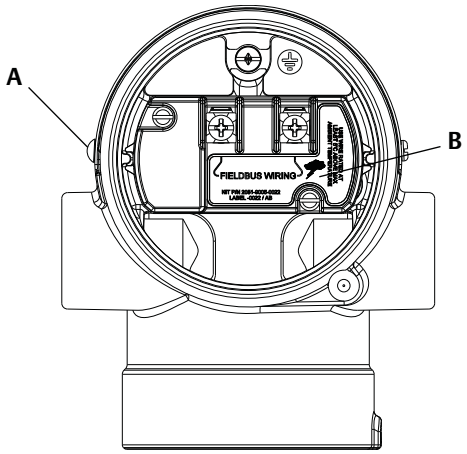
Note
Grounding the transmitter case via threaded conduit connection may not provide sufficient ground continuity.

Transient protection terminal block grounding

The transmitter can withstand electrical transients of the energy level usually encountered in static discharges or induced switching transients. However, high-energy transients, such as those induced in wiring from nearby lightning strikes, can damage the transmitter.

The transient protection terminal block can be ordered as an installed option (Option Code T1) or as a spare part to retrofit existing 2051 Transmitters in the field. See "Spare parts" on page 193 for part numbers. The lightning bolt symbol shown in Figure 4-7 on page 74 identifies the transient protection terminal block.

Figure 4-7. Transient Protection Terminal Block



A. External ground connection location
B. Lightning bolt location

Note
The transient protection terminal block does not provide transient protection unless the transmitter case is properly grounded. Use the guidelines to ground the transmitter case. Refer to Figure 4-7.

Section 5 Operation and Maintenance

5.1 Overview

⚠ CAUTION

Absolute pressure transmitters (2051CA and 2051TA) are calibrated at the factory. Trimming adjusts the position of the factory characterization curve. It is possible to degrade performance of the transmitter if any trim is done improperly or with inaccurate equipment.

This section contains information on operation and maintenance procedures.

Field Communicator and AMS® Device Manager instructions are given to perform configuration functions.

5.1.1 Methods and manual operation

Each FOUNDATION™ fieldbus host or configuration tool has different ways of displaying and performing operations. Some hosts will use Device Descriptions (DD) and DD Methods to complete device configuration and will display data consistently across platforms. The DD can be found on FOUNDATION's website at www.fieldbus.org. There is no requirement that a host or configuration tool support these features.

For DeltaV™ users, the DD can be found at www.easydeltav.com. The information in this section will describe how to use methods in a general fashion.

5.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

5.2.1 Warnings

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 2051 Reference Manual for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ WARNING

Performing a 'Restart with defaults' will set all function block information in the device to factory defaults. This includes the clearing of all function block links and schedule, as well as defaulting all Resource and Transducer Block user data (LCD display Transducer Block parameter configuration, etc.).

5.3 Calibration overview

⚠ CAUTION

The Rosemount 2051 Pressure Transmitter is an accurate instrument that is fully calibrated in the factory. Field calibration is provided to the user to meet plant requirements or industry standards.

Sensor calibration allows the user to adjust the pressure (digital value) reported by the transmitter to be equal to a pressure standard. The sensor calibration can adjust the pressure offset to correct for mounting conditions or line pressure effects. This correction is recommended. The calibration of the pressure range (pressure span or gain correction) is not recommended for new instruments.

Calibrate the sensor

- Sensor Trim ("Perform a calibration or sensor trim" on page 81)
- Zero Trim ("Perform a calibration or sensor trim" on page 81)

5.3.1 Determining necessary sensor trims

Bench calibration is not recommended for new instruments. It is possible to degrade the performance of the transmitter if a trim is done improperly or with inaccurate equipment. The transmitter can be set back to factory settings using the Recall Factory Trim command shown in Figure 5-3 on page 83.

For transmitters that are field installed, the manifolds discussed in "Rosemount 305, 306, and 304 Manifolds" on page 51 allow the differential transmitter to be zeroed using the zero trim function. Both 3-valve and 5-valve manifolds are discussed. This field calibration will eliminate any pressure offsets caused by mounting effects (head effect of the oil fill) and static pressure effects of the process.

Determine the necessary trims with the following steps.

1. Apply pressure.
2. Check the pressure, if the pressure does not match the applied pressure, perform a sensor trim. See "Perform a calibration or sensor trim" on page 81.

5.3.2 Determining calibration frequency

Calibration frequency can vary greatly depending on the application, performance requirements, and process conditions. Use the following procedure to determine calibration frequency that meets the needs of your application.

1. Determine the performance required for your application.
2. Determine the operating conditions.
3. Calculate the Total Probable Error (TPE).
4. Calculate the stability per month.
5. Calculate the calibration frequency.

Sample calculation for Rosemount 2051

Step 1: Determine the performance required for your application.

Required Performance: 0.30% of span

Step 2: Determine the operating conditions.

Transmitter:	Rosemount 2051CD, Range 2 [URL=250 inH_2O(623 mbar)]
Calibrated Span:	150 inH_2O (374 mbar)
Ambient Temperature Change:	± 50 °F (28 °C)
Line Pressure:	500 psig (34,5 bar)

Step 3: Calculate total probable error (TPE).

$$TPE = \sqrt{(ReferenceAccuracy)^2 + (TemperatureEffect)^2 + (StaticPressureEffect)^2} = 0.189\% \text{ of span}$$

Where:

Reference Accuracy = ± 0.065% of span

Ambient Temperature Effect = $\left(\frac{(0.025 \times URL)}{Span} + 0.125\right)$% per 50 °F = ±0.167% of span

Span Static Pressure Effect[(1)] =

0.1% reading per 1000 psi (69 bar) = ±0.05% of span at maximum span

(1) Zero static pressure effect removed by zero trimming at line pressure.

Step 4: Calculate the stability per month.

$$\text{Stability} = \pm\left[\frac{(0.100 \times \text{URL})}{\text{Span}}\right]\% \text{ of span for 2 years} = \pm 0.0069\% \text{ of URL for 1 month}$$

Step 5: Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.3\% - 0.189\%)}{0.0069\%} = 16 \text{ months}$$

Sample calculation for Rosemount 2051C with P8 option (0.05% accuracy & 5-year stability)

Step 1: Determine the performance required for your application.

Required Performance: 0.30% of span

Step 2: Determine the operating conditions.

Transmitter:	2051CD, Range 2 [URL=250 inH_2O(623 mbar)]
Calibrated Span:	150 inH_2O (374 mbar)
Ambient Temperature Change:	± 50 °F (28 °C)
Line Pressure:	500 psig (34,5 bar)

Step 3: Calculate total probable error (TPE).

$$\text{TPE} = \sqrt{(\text{ReferenceAccuracy})^2 + (\text{TemperatureEffect})^2 + (\text{StaticPressureEffect})^2} = 0.117\% \text{ of span}$$

Where:

Reference Accuracy = ± 0.05% of span

Ambient Temperature Effect =

$$\pm\left(\frac{0.025 \times \text{URL}}{\text{Span}} + 0.125\right) \text{per 50 °F} = \pm 0.0833\% \text{ of span}$$

Span Static Pressure Effect[(1)] =

0.1% reading per 1000 psi (69 bar) = ±0.05% of span at maximum span

(1) Zero static pressure effect removed by zero trimming at line pressure.

Step 4: Calculate the stability per month.

$$\text{Stability} = \pm\left[\frac{(0.125 \times \text{URL})}{\text{Span}}\right]\% \text{ of span for 5 years} = \pm 0.0035\% \text{ of span per month}$$

Step 5: Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.3\% - 0.117\%)}{0.0035\%} = 52 \text{months}$$

5.3.3 Compensating for span line pressure effects (range 4 and range 5)

Rosemount 2051 Range 4 and 5 Pressure Transmitters require a special calibration procedure when used in differential pressure applications. The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. The

Rosemount 2051 Differential Pressure Transmitters (ranges 1 through 3) do not require this procedure because optimization occurs at the sensor.

The systematic span shift caused by the application of static line pressure is -0.95% of reading per 1000psi (69 bar) for Range 4 transmitters, and -1% of reading per 1000psi (69 bar) for Range 5 transmitters. Using the following procedure, the span effect can be corrected to ±0.2% of reading per 1000 psi (69 bar) for line pressures from 0 to 3626 psi (0 to 250 bar).

Use the following example to compute correct input values.

Example

A range 4 differential pressure transmitter (Rosemount 2051CD4...) will be used in an application with a static line pressure of 1200 psi (83 bar). To correct for systematic error caused by high static line pressure, first use the following formulas to determine the corrected values for the high trim value.

High trim value

HT = (URV - (S/100 x P/1000 x LRV))

Where:	HT =	Corrected High Trim Value
	URV =	Upper Range Value
	S =	Span shift per specification (as a percent of reading)
	P =	Static Line Pressure in psi

In this example:

URV =	1500 inH_2O (3.74 bar)
S =	-0.95%
P =	1200 psi
LT =	1500 - (-0.95%/100 x 1200 psi/1000 psi x 1500 inH_2O)
LT =	1517.1 inH_20

Complete the Upper Sensor Trim procedure as described in "Perform a calibration or sensor trim" on page 81. In the example above, at step 4, apply the nominal pressure value of 1500 inH_20. However, enter the calculated correct upper Sensor Trim value of 1517.1 inH_20 with a Field Communicator.

Note
The Range Values for the 4 and 20 mA points should be at the nominal URV and LRV. In the example above, the values are 1500 inH_20 and 500 inH_20 respectively. Confirm the values on the HOME screen of the Field Communicator. Modify, if needed, by following the steps in "Rerange the transmitter" on page 15.

5.4 Trim the pressure signal

5.4.1 Sensor trim overview

A Sensor Trim corrects the pressure offset and pressure range to match a pressure standard. The upper Sensor Trim corrects the pressure range and the lower Sensor Trim (Zero Trim) corrects the pressure offset. An accurate pressure standard is required for full calibration. A zero trim can be performed if the process is vented, or the high and low side pressure are equal (for differential pressure transmitters).

Zero trim is a single-point offset adjustment. It is useful for compensating for mounting position effects and is most effective when performed with the transmitter installed in its final mounting position. Since this correction maintains the slope of the characterization curve, it should not be used in place of a Sensor Trim over the full sensor range.

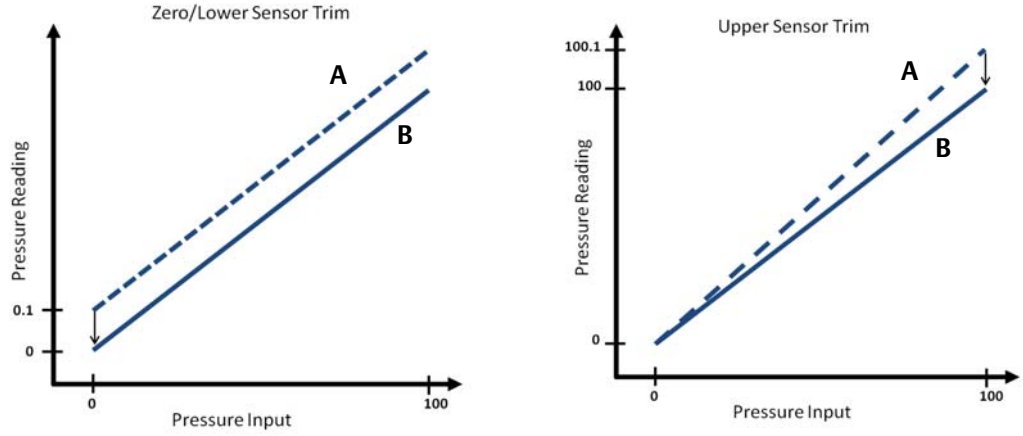
When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct levels. Line pressure should be applied to the transmitter during a zero trim to eliminate line pressure errors. Refer to "Integral manifold operation" on page 61.

Note
FOUNDATION fieldbus has no analog signal that needs ranging. Therefore, ranging a new device prior to installation is usually not necessary or recommended.

Note
Do not perform a zero trim on Rosemount 2051T Absolute Pressure Transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on a 2051T Absolute Pressure Transmitter, perform a low trim within the Sensor Trim function. The low trim function provides an offset correction similar to the zero trim function, but it does not require zero-based input.

Upper and lower sensor trim is a two-point sensor calibration where two end-point pressures are applied, all output is linearized between them, and requires an accurate pressure source. Always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The trim values help optimize performance over a specific measurement range.

Figure 5-1. Sensor Trim Example



A. Before Trim
B. After Trim

5.4.2 Perform a calibration or sensor trim

When performing a Sensor Trim, if both upper and lower trims are to be performed, the lower trim must be done prior to the upper trim.

Note
Use a pressure input source that is at least four times more accurate than the transmitter, and allow the input pressure to stabilize for 60 seconds before entering any values.

Performing a sensor trim

Note
Calibration and sensor trims are performed in the sensor transducer block. For block oriented user interfaces, perform calibrations and trims in the sensor transducer block.

Menu Navigation: <Overview>, <Calibration>, <Sensor Trim>

All sensor trims, and restoring factory calibration can be performed using the Overview and Service Tools branches of the menu tree. In addition, calibrations and trims can be documented with the information stored to an asset management system.

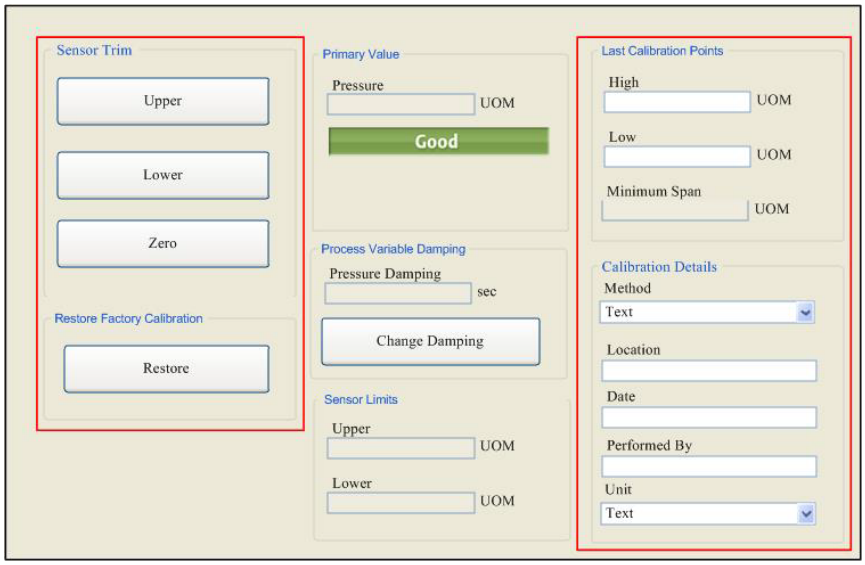
Navigate to the Sensor Trim screen and click on the button for the type of trim desired. An automated procedure called a ‘Method’ will guide the user through the desired trim procedure. The automated procedure for upper and lower sensor trims includes steps for documenting pressure, units, date, and name of person performing the trim and physical location where the trim was performed. This information can be entered or edited for full calibrations in “Last Calibration Points”, and “Calibration Details”.

Note
Generally only a zero trim should be performed. For high static pressure applications, a lower and upper trim can be performed.

Note
Refer to Section 5: Calibration overview through Section 5: Sensor trim overview for information on the various types of trims. Refer to "Rosemount 305, 306, and 304 Manifolds" on page 59 for manifold operation instructions to properly drain/vent valves.

Note
If both an upper and lower sensor trim are needed, perform the lower trim first.

Figure 5-2. Sensor Trim Screen



The “Sensor Trim” “Upper, Lower, Zero, and Restore” buttons start automated procedures called Methods which guide the user through the sequence of steps needed to perform the desired trim. “Upper and lower” trims require a pressure source. In addition, for “Upper, lower, and zero” trims the user will need to place manifold valves in the proper position to perform the trim, and return the manifold valves to the proper positions for normal operation. “Restore Factory Calibration” doesn’t require a pressure source or manipulation of manifold valves.

To calibrate the sensor using the Sensor Trim function, perform the following procedure:

1. Select **Lower Sensor Trim**.

Note
Select pressure points so that lower and upper values are equal to or outside the expected process operation range.

5.5 Status

Along with the measured or calculated PV value, every FOUNDATION fieldbus block passes an additional parameter called STATUS. The PV and STATUS are passed from the Transducer Block to the Analog Input Block. The STATUS can be one of the following: GOOD, BAD, or UNCERTAIN. When there are no problems detected by the self-diagnostics of the block, the STATUS will be GOOD. If a problem occurs with the hardware in the device, or, the quality of the process variable is compromised for some reason, the STATUS will become either BAD or UNCERTAIN depending upon the nature of the problem. It is important that the Control Strategy that makes use of the Analog Input Block is configured to monitor the STATUS and take action where appropriate when the STATUS is no longer GOOD.

5.6 Master reset method

5.6.1 Resource block

Menu Navigation: <Service Tools>, <Maintenance>, <Reset / Restore>

Note: Master Reset (sometimes called restart) is performed in the resource block. For block oriented user interfaces, perform the reset in the resource block.

There are two master reset options. One restarts the transmitter processor but doesn't change device configuration. The second is a restart with factory defaults. It returns all device and function block parameters to the factory defaults. An automated procedure called a “Method” will guide the user through both reset options.

Figure 5-3. Master Reset Button

The “Master Reset” button starts the method that initiates the reset and verifies the reset is complete. Note that during the reset communication between the device and the host will be lost. There may be some delay before the device is recognized again by the host.

Set the RESTART to one of the options below:

- Run - Default State
- Resource - Not Used
- Defaults - Sets all device parameters to FOUNDATION fieldbus default values
- Processor - Does a software reset of the CPU

5.7 Simulation

⚠ Simulate replaces the channel value coming from the Sensor Transducer Block. For testing purposes, it is possible to manually drive the output of the Analog Input Block to a desired value. There are two ways to do this.

5.7.1 Manual mode

To change only the OUT_VALUE and not the OUT_STATUS of the AI Block, place the TARGET MODE of the block to MANUAL. Then, change the OUT_VALUE to the desired value.

5.7.2 Simulate

1. If the SIMULATE switch is in the OFF position, move it to the ON position.
2. To change both the OUT_VALUE and OUT_STATUS of the AI Block, set the TARGET MODE to AUTO.
3. Set SIMULATE_ENABLE_DISABLE to ‘Active’.
4. Enter the desired SIMULATE_VALUE to change the OUT_VALUE and SIMULATE_STATUS_QUALITY to change the OUT_STATUS.
5. Set SIMULATE_ENABLE_DISABLE to 'Inactive' to return the AI block to normal operation.

Section 6 Troubleshooting

6.1 Overview

This section provides summarized troubleshooting suggestions for the most common operating problems. This section contains Rosemount 2051 fieldbus troubleshooting information only. Disassembly and reassembly procedures can be found in the "Disassembly procedures" on page 86 and "Reassembly procedures" on page 88.

Follow the procedures described here to verify transmitter hardware and process connections are in good working order. Always deal with the most likely checkpoints first.

Table 6-3 on page 93 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

If you suspect malfunction despite the absence of any diagnostic messages on the Field Communicator display, consider using "Troubleshooting guides" on page 91 to identify any potential problem.

6.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

6.2.1 Warnings

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 2051 Reference Manual for any restrictions associated with a safe installation.

- Before connecting a field communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ CAUTION

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

6.3 Disassembly procedures

⚠ Do not remove the instrument cover in explosive atmospheres when the circuit is live.

6.3.1 Removing from service

Follow these steps:

1. Follow all plant safety rules and procedures.
2. Power down device.
3. Isolate and vent the process from the transmitter before removing the transmitter from service.
4. Remove all electrical leads and disconnect conduit.
5. Remove the transmitter from the process connection.
   a. The Rosemount 2051C Transmitter is attached to the process connection by four bolts and two cap screws. Remove the bolts and screws and separate the transmitter from the process connection. Leave the process connection in place and ready for re-installation. Reference Figure 3-7 on page 54 for coplanar flange.

b. The Rosemount 2051T Transmitter is attached to the process by a single hex nut process connection. Loosen the hex nut to separate the transmitter from the process. Do not wrench on neck of transmitter. See warning in "Housing rotation" on page 58.

6. Do not scratch, puncture, or depress the isolating diaphragms.

7. Clean isolating diaphragms with a soft rag and a mild cleaning solution, and rinse with clear water.

8. For the 2051C, whenever you remove the process flange or flange adapters, visually inspect the PTFE O-rings. Replace the O-rings if they show any signs of damage, such as nicks or cuts. Undamaged O-rings may be reused.

6.3.2 Removing terminal block

Electrical connections are located on the terminal block in the compartment labeled "FIELD TERMINALS."

1. Remove the housing cover from the field terminal side.
   See "Safety messages" on page 85 for complete warning.

2. Loosen the two small screws located on the assembly in the 9 o'clock and 5 o'clock positions relative to the top of the transmitter.

3. Pull the entire terminal block out to remove it.

6.3.3 Removing electronics board

The transmitter electronics board is located in the compartment opposite the terminal side. To remove the electronics board see Figure 4-1 on page 68 and perform following procedure:

1. Remove the housing cover opposite the field terminal side.

2. If you are disassembling a transmitter with a LCD display, loosen the two captive screws that are visible (See Figure 4.3 LCD Display for screw locations). on the front of the meter display. The two screws anchor the LCD display to the electronics board and the electronics board to the housing.

Note
The electronics board is electrostatically sensitive; observe handling precautions for static-sensitive components

3. Using the two captive screws, slowly pull the electronics board out of the housing. The sensor module ribbon cable holds the electronics board to the housing. Disengage the ribbon cable by pushing the connector release.

Note
If an LCD display is installed, use caution as there is an electronic pin connector that interfaces between the LCD display and electronics board.

6.3.4 Removing sensor module from the electronics housing

1. Remove the electronics board. Refer to "Removing electronics board" on page 87.

Important
To prevent damage to the sensor module ribbon cable, disconnect it from the electronics board before you remove the sensor module from the electrical housing.

2. Carefully tuck the cable connector completely inside of the internal black cap.

Note
Do not remove the housing until after you tuck the cable connector completely inside of the internal black cap. The black cap protects the ribbon cable from damage that can occur when you rotate the housing.

3. Using a $^{5}/_{64}$-inch hex wrench, loosen the housing rotation set screw one full turn.

4. Unscrew the module from the housing, making sure the black cap on the sensor module and sensor cable do not catch on the housing.

6.4 Reassembly procedures

1. Inspect all cover and housing (non-process wetted) O-rings and replace if necessary. Lightly grease with silicone lubricant to ensure a good seal.

2. Carefully tuck the cable connector completely inside the internal black cap. To do so, turn the black cap and cable counterclockwise one rotation to tighten the cable.

3. Lower the electronics housing onto the module. Guide the internal black cap and cable on the sensor module through the housing and into the external black cap.

4. Turn the module clockwise into the housing.

Important
Make sure the sensor ribbon cable and internal black cap remain completely free of the housing as you rotate it. Damage can occur to the cable if the internal black cap and ribbon cable become hung up and rotate with the housing.

⚠ 5. Thread the housing completely onto the sensor module. The housing must be no more than one full turn from flush with the sensor module to comply with explosion proof requirements.

See "Safety messages" on page 85 for complete warning.

6. Tighten the housing rotation set screw to no more than 7 in-lbs when desired location is reached.

6.4.1 Attaching electronics board

1. Remove the cable connector from its position inside of the internal black cap and attach it to the electronics board.
2. Using the two captive screws as handles, insert the electronics board into the housing. Make sure the power posts from the electronics housing properly engage the receptacles on the electronics board. Do not force. The electronics board should slide gently on the connections.
3. Tighten the captive mounting screws.
4. Replace the housing cover. It is recommended the cover be tightened until there is no gap between the cover and the housing.

6.4.2 Installing terminal block

1. Gently slide the terminal block into place, making sure the two power posts from the electronics housing properly engage the receptacles on the terminal block.
2. Tighten the captive screws.
3. Replace the electronics housing cover. The transmitter covers must be fully engaged to meet Explosion-Proof requirements.

6.4.3 Reassembling the 2051C process flange

1. Inspect the sensor module PTFE O-rings. Undamaged O-rings may be reused. Replace O-rings that show any signs of damage, such as nicks, cuts, or general wear.

Note
If you are replacing the O-rings, be careful not to scratch the O-ring grooves or the surface of the isolating diaphragm when removing the damaged O-rings.

2. Install the process connection. Possible options include:
   a. Coplanar™ Process Flange:
      – Hold the process flange in place by installing the two alignment screws to finger tightness (screws are not pressure retaining). Do not over-tighten as this will affect module-to-flange alignment.
      – Install the four 1.75-in. flange bolts by finger tightening them to the flange.
   b. Coplanar Process Flange with Flange Adapters:
      – Hold the process flange in place by installing the two alignment screws to finger tightness (screws are not pressure retaining). Do not over-tighten as this will affect module-to-flange alignment.
      – Hold the flange adapters and adapter O-rings in place while installing (in the desired of the four possible process connection spacing configurations) using four 2.88-inch bolts to mount securely to the coplanar flange. For gage pressure configurations, use two 2.88-inch bolts and two 1.75-inch bolts
   c. Manifold:
      – Contact the manifold manufacturer for the appropriate bolts and procedures.

3. Tighten the bolts to the initial torque value using a crossed pattern. See Table 6-1 on page 90 for appropriate torque values.

4. Using same cross pattern, tighten bolts to final torque values seen in Table 6-1 on page 90.

Table 6-1. Bolt Installation Torque Values

Bolt material	Initial torque value	Final torque value
CS-ASTM-A445 Standard	300 in-lb. (34 N-m)	650 in-lb. (73 N-m)
316 SST—Option L4	150 in-lb. (17 N-m)	300 in-lb. (34 N-m)
ASTM-A-19 B7M—Option L5	300 in-lb. (34 N-m)	650 in-lb. (73 N-m)
ASTM-A-193 Class 2, Grade B8M—Option L8	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)

Note
If you replaced the PTFE sensor module O-rings, re-torque the flange bolts after installation to compensate for cold flow of the O-ring material.

Note
For Range 1 transmitters: after replacing O-rings and re-installing the process flange, expose the transmitter to a temperature of 185 °F (85 °C) for two hours. Then re-tighten the flange bolts in a cross pattern, and again expose the transmitter to a temperature of 185 °F (85 °C) for two hours before calibration.

⚠ See “Safety messages” on page 85 for complete warning.

6.4.4 Installing drain/vent valve

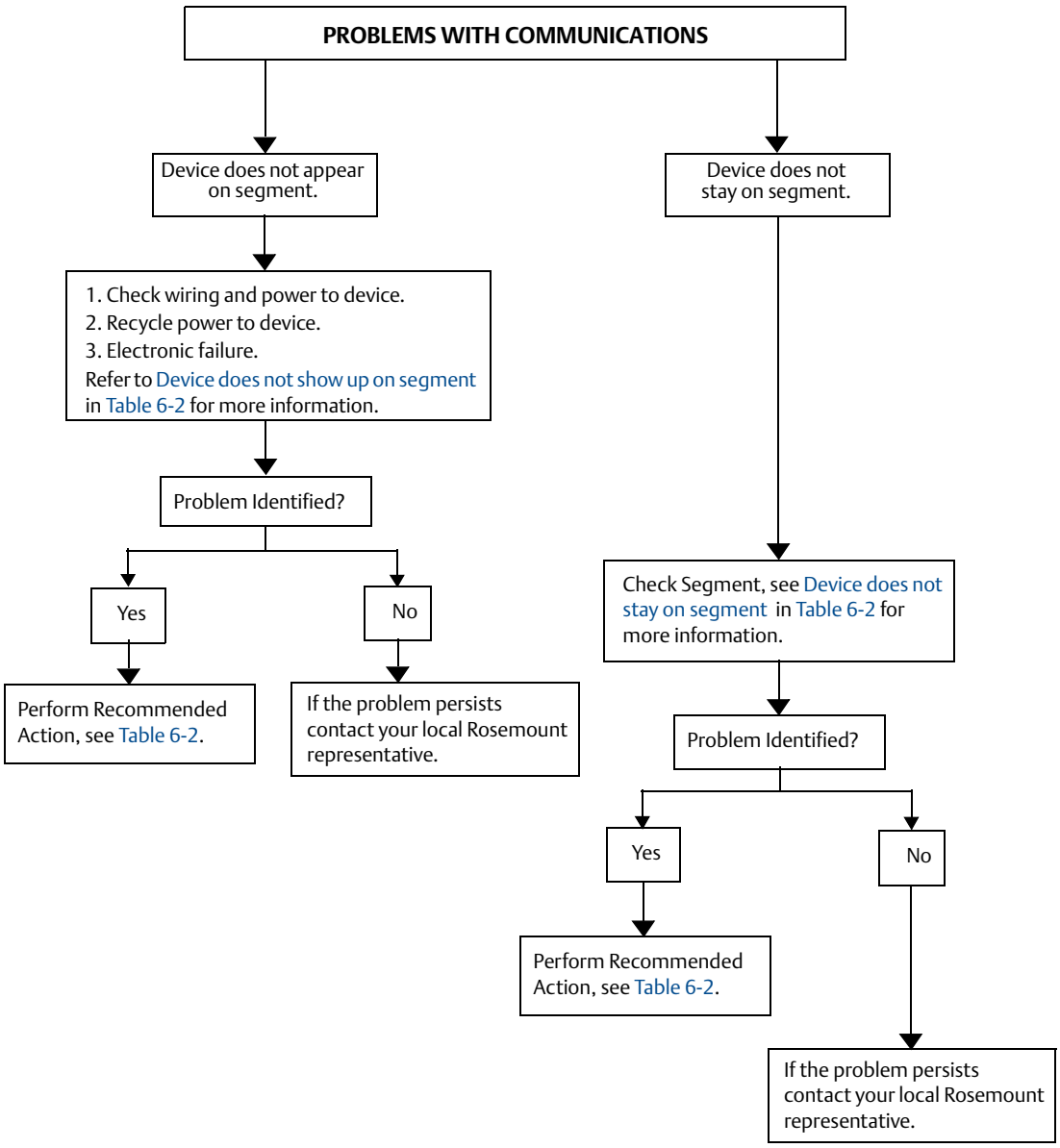
1. Apply sealing tape to the threads on the seat. Starting at the base of the valve with the threaded end pointing toward the installer, apply five clockwise turns of sealing tape.

2. Tighten the drain/vent valve to 250 in-lb. (28.25 N-m).

3. Take care to place the opening on the valve so that process fluid will drain toward the ground and away from human contact when the valve is opened.

6.5 Troubleshooting guides

Figure 6-1. Problems with Communications Flowchart



Note
Use this flowchart if other devices appear on the segment, communicate, and remain on the segment. If other devices don't appear on the segment, communicate, or stay on the segment the electrical characteristics of the segment should be checked.

Figure 6-2. Rosemount 2051 Troubleshooting Flowchart

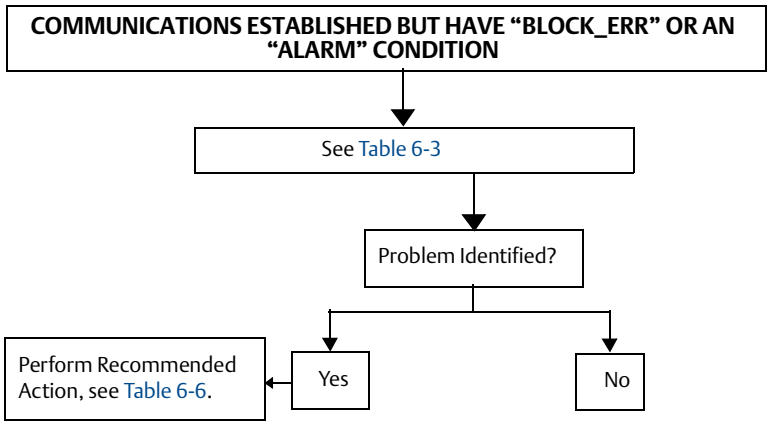


Table 6-2. Troubleshooting Guide

Symptom[1]	Cause	Recommended actions
Device does not show up on segment	Unknown	1. Recycle power to device.
	No power to device	1. Ensure the device is connected to the segment. 2. Check voltage at terminals. There should be 9–32Vdc. 3. Check to ensure the device is drawing current. There should be approximately 17 mA.
	Segment problems	N/A
	Electronics failing	1. Electronics board loose in housing. 2. Replace electronics.
	Incompatible network settings	1. Change host network parameters. 2. Refer to host documentation for procedure. 3. See "Capabilities" on page 14 for device network parameter values.
Device does not stay on segment[2]	Incorrect signal levels. Refer to host documentation for procedure.	1. Check for two terminators. 2. Excess cable length. 3. Bad Power supply or conditioner
	Excess noise on segment. Refer to host documentation for procedure.	1. Check for incorrect grounding. 2. Check for correct shielded wire. 3. Tighten all wiring and shield connections on the effected part of the segment. 4. Check for corrosion or moisture on terminals. 5. Check for bad power supply. 6. Check for electrically noisy equipment attached to the instrument ground.
	Electronics failing	1. Tighten electronics board. 2. Replace electronics.
	Other	1. Check for water in the terminal housing.

(1) The corrective actions should be done with consultation of your system integrator.
(2) Wiring and installation 31.25 kbit/s, voltage mode, wire medium application guide AG-140 available from the fieldbus Foundation.

6.6 Troubleshooting and diagnostic messages

Detailed tables of the possible messages that will appear on either the LCD display, a Field Communicator, or a PC based configuration and maintenance system are listed in the section below. Use the table below to diagnose particular status messages.

Table 6-3. Status Messages

NE107 Alert	Plant-Web® Alert	Diagnostic (alternate name)	Description	Recommended actions	Default configu-ration	LCD display message	Associated status bits
Failure	Failure	Incompatible Module	The pressure sensor is incompatible with the attached electronics.	1. Replace with electronics board or sensor module with compatible hardware.	Enabled	^^^^XMTR MSMTCH	0x10000000
Failure	Failure	Sensor Failure	An error has been detected in the pressure sensor.	1. Check the interface cable between the sensor module and the electronics board. 2. Replace the sensor module.	Enabled	^^^^FAIL SENSOR	0x20000000
Failure	Failure	Electronics Failure	A failure has occurred in the electronics board.	1. Replace with electronics board.	Enabled	^^^^FAIL ^BOARD	0x40000000
Offspec	Maintenance	Pressure Out of Limits	The process pressure is outside the transmitter's measurement range.	1. Verify the applied pressure is within the range of the pressure sensor. 2. Verify the manifold valves are in the proper position. 3. Check the transmitter pressure connection to verify it is not plugged or the isolating diaphragms are not damaged. 4. Replace the sensor module.	Enabled	PRES^OUT LIMITS	0x00100000
Offspec	Maintenance	Sensor Temperature Out of Limits	The sensor temperature is outside the transmitter's operating range.	1. Check the process and ambient temperature conditions are within -85 to 194 °F (-65 to 90 °C). 2. Replace the sensor module.	Enabled	TEMP^OUT LIMITS	0x00008000
Maintenance	Maintenance	Display Update Failure	The display is not receiving updates from the electronics board.	1. Check the connection between the display and the electronics board. 2. Replace the display. 3. Replace the electronics board.	Enabled	N/A	0x00000010
Maintenance	Maintenance	Alert Simulation Enabled	Alert simulation is enabled. The active alerts are simulated and any real alerts are suppressed.	1. To view real alerts, disable the alerts simulation.	Enabled	N/A	FD_SIMULATE .ENABLE 0x02
Function Check	Advisory	Function Check	The sensor transducer block mode is not in auto.	1. Check if any transducer block is currently under maintenance. 2. If no transducer block is under maintenance, then follow site procedures to change the affected transducer block's Actual Mode to Auto.	Enabled	N/A	0x00000001

6.7 Analog Input (AI) function block

This section describes error conditions that are supported by the AI Block. Read Table 6-5 to determine the appropriate corrective action.

Table 6-4. AI BLOCK_ERR Conditions

Condition number	Condition name and description
0	Other
1	**Block Configuration Error:** the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or CHANNEL = zero.
3	**Simulate Active:** Simulation is enabled and the block is using a simulated value in its execution.
7	**Input Failure/Process Variable has Bad Status:** The hardware is bad, or a bad status is being simulated.
14	**Power Up**
15	**Out of Service:** The actual mode is out of service.

Table 6-5. Troubleshooting the AI Block

Symptom	Possible causes	Recommended actions
Bad or no pressure readings (Read the AI "BLOCK_ERR" parameter)	BLOCK_ERR reads OUT OF SERVICE (OOS)	1. AI Block target mode target mode set to OOS. 2. Resource Block OUT OF SERVICE.
	BLOCK_ERR reads CONFIGURATION ERROR	1. Check CHANEL parameter (see "Analog input (AI) function block" on page 111) 2. Check L_TYPE parameter (see "Analog input (AI) function block" on page 111) 3. Check XD_SCALE engineering units. (see "Analog input (AI) function block" on page 111
	BLOCK_ERR reads POWERUP	1. Download schedule into block. Refer to host for downloading procedure.
	BLOCK_ERR reads BAD INPUT	1. Sensor Transducer Block Out Of Service (OOS) 2. Resource Block Out of Service (OOS)
	No BLOCK_ERR but readings are not correct. If using Indirect mode, scaling could be wrong.	1. Check XD_SCALE parameter. 2. Check OUT_SCALE parameter. (see "Analog input (AI) function block" on page 111)
	No BLOCK_ERR. Sensor needs to be calibrated or Zero trimmed.	1. See "Sensor trim overview" on page 80 to determine the appropriate trimming or calibration procedure.
OUT parameter status reads UNCERTAIN and substatus reads EngUnitRangViolation.	Out_ScaleEU_0 and EU_100 settings are incorrect.	1. See "Analog input (AI) function block" on page 111.

Table 6-6. Recommended Actions

Text string	FD_EXTENDED_ACTIVE_1
Not Initialized	None
No Action Required	No Active Conditions
1. Replace the Fieldbus Electronics Board.	Electronics Failure
1. Check the interface cable between the Sensor Module and the Fieldbus Electronics Board. 2. Replace the Sensor Module.	Sensor Failure
1. Replace the Fieldbus Electronics Board or Sensor Module with compatible hardware.	Incompatible Module

Table 6-6. Recommended Actions

Text string	FD_EXTENDED_ACTIVE_1
1. Check the transmitter pressure connection to make sure it is not plugged or isolating diaphragms are not damaged. 2. Replace the Sensor Module.	Pressure Out of Limits
1. Check the process and ambient temperature conditions are within -85 to 194F (-65 to 90C). 2. Replace the Sensor Module.	Sensor Temperature Out of Limits
1. Check LCD Display connection. 2. Replace the LCD Display. 3. Replace the Fieldbus Electronics Board.	Display Update Failure
1. Check to see if one of the transducer blocks is currently under maintenance. 2. If none of the transducer blocks are under maintenance, then follow site procedures to change the affected transducer block's Actual Mode to Auto.	Check Function
Simulate is Active - No Action Required	Simulation–No Active Conditions
Simulate is Active - 1. Replace the Fieldbus Electronics Board.	Simulating–Electronics Failure
Simulate is Active - 1. Check the interface cable between the Sensor Module and the Fieldbus Electronics Board. 2. Replace the Sensor Module.	Simulating–Sensor Failure
Simulate is Active - 1. Replace the Fieldbus Electronics Board or Sensor Module with compatible hardware.	Simulating–Incompatible Module
Simulate is Active - 1. Check the transmitter pressure connection to make sure it is not plugged or isolating diaphragms are not damaged. 2. Replace the Sensor Module.	Simulating–Pressure Out of Limits
Simulate is Active - 1. Check the process and ambient temperature conditions are within -85 to 194F (-65 to 90C). 2. Replace the Sensor Module.	Simulating–Sensor Temperature Out of Limits
Simulate is Active - 1. Check LCD Display connection. 2. Replace the LCD Display. 3. Replace the Fieldbus Electronics Board.	Simulating–Display Update Failure
Simulate is Active - 1. Check to see if one of the transducer blocks is currently under maintenance. 2. If none of the transducer blocks are under maintenance, then follow site procedures to change the affected transducer block's Actual Mode to Auto.	Simulating–Check Function

Appendix A Specifications and Reference Data

A.1 Resource block

This section contains information on the 2051 Resource Block. Descriptions of all Resource Block Parameters, errors, and diagnostics are included. The modes, alarm detection, status handling, and troubleshooting are also discussed.

A.1.1 Definition

The resource block defines the physical resources of the device. The resource block also handles functionality that is common across multiple blocks. The block has no linkable inputs or outputs.

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
ACK_OPTION (38)	0x0000: No option selected 0x0001: Auto ack write alarm 0x0080: Auto ack block alarm 0x0100: Auto ack fail alarm 0x0200: Auto ack off spec alarm 0x0400: Auto ack maint alarm 0x0800: Auto ack check alarm	0	Enumeration	Selection of which alarms associated with the resource block will be automatically acknowledged	O/S, Auto
ADVISE_ACTIVE (92)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_MAINT_ACTIVE & FD_CHECK_ACTIVE combined together This parameter is needed for backward compatibility with PlantWeb® Alerts.	Read-Only
ADVISE_ALM (81)	ADVISE_ALM.1 - UNACKNOWLEDGED; ADVISE_ALM.2 - ALARM_STATE; ADVISE_ALM.3 - TIME_STAMP; ADVISE_ALM.4 - SUB_CODE; ADVISE_ALM.5 - VALUE;	[None]	[None]	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.	Mixed

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
ADVISE_ENABLE (90)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x00000019	Enumeration	Read Only copy of FD_MAINT_MAP & FD_CHECK_MAP combined together This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
ADVISE_MASK (91)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_MAINT_MASK & FD_CHECK_MASK combined together This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
ADVISE_PRI (89)	0 to 15	0	[None]	Designates the alarming priority of the ADVISE_ALM	O/S, Auto
ALARM_SUM (37)	ALARM_SUM.1 - CURRENT; ALARM_SUM.2 - UNACKNOWLEDGED; ALARM_SUM.3 - UNREPORTED; ALARM_SUM.4 - DISABLED;		[None]	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block	Mixed
ALERT_KEY (4)	Can write any value from 1-255	0	[None]	The identification number of the plant unit	O/S, Auto
BLOCK_ALM (36)	BLOCK_ALM.1 - UNACKNOWLEDGED; BLOCK_ALM.2 - ALARM_STATE; BLOCK_ALM.3 - TIME_STAMP; BLOCK_ALM.4 - SUB_CODE; BLOCK_ALM.5 - VALUE;		[None]	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.	Mixed
BLOCK_ERR (6)	0x0000: No errors 0x0001: Other (LSB); 0x0008: Simulate Active; 0x0020: Device Fault State Set; 0x0040: Device Needs Maintenance Soon; 0x0200: Memory Failure; 0x0400: Lost Static Data; 0x0800: Lost NV Data; 0x2000: Device Needs Maintenance Now; 0x4000: Power-up; 0x8000: Out-of-Service (MSB);	0x0000	Enumeration	The error status associated with the hardware or software components associated with a block; it is a bit string, so that multiple errors may be shown	Read-Only
CLR_FSTATE (30)	0: Uninitialized; 1: Off (Normal operating)	1	Enumeration	Writing a Clear to this parameter will clear the device faultstate state if the field condition, if any, has cleared.	O/S, Auto
COMPATIBILITY_REV (67)	8	8	[None]	This parameter is used when replacing field devices. Specifies the minimum device revision number of the DD file that is compatible with this device	Read-Only
CONFIRM_TIME (33)	A 32-bit unsigned integer capable of holding values 0 to 4294967295	640000	1/32 msec	The minimum time between retries of alert reports	O/S, Auto
CYCLE_SEL (20)	0x0000: No selection 0x0001: Scheduled; 0x0002 Block Execution	0x0000	Enumeration	Cycle Selection - used to select the block execution method for this resource. The supported cycle types are: SCHEDULED, COMPLETION_OF_BLOCK_EXECUTION.	O/S, Auto
CYCLE_TYPE (19)	0x0001: Scheduled; 0x0002 Block Execution	0x0003	Enumeration	Identifies the block execution methods available for this resource “Scheduled” means block execution, is scheduled through system management “Block execution” means block execution is scheduled the completion of execution of another block	Read-Only

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
DD_RESOURCE (9)	ALL	32_spaces	[None]	String identifying the tag of the resource which contains the Device Description for the resource	Read-Only
DD_REV (13)	1	1	[None]	Revision of the DD associated with the resource - used by the interface device to locate the DD file for the resource	Read-Only
DEV_OPTIONS (72)	0x00000000: No options active 0x00000001: LCD display present 0x00000002: Statistical Process Monitoring	0	Enumeration	Indicates which device options are enabled. Some may be enabled in factory and are not available to the end user.	Read-Only
DEV_REV (12)	8	8	[None]	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource	Read-Only
DEV_STRING (7)	[None]	[None]	[None]	Factory use only. Users should not modify.	O/S, Auto
DEV_TYPE (1)	0x2051	0x2051	Enumeration	Manufacturer's model number associated with the resource - used by interface devices to locate the DD file for the resource	Read-Only
DEVICE_INFO (11)	Factory defined parameters for display only, not user modifiable	[None]	[None]	Used to group device specific informational parameters	Read-Only
DOWNLOAD_MODE (93)	[None]	1	Enumeration	Used by factory only	O/S
FAILED_ACTIVE (75)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_FAIL_ACTIVE This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
FAILED_ALM (84)	FAILED_ALM.1 - UNACKNOWLEDGED FAILED_ALM.2 - ALARM_STATE FAILED_ALM.3 - TIME_STAMP FAILED_ALM.4 - SUB_CODE FAILED_ALM.5 - VALUE	[None]	[None]	Alarm indicating a failure within a device which makes the device non-operational. Includes subfields: UNACKNOWLEDGED,ALARM_STATE,TIME_STAMP,SUB_CODE, VALUE	Mixed
FAILED_ENABLE (82)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x70000000	Enumeration	Read Only copy of FD_FAIL_MAP This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
FAILED_MASK (83)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_FAIL_MASK This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
FAILED_PRI (77)	0 (lowest) to 15 (highest) priority 0 = Field Diagnostics Enabled, PlantWeb Alerts Disabled 1-15 = PlantWeb Alerts Enable, Field Diagnostics Disabled	0	[None]	Designates the alarming priority of the FAILED_ALM. This parameter is also used to switch between PlantWeb alerts and Field Diagnostics functionality.	O/S, Auto
FAULT_STATE (28)	0: Uninitialized; 1: Clear (Normal operating)	1	Enumeration	Condition set by loss of communication to an output block, failure promoted to an output block or a physical contact - when faultstate condition is set, output function blocks will perform their FSTATE actions	Read-Only

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
FD_CHECK_ACTIVE (46)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	Read-Only
FD_CHECK_ALM (50)	FD_CHECK_ALM.1 - UNACKNOWLEDGED; FD_CHECK_ALM.2 - ALARM_STATE; FD_CHECK_ALM.3 - TIME_STAMP; FD_CHECK_ALM.4 - SUBCODE; FD_CHECK_ALM.5 - VALUE;	[None]	Enumeration	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.	Mixed
FD_CHECK_MAP	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x00000001	Enumeration	This parameter maps conditions to be detected as active for the CHECK alarm category. Each condition that can be detected has a corresponding bit defined in this map. If the bit is set, it indicates that the condition is in the CHECK category (and will set the same bit in FD_CHECK_ACTIVE if the condition occurs). Multiple bits can be set at the same time.	O/S, Auto
FD_CHECK_MASK (54)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	O/S, Auto
FD_CHECK_PRI (62)	0 to 15	0	[None]	This parameter allows the host system to specify the priority of this alarm category.	O/S, Auto
FD_EXTENDED_ ACTIVE_1 (65)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	A parameter to allow the user finer detail on conditions causing an active condition in the FD_*_ACTIVE parameters.This parameter will display all possible active conditions so there will always be 1 parameter that will display active conditions even if they are not mapped to the categories.	Read-Only
FD_EXTENDED_ MAP_1 (66)	Any bit values are allowed, they will be discarded. The parameter will always return and use 0x70108019 0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x70108019	Enumeration	A parameter to allow the user finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters.Any bit values are allowed, they will be discarded. The parameter will always return and use 0x70108019 to map each of the bits.	O/S, Auto
FD_FAIL_ACTIVE (43)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	Read-Only

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
FD_FAIL_ALM (55)	FD_FAIL_ALM.1 - UNACKNOWLEDGED; FD_FAIL_ALM.2 - ALARM_STATE; FD_FAIL_ALM.3 - TIME_STAMP; FD_FAIL_ALM.4 - SUBCODE; FD_FAIL_ALM.5 - VALUE;	[None]	Enumeration	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.	Mixed
FD_FAIL_MAP (47)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x70000000	Enumeration	This parameter maps conditions to be detected as active for the FAIL alarm category. Each condition that can be detected has a corresponding bit defined in this map. If the bit is set, it indicates that the condition is in the FAIL category (and will set the same bit in FD_FAIL_ACTIVE if the condition occurs). Multiple bits can be set at the same.	O/S, Auto
FD_FAIL_MASK (51)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	O/S, Auto
FD_FAIL_PRI (59)	0 to 15	0	[None]	This parameter allows the host system to specify the priority of this alarm category. Set using the control host FOUNDATION™ fieldbus interface.	O/S, Auto
FD_MAINT_ACTIVE (45)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	Read-Only
FD_MAINT_ALM (57)	FD_MAINT_ALM.1 - UNACKNOWLEDGED; FD_MAINT_ALM.2 - ALARM_STATE; FD_MAINT_ALM.3 - TIME_STAMP; FD_MAINT_ALM.4 - SUBCODE; FD_MAINT_ALM.5 - VALUE;	[None]	Enumeration	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.	Mixed
FD_MAINT_MAP (49)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x00000018	Enumeration	This parameter maps conditions to be detected as active for the MAINT alarm category. Each condition that can be detected has a corresponding bit defined in this map. If the bit is set, it indicates that the condition is in the MAINT category (and will set the same bit in FD_MAINT_ACTIVE if the condition occurs). Multiple bits can be set at the same time.	O/S, Auto
FD_MAINT_MASK (53)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	O/S, Auto
FD_MAINT_PRI (61)	0 to 15	0	[None]	This parameter allows the host system to specify the priority of this alarm category. Set using the control host FOUNDATION fieldbus interface.	O/S, Auto

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
FD_OFFSPEC_ACTIVE (44)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	Read-Only
FD_OFFSPEC_ALM (56)	FD_OFFSPEC_ALM.1 - UNACKNOWLEDGED; FD_OFFSPEC_ALM.2 - ALARM_STATE; FD_OFFSPEC_ALM.3 - TIME_STAMP; FD_OFFSPEC_ALM.4 - SUBCODE; FD_OFFSPEC_ALM.5 - VALUE;	[None]	Enumeration	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.	Mixed
FD_OFFSPEC_MAP (48)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x00108000	Enumeration	This parameter maps conditions to be detected as active for the OFFSPEC alarm category. Each condition that can be detected has a corresponding bit defined in this map. If the bit is set, it indicates that the condition is in the OFFSPEC category (and will set the same bit in FD_OFFSPEC_ACTIVE if the condition occurs). Multiple bits can be set at the same time.	O/S, Auto
FD_OFFSPEC_MASK (52)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	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.	O/S, Auto
FD_OFFSPEC_PRI (60)	0 to 15	0	[None]	This parameter allows the host system to specify the priority of this alarm category. Set using the control host FOUNDATION fieldbus interface.	O/S, Auto
FD_RECOMMEN_ACT (64)	See FD_RECOMMENDED_ACTION table.	1	Enumeration	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 manufacturer. Disabling or masking a device condition will not have an effect on the recommended actions.	Read-Only
FD_SIMULATE (63)	FD_SIMULATE.1 - DIAGNOSTIC_SIMULATE_VALUE; FD_SIMULATE.2 - DIAGNOSTIC_VALUE; FD_SIMULATE.3 - ENABLE;		[None]	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 physical simulate switch needs to be enabled to allow simulation to be activated in software. When simulation is enabled, the DIAGNOSTIC_SIMULATE_VALUE can be used to simulate the *_ACTIVE parameters. While simulation is enabled the recommended action will show that simulation is active.	O/S, Auto
FD_VER (42)	1	1	[None]	Reflects the value of the major version of Field Diagnostics specification to which the device was designed - this allows hosts to distinguish between changes that may be necessary to be made in such a recent specification.	Read-Only

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
FEATURE_SEL (18)	0x0000: No features selected 0x0001: Unicode strings; 0x0002: Reports supported; 0x0008: Soft Write Lock supported; 0x0010: Hard Write Lock supported; 0x0400: Multi-bit Alarm (bit-alarm) support; 0x0800: Restart/Relink required after using FB Action	0x0000	Enumeration	Used to select resource block options	O/S, Auto
FEATURES (17)	0x0001: Unicode strings; 0x0002: Reports supported; 0x0008: Soft Write Lock supported; 0x0010: Hard Write Lock supported; 0x0400: Multi-bit Alarm (bit-alarm) support; 0x0800: Restart/Relink required after using FB Action	0x0C1B	Enumeration	Used to show supported resource block options	Read-Only
FINAL_ASSY_NUM (74)	32 bit number	Set at factory; not modifiable	[None]	The same final assembly number placed on the neck label	O/S, Auto
FREE_SPACE (24)	0.0 to100.0 calculated by the device	33.3333	%	Percent of memory available for further configuration - Additional function blocks may be instantiated if value > 0.0%	Read-Only
FREE_TIME (25)	0.0 to100.0	Set to 0 to indicate parameter is not used.	%	Percent of the block processing time that is free to process additional blocks	Read-Only
GRANT_DENY (14)	Indexes for subparameters of GRANT_DENY: 1 - GRANT; 2 - DENY;	0	[None]	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block. See fieldbus specifications for sub-parameters.	O/S, Auto
HARD_TYPES (15)	0x0001 indicated the device contains at least one AI block.	0x0001	Enumeration	The types of hardware available as channel numbers	Read-Only
HARDWARE_ REVISION (68)	Set at factory	Set at factory; not modifiable	[None]	Hardware revision of that hardware	Read-Only
HEALTH_INDEX (76)	10, 30, 70, 90, 100	100	[None]	Represents the overall health of the device, 100 being perfect.The value will be set based on active field diagnostic conditions. Disabling or masking a device condition will not have an effect on the health index.	Read-Only
ITK_VER (41)	6	6	[None]	Major revision number of the interoperability test case used in certifying this device as interoperable - the format and range are controlled by the Fieldbus Foundation.	Read-Only
LIM_NOTIFY (32)	0 to 7	7	[None]	Maximum number of unconfirmed alert notify messages allowed	O/S, Auto
MAINT_ACTIVE (88)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_OFFSPEC_ACTIVE This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
MAINT_ALM (80)	MAINT_ALM.1 - UNACKNOWLEDGED; MAINT_ALM.2 - ALARM_STATE; MAINT_ALM.3 - TIME_STAMP; MAINT_ALM.4 - SUB_CODE; MAINT_ALM.5 - VALUE;	[None]	[None]	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.	Mixed

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
MAINT_ENABLE (86)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0x00108000	Enumeration	Read Only copy of FD_OFFSPEC_MAP This parameter is needed for backward compatibility with PlantWeb Alerts.	Read-Only
MAINT_MASK (87)	0x00000000: All bits cleared 0x00000001: Check Function 0x00000008: Variation Change Detected 0x00000010: Display Update Failure 0x00008000: Sensor Temperature Out of Limits 0x00100000: Pressure Out of Limits 0x10000000: Incompatible Module 0x20000000: Sensor Failure 0x40000000: Electronics Failure	0	Enumeration	Read Only copy of FD_OFFSPEC_MASK	Read-Only
MAINT_PRI (85)	0 to 15	0	[None]	Designates the alarming priority of the MAINT_ALM	O/S, Auto
MANUFAC_ID (10)	0x00001151:Rosemount	0x00001151	Enumeration	Manufacturer identification number - used by an interface device to locate the DD file for the resource	Read-Only
MAX_NOTIFY (31)	An 8-bit unsigned integer capable of holding values 0 to 255	7	[None]	Maximum number of unconfirmed alert notify messages possible	Read-Only
MEMORY_SIZE (22)	16 kilobytes	16	Kbytes	Available configuration memory in the empty resource - to be checked before attempting a download	Read-Only
MIN_CYCLE_T (21)	1760 = 55 msec	1760	1/32 msec	Minimum Cycle Time - the smallest macrocycle of time of which the device is capable.	Read-Only
MODE_BLK (5)	MODE_BLK.1 - TARGET; MODE_BLK.2 - ACTUAL; MODE_BLK.3 - PERMITTED; MODE_BLK.4 - NORMAL;		N/A	The actual, target, permitted, and normal modes of the block	Mixed
NV_CYCLE_T (23)	960000= 30 seconds	960000	1/32 msec	Minimum time interval 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 that have changed (as defined by the manufacturer) need to be updated in NVRAM.	Read-Only
OUTPUT_BOARD_SN (73)	Set at the factory	mfg_block	[None]	Output board serial number	Read-Only
PD_TAG (70)	Supported characters defined by FOUNDATION fieldbus specifications.	32_spaces	N/A	PD tag description of device	Read-Only
RECOMMENDED_ ACTION (78)	See FD_RECOMMENDED_ACTION.	1	Enumeration	Read-Only copy of FD_RECOMMEN_ACT	Read-Only
RESTART (16)	0: Uninitialized; 1: Run: is the passive state of the parameter; 2: Restart resource: to clear up problems like garbage collection; 3: Restart with defaults: to reset all configurable function block application objects to their initial value i.e. their value before any configuration was done by the user; 4: Restart processor: provides a way to hit the reset button on the processor associated with the resource; 5-10: Device specific: unused; 11: Restore Factory default blocks: restores default blocks i.e. manufacturer pre-instantiated blocks; 12: Reset transducer block Factory calibration: resets transducer block calibration to manufacturer settings (same as STB.FACTORY_CAL_RECALL)	1	Enumeration	Allows a manual restart to be initiated or allows values to be defaulted. The values 5-10 will not appear in the DD enumeration, because they are unused.When these values are written the only action that will happen is this parameter will set back to a value of 1.	O/S, Auto

Table A-1. Resource Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writable mode
RS_STATE (7)	0: Uninitialized; 1: StartRestart; 2: Initialization; 3: Online Linking; 4: Online; 5: Standby; 6: Failure	0	Enumeration	State of the function block application state machine	Read-Only
SET_FSTATE (29)	0: Uninitialized; 1: Off (Normal operating)	1	Enumeration	Allows the faultstate condition to be manually initiated by selecting Set	O/S, Auto
SHED_RCAS (26)	A 32-bit unsigned integer capable of holding values 0 to 4294967295	640000	1/32 msec	Time duration at which to give up on - computer writes to function block RCas locations	O/S, Auto
SHED_ROUT (27)	A 32-bit unsigned integer capable of holding values 0 to 4294967295	640000	1/32 msec	Time duration at which to give up on - computer writes to function block ROut locations	O/S, Auto
SOFTWARE_REV (69)	Denotes software build number and software build date	Read from the device	[None]	Software revision of source code that has resource block in it	Read-Only
ST_REV (1)	A 16-bit unsigned integer capable of holding values 0 to 65535	0		The revision level of the static data associated with the function block	Read-Only
STRATEGY (3)	A 16-bit unsigned integer capable of holding values 0 to 65535	0	[None]	The strategy field can be used to identify grouping of blocks	O/S, Auto
SWITCHES_STATE (94)	1: Disable 2: Enable	Read from the device	[None]	Shows the group of device specific informational parameters related to the state of security and simulate switchers	Read-Only
TAG_DESC (2)	A string of bytes that can contain any value, usually shown as pairs of hex characters	32_spaces	[None]	The user description of the intended application of the block	O/S, Auto
TEST_RW (8)	TEST_RW.1 - VALUE_1; TEST_RW.2 - VALUE_2; TEST_RW.3 - VALUE_3; TEST_RW.4 - VALUE_4; TEST_RW.5 - VALUE_5; TEST_RW.6 - VALUE_6; TEST_RW.7 - VALUE_7; TEST_RW.8 - VALUE_8; TEST_RW.9 - VALUE_9; TEST_RW.10 - VALUE_10; TEST_RW.11 - VALUE_11; TEST_RW.12 - VALUE_12; TEST_RW.13 - VALUE_13; TEST_RW.14 - VALUE_14; TEST_RW.15 - VALUE_15;		N/A	Read/write test parameter - used only for ITK conformance testing	O/S, Auto
UPDATE_EVT (35)	UPDATE_EVT.1 - UNACKNOWLEDGED; UPDATE_EVT.2 - UPDATE_STATE; UPDATE_EVT.3 - TIME_STAMP; UPDATE_EVT.4 - STATIC_REVISION; UPDATE_EVT.5 - RELATIVE_INDEX;		[None]	This alert is generated by any change to the static data - contains subfields: UNACKNOWLEDGED, UPDATE_STATE, TIME_STAMP, STATIC_REVISION, RELATIVE_INDEX	Mixed
WRITE_ALM (40)			[None]	This alert is generated if the write lock parameter is cleared - contains subfields: UNACKNOWLEDGED, ALARM_STATE, TIME_STAMP, SUB_CODE	Mixed
WRITE_LOCK (34)	0: Uninitialized; 1: Not Locked (Writes to Parameters are allowed); 2: Locked (Writes to Parameters are not allowed except to WRITE_LOCK)	1	Enumeration	If set to Locked, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.	O/S, Auto
WRITE_PRI (39)	0 to 15	0	[None]	Priority of the alarm generated by clearing the write lock	O/S, Auto

A.2 Sensor transducer block

The transducer block contains the actual measurement data, including a pressure and temperature reading. The transducer block includes information about sensor type, engineering units, linearization, reranging, temperature compensation, and diagnostics.

Table A-2. Sensor Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
ALERT_KEY (4)	Any value from 1-255	0	N/A	The identification number of the PlantUnit	O/S, Auto
BLOCK_ALM (8)	[None]	[None]	[None]	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.	Mixed
BLOCK_ERR (6)	0x0000:No errors 0x0001: Other (LSB) 0x8000: Out-of-Service	0x0000	Enumeration	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.	Read-Only
CAL_MIN_SPAN (19)	ALL	2.5	CU (Calibration units)	The minimum calibration span value allowed - This minimum span information is necessary to ensure that when calibration is done, the two calibrated points are not too close together.	Read-Only
CAL_POINT_HI (17)	ALL	250	CU (Calibration units)	The highest calibrated value	O/S, Man
CAL_POINT_LO (18)	ALL	0.0	CU (Calibration units)	The lowest calibrated value	O/S, Man
CAL_UNIT (21)	1130: Pascals 1132: Megapascals 1133: Kilopascals 1136: Hectopascals 1137: Bar 1138: Millibar 1139: torr @ 0C 1140: Atm 1141: Psi 1144: g/cm^2 1145: kg?cm^2 1146: in H_2O @ 60F 1147: in H_2O @ 4C 1148: in H_20 @ 68F 1150: mm H_20 @ 4C 1151: mm H_20 @ 68F 1152: ft H_20 @ 68F 1153: ft H_20 @ 4C 1154: ft H_20 @ 68F 1156: in Hg @ 0C 1158: mm Hg @ 0C 1724: inH_2O (60°F) 1735: cmH_2O (4°C) 1736: mH_2O (4°C) 1737: cmHg (0°C) 1738: psf 1739: mHg (0°C) 1750: ftH_2O (60°F) 1751: kg/m^2		Enumeration	The Device Description engineering units code index for the calibration values.	O/S, Man
CAL_VALUE (20)	CAL_VALUE.1 - STATUS; CAL_VALUE.2 - VALUE	[None]	[None]	The pressure value used for calibration in CAL_UNITS	Read-Only

Table A-2. Sensor Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
COLLECTION_ DIRECTORY (13)	0	0	[None]	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer block - Directory has a value of zero if only a single data collection exists	Read-Only
DRAIN_VENT_MTL (44)	0 to 255 2: 316 Stainless Steel; 3: Alloy C-276; 4: Alloy 400/K-500; 251: None; 252: Unknown; 253: Special	252	[None]	Indicates the type of material of which the drain vents on the flange are made	O/S
FACTORY_CAL_ RECALL (34)	1: No Recall (always read, but can't be written); 2: Recall	1	Enumeration	Recalls the sensor calibration set at the factory	O/S
FLANGE_MTL (38)	0 to 255 0: Carbon Steel; 2: 316 Stainless Steel; 3: Cast C-276; 4: Alloy 400/K-500; 24: K-500; 252: Unknown; 253: Special	252	Enumeration	Indicates the type of material of which the flange is made	O/S
FLANGE_TYPE (37)	0 to 255 12: Conventional (Traditional); 13: Coplanar; 14: Remote Seal; 15: Level; 3 in., 150 lb.; 16: Level; 4 in., 150 lb.; 17: Level; 3 in., 300 lb.; 18: Level; 4 in., 300 lb.; 19: Level; DN 80, PN 40; 20: Level; DN 100, PN 40; 21: Level; DN 100, PN 10/16; 22: Level; 2 in., 150 lb.; 23: Level; 2 in., 300 lb.; 24: Level; DN 50, PN 6; 25: Level; DN 50, PN 40; 44: 0.5 in NPTF; 45: DIN 16288G 1/2 A Male; 46: 0.25 in NPT; 243: 1.5" Tri-Clamp™; 244: 2" Tri-Clamp; 246: Varivent® Type F; 247: Varivent® Type N; 248: DIN 11851 DN 40; 249: DIN 11851 DN50; 252: Unknown; 253: Special	252	Enumeration	Indicates the type of flange that is attached to the device	O/S
MODE_BLK (5)	MODE_BLK.1 - TARGET; MODE_BLK.2 - ACTUAL; MODE_BLK.3 - PERMITTED; MODE_BLK.4 - NORMAL	5	N/A	The actual, target, permitted, and normal modes of the block	Mixed
MODULE_TYPE (35)	Values: 0: Standard Coplanar (C) 1: Standard Threaded (T) 252: Unknown	252	Enumeration	Indicates the type of sensor module	Read-Only
O_RING_MTL (43)	0 to 255 0: Undefined; 10: PTFE; 11: Viton; 12: Buna-N; 13: Ethyl-Prop; 36: PTFE Glass; 37: PTFE Graphite; 251: None; 252: Unknown; 253: Special	252	[None]	Indicates the type of material of which the flange O-rings are made	O/S
PRIMARY_VALUE (15)	PRIMARY_VALUE.1 - STATUS PRIMARY_VALUE.2- VALUE	[None]	PV range units	Measured value and status available to the function block	Read-Only
PRIMARY_VALUE_ DAMPING (45)	0.4 to 60.0	0.4	Sec.	Time constant of a single exponential filter for the PV, in seconds	O/S

Table A-2. Sensor Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
PRIMARY_VALUE_ RANGE (16)	PRIMARY_VALUE_RANGE.1 - EU_100; PRIMARY_VALUE_RANGE.2 - EU_0; PRIMARY_VALUE_RANGE.3 - UNITS_INDEX; 1130: Pascals 1132: Megapascals 1133: Kilopascals 1136: Hectopascals 1137: Bar 1138: Millibar 1139: torr @ 0C 1140: Atm 1141: Psi 1144: g/cm^2 1145: kg?cm^2 1146: in H_2O @ 60F 1147: in H_2O @ 4C 1148: in H_20 @ 68F 1150: mm H_20 @ 4C 1151: mm H_20 @ 68F 1152: ft H_20 @ 68F 1153: ft H_20 @ 4C 1154: ft H_20 @ 68F 1156: in Hg @ 0C 1158: mm Hg @ 0C 1724: inH_2O (60°F) 1735: cmH_2O (4°C) 1736: mH_2O (4°C) 1737: cmHg (0°C) 1738: psf 1739: mHg (0°C) 1750: ftH_2O (60°F) 1751: kg/m^2 PRIMARY_VALUE_RANGE.4 - DECIMAL	[None]	PVR	The high and low range limit values, engineering units code, and number of digits to the right of the decimal point to be used to display the final value	Read-Only
PRIMARY_VALUE_ TYPE (14)	107: differential pressure; 108: gauge pressure; 109: absolute pressure; 65535: other; Note: Can only write the same value as the current value	107, 108, or 109 depending on assembled sensor type	Enumeration	The type of measurement represented by the primary value - Can only write the same value as the current value	O/S
PV_GAUGE_SCALE (46)	[None]	[None]	[None]	Used to store the upper and lower scale gauge limits	O/S, Auto, Manual
REM_SEAL_FILL (42)	0 to 255 2: Silicone oil; 3: Syltherm 800; 4: Inert (Halocarbon™); 5: Glycerin and Water; 6: Propylene Glycol and Water; 7: Neobee M-20; 8: Syltherm XLT; 10: D.C. Silicone 704; 14: D.C. Silicone 200; 251: None; 252: Unknown; 253: Special;	252	[None]	Indicates the type of fill fluid used in the remote seals	O/S
REM_SEAL_ISO_ MTL (41)	0 to 255 2: 316L Stainless Steel 3: Alloy C-276 4: Alloy 400 5: Tantalum 9: Co-Cr-Ni 34: PTFE Coated 316L SST 240: Nickel 201 251: None 252: Unknown 253: Special	252	[None]	Indicates the type of material of which the remote seal isolators are made	O/S

Table A-2. Sensor Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
REM_SEAL_NUM (39)	0 to 255 0: Undefined; 1: One Seal; 2: Two Seals; 251: None; 252: Unknown; 253: Special;	252	Enumeration	Indicates the number of remote seals attached to the device	O/S
REM_SEAL_TYPE (40)	0 to 255 0: Undefined; 1: Reserved; 2: CTW; 3: EFW (Expanded Flange Seal); 4: PFW (Pancake); 5: RFW (Flanged Remote); 6: RTW (Threaded Remote); 7: SCW; 8: SSW; 9: High Temperature; 10: FFW Flanged Flush Surface; 11: UCW; 12: TSW; 251: None; 252: Unknown; 253: Special	252	[None]	Indicates the type of remote seals attached to the device	O/S
SECONDARY_ VALUE (32)	SECONDARY_VALUE.1 - STATUS; SECONDARY_VALUE.2 - VALUE	[None]	[None]	Secondary value, related to the sensor	Read-Only
SECONDARY_ VALUE_UNIT (33)	1001: Deg C 1002: Deg F	1001	Enumeration	Engineering units to be used with the SECONDARY_VALUE	Read-Only
SENSOR_CAL_ DATE (28)	ALL	0	[None]	The date of the last sensor calibration - This is intended to reflect the calibration of that part of the sensor that is usually wetted by the process.	O/S, Man
SENSOR_CAL_LOC (27)	ALL	32_spaces	[None]	The location of the last sensor calibration - This describes the physical location at which the calibration was performed.	O/S, Man
SENSOR_CAL_ METHOD (26)	0: Uninitialized 100: Volumetric; 101: Static Weigh; 102: Dynamic Weigh; 103: Factory Trim Standard Calibration; 104: User Trim Standard Calibration; 105: Factory Trim Special Calibration; 106: User Trim Special Calibration; 255: Other	0	Enumeration	The method of last sensor calibration - It could be one of the several standard calibration methods defined by ISO or some other method.	O/S, Man
SENSOR_CAL_TYPE (36)	Values: 0: Differential Pressure 1: Gauge Pressure 2: Absolute Pressure	0	Enumeration	The type of last sensor calibration	O/S, Man
SENSOR_CAL_ WHO (29)	ALL	32_spaces	[None]	The name of the person responsible for the last sensor calibration	O/S, Man
SENSOR_FILL_ FLUID (31)	0 to 255; 0: Undefined; 1: Silicone; 2: Inert; 3: Undefined; 7: Neobee; 251: None; 252: Unknown; 253: Special	252	Enumeration	Defines the type of fill fluid used in the sensor - For UI purposes only (no effect on device behavior)	Read-Only
SENSOR_ISOLATOR _MTL (30)	0 to 255; 0: Undefined; 2: 316 Stainless Steel; 3: Alloy C-276; 4: Alloy 400; 5: Tantalum; 15: Gold-Plated Alloy 400; 34: Gold-Plated 316L SST; 251: None; 252: Unknown; 253: Special	252	Enumeration	Defines the construction material for the isolating diaphragms - For UI purposes only (no effect on device behavior)	Read-Only

Table A-2. Sensor Transducer Block Parameters

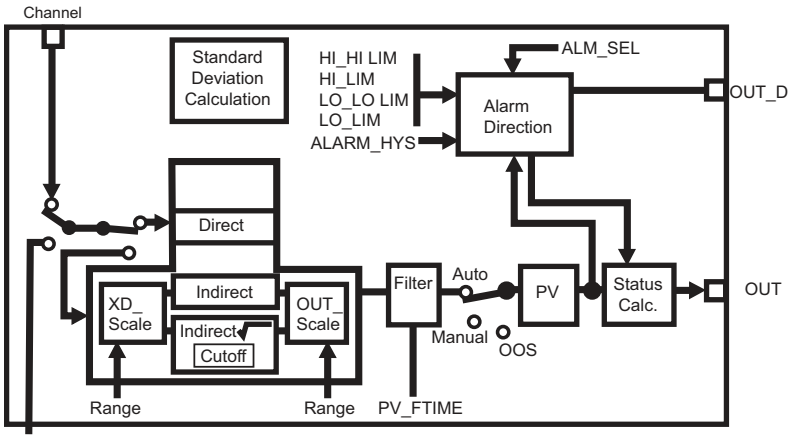
Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
SENSOR_RANGE (24)	SENSOR_RANGE.1 - EU_100; SENSOR_RANGE.2 - EU_0; SENSOR_RANGE.3 - UNITS_INDEX; 1130: Pascals 1132: Megapascals 1133: Kilopascals 1136: Hectopascals 1137: Bar 1138: Millibar 1139: torr @ 0C 1140: Atm 1141: Psi 1144: g/cm^2 1145: kg?cm^2 1146: in H_2O @ 60F 1147: in H_2O @ 4C 1148: in H_20 @ 68F 1150: mm H_20 @ 4C 1151: mm H_20 @ 68F 1152: ft H_20 @ 68F 1153: ft H_20 @ 4C 1154: ft H_20 @ 68F 1156: in Hg @ 0C 1158: mm Hg @ 0C 1724: inH_2O (60°F) 1735: cmH_2O (4°C) 1736: mH_2O (4°C) 1737: cmHg (0°C) 1738: psf 1739: mHg (0°C) 1750: ftH_2O (60°F) 1751: kg/m^2 SENSOR_RANGE.4 - DECIMAL;	[None]	SR	The high and low range limit values, engineering units code. and number of digits to the right of the decimal point for the sensor	Read-Only
SENSOR_SN (25)	ALL	“16777215”	[None]	The sensor serial number	Read-Only
SENSOR_TYPE (23)	117: Capacitive (DP sensor); 121: Pressure sensor unknown (for no sensor attached); 124 - Strain gauge (AP or GP sensor); Note: Can only write the same value as the current value	117, 124	Enumeration	The type of sensor connected with the transducer block - Can only write the same value as the current value	O/S
ST_REV (1)	A 16-bit unsigned integer capable of holding values 0 to 65535	0	N/A	The revision level of the static data associated with the function block	Read-Only
STRATEGY (3)	A 16-bit unsigned integer capable of holding values 0 to 65535	0	N/A	The strategy field can be used to identify grouping of blocks	O/S, Auto
TAG_DESC (2)	A string of bytes that can contain any value, usually shown as pairs of hex characters	32_spaces	N/A	The user description of the intended application of the block	O/S, Auto
TRANSDUCER_ DIRECTORY (9)	0	0	[None]	A directory that specifies the number and starting indicies of the transducers in the transducer block	Read-Only
TRANSDUCER_ TYPE (10)	100= standard pressure with calibration	100	Enumeration	Identifies the transducer that follows	Read-Only
TRANSDUCER_ TYPE_VER (11)	0x0201 02 = Revision of FF-903 01=Rosemount revision	0x0201	[None]	The version of the transducer identified by TRANSDUCER_TYPE in the form 0xAABB where AA is the major revision of the transducer specification on which the transducer is based, and BB is a revision number assigned and controlled by the manufacturer of the device.	Read-Only
UPDATE_EVT (7)	[None]	[None]	[None]	This alert is generated by any change to the static data. Contains subfield: UNACKNOWLEDGED, UPDATE_STATE, TIME_STAMP, STATIC_REVISION, RELATIVE_INDEX	Mixed
XD_ERROR (12)	0= No error 22= I/O failure	0	Enumeration	Provides additional error codes related to transducer blocks	Read-Only
XD_OPTS (22)	0x00000000: No bits set 0x00000001: Input Status Bad in Manual 0x00000002: Input Status Uncertain in Manual	0x00000000	Enumeration	Options the user may select to alter transducer behavior when the block is in manual mode.	O/S

A.3 Analog input (AI) function block

The Analog Input (AI) function block processes field device measurements and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The measuring device may have several measurements or derived values available in different channels. Use the channel number to define the variable that the AI block processes.

The AI block supports alarming, signal scaling, signal filtering, signal status calculation, mode control, and simulation. In Automatic mode, the block's output parameter (OUT) reflects the process variable (PV) value and status. In Manual mode, OUT may be set manually. The Manual mode is reflected on the output status. A discrete output (OUT_D) is provided to indicate whether a selected alarm condition is active. Alarm detection is based on the OUT value and user specified alarm limits. Figure A-1 illustrates the internal components of the AI function block, and Table A-3 lists the AI block parameters and their units of measure, descriptions, and index numbers.

Figure A-1. AI Block Internal Components



A.3.1 AI parameter table

Table A-3. Definitions of Analog Input Function Block System Parameters

Parameter	Available values	Units	Default	Read/write	Description
ACK_OPTION	0 = Auto Ack Disabled 1 = Auto Ack Enabled	None	0 all Disabled	Read and Write	Used to set auto acknowledgment of alarms
ALARM_HYS	0 – 50	Percent	0.5	Read and Write	The amount the alarm value must return within the alarm limit before the associated active alarm condition clears.
ALARM_SEL	HI_HI, HI, LO, LO_LO	None	Non selected	Read and Write	Used to select the process alarm conditions that will cause the OUT_D parameter to be set.
ALARM_SUM	Enable/Disable	None	Enable	Read and Write	The summary alarm is used for all process alarms 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 parameter. 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.

Table A-3. Definitions of Analog Input Function Block System Parameters

Parameter	Available values	Units	Default	Read/write	Description
ALERT_KEY	1 – 255	None	0	Read and Write	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
BLOCK_ALM	N/A	None	N/A	Read-Only	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 parameter. 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.
BLOCK_ERR	N/A	None	N/A	Read-Only	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
CAP_STDDEV	> = 0	Seconds	0	Read and Write	The time over which the VAR_INDEX is evaluated.
CHANNEL	1 = Pressure 2 = Housing temperature	None	AI[1]: Channel = 1 AI2: Channel = 2	Read and Write	The CHANNEL value is used to select the measurement value. Refer to the appropriate device manual for information about the specific channels available in each device. You must configure the CHANNEL parameter before you can configure the XD_SCALE parameter.
FIELD_VAL	0 – 100	Percent	N/A	Read-Only	The value and status from the transducer block or from the simulated input when simulation is enabled.
GRANT_DENY	Program Tune Alarm Local	None	N/A	Read and Write	Normally the operator has permission to write to parameter values, but Program or Local remove that permission and give it to the host controller or a local control panel.
HI_ALM	N/A	None	N/A	Read-Only	The HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_ALM	N/A	None	N/A	Read-Only	The HI HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_LIM	Out_Scale[2]	Out_Scale[2]	N/A	Read and Write	The setting for the alarm limit used to detect the HI HI alarm condition.
HI_HI_PRI	0 – 15	None	1	Read and Write	The priority of the HI HI alarm.
HI_LIM	Out_Scale[2]	Out_Scale[2]	N/A	Read and Write	The setting for the alarm limit used to detect the HI alarm condition.
HI_PRI	0 – 15	None	1	Read and Write	The priority of the HI alarm.
IO_OPTS	Low Cutoff Enable/Disable	None	Disable	Read and Write	Allows the selection of input/output options used to alter the PV. Low cutoff enabled is the only selectable option.
L_TYPE	Direct Indirect Indirect Square Root	None	Direct	Read and Write	Linearization type. Determines whether the field value is used directly (Direct), is converted linearly (Indirect), or is converted with the square root (Indirect Square Root).
LO_ALM	N/A	None	N/A	Read-Only	The LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LIM	Out_Scale[2]	Out_Scale[2]	N/A	Read and Write	The setting for the alarm limit used to detect the LO alarm condition.
LO_LO_ALM	N/A	None	N/A	Read-Only	The LO LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LO_LIM	Out_Scale[2]	Out_Scale[2]	N/A	Read and Write	The setting for the alarm limit used to detect the LO LO alarm condition.
LO_LO_PRI	0 – 15	None	1	Read and Write	The priority of the LO LO alarm.

Table A-3. Definitions of Analog Input Function Block System Parameters

Parameter	Available values	Units	Default	Read/write	Description
LO_PRI	0 – 15	None	1	Read and Write	The priority of the LO alarm.
LOW_CUT	> = 0	Out_Scale(2)	0	Read and Write	If percentage value of transducer input fails below this, PV = 0.
MODE_BLK	Auto Manual Out of Service	None	N/A	Read and Write	The actual, target, permitted, and normal modes of the block. Target: The mode to "go to" Actual: The mode the "block is currently in" Permitted: Allowed modes that target may take on Normal: Most common mode for target
OUT	Out_Scale(2) ± 10%	Out_Scale(2)	N/A	Read and Write	The block output value and status.
OUT_D	Discrete_State 1 – 16	None	Disabled	Read and Write	Discrete output to indicate a selected alarm condition.
OUT_SCALE	Any output range	All available	none	Read and Write	The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with OUT.
PV	N/A	Out_Scale(2)	N/A	Read-Only	The process variable used in block execution.
PV_FTIME	> = 0	Seconds	0	Read and Write	The time constant of the first-order PV filter. It is the time required for a 63% change in the IN value.
SIMULATE	N/A	None	Disable	Read and Write	A group of data that contains the current transducer value and status, the simulated transducer value and status, and the enable/disable bit.
ST_REV	N/A	None	0	Read-Only	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
STATUS_OPTS	Propagate fault forward Uncertain if Limited Bad if Limited Uncertain if Man Mode		0	Read and Write	
STDDEV	0 – 100	Percent	0	Read and Write	The average absolute error between the PV and its previous mean value over that evaluation time defined by VAR_SCAN.
STRATEGY	0 – 65535	None	0	Read and Write	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
TAG_DESC	32 text characters	None	none	Read and Write	The user description of the intended application of the block.
UPDATE_EVT	N/A	None	N/A	Read-Only	This alert is generated by any change to the static data.

Table A-3. Definitions of Analog Input Function Block System Parameters

Parameter	Available values	Units	Default	Read/write	Description
XD_SCALE	Any sensor range	1130: Pascals 1132: Megapascals 1133: Kilopascals 1136: Hectopascals 1137: Bar 1138: Millibar 1139: torr @ 0C 1140: Atm 1141: Psi 1144: g/cm^2 1145: kg/cm^2 1146: in H_2O @ 60F 1147: in H_20 @ 4C 1148: in H_2O @ 68F 1150: mm H_2O @ 4C 1151: mm H_2O @ 68F 1152: ft H_2O @ 60F 1153: ft H_2O @ 4C 1154: ft H_2O @ 68F 1156: in Hg @ 0C 1158: mm Hg @ 0C 1724: inH_2O (60°F) 1735: cmH_2O (4°C) 1736: mH_2O (4°C) 1737: cmHg (0°C) 1738: psf	AI1[(1)]: Customer specification or inH_2O (68 °F) for DP/GP rng 1, 2, 3) or psi for DP/GP rng 4, 5 AP/2051T all rng AI2 deg C		In all Rosemount devices the units of the transducer block is forced to match the unit code.

(1) The host system may write over default values pre-configured by Rosemount Inc.
(2) Assume that when L_Type = Direct, the user configures Out_Scale which is equal to XD_Scale

A.4 LCD display transducer block

Table A-4. LCD Display Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
BLK_TAG_1 (16)	ALL	32_spaces	[None]	The tag of the block containing Advanced Config Display Parameter (DP) slot #1. Block Tag -- a string of 1-32 characters that uniquely identifies each block. BLK_TAG_1 value should match existing block tag in the device and any other values will cause error. The combination of the BLK_TAG_1 and PARAM_INDEX_1 are used to uniquely identify the specific parameter in the device that will be displayed.	O/S, Auto
BLK_TAG_2 (22)	ALL	32_spaces	[None]	The tag of the block containing Advanced Config Display Parameter (DP) slot #2. Block Tag -- a string of 1-32 characters that uniquely identifies each block. BLK_TAG_2 value should match existing block tag in the device and any other values will cause error. The combination of the BLK_TAG_2 and PARAM_INDEX_2 are used to uniquely identify the specific parameter in the device that will be displayed.	O/S, Auto
BLK_TAG_3 (28)	ALL	32_spaces	[None]	The tag of the block containing Advanced Config Display Parameter (DP) slot #3. Block Tag -- a string of 1-32 characters that uniquely identifies each block. BLK_TAG_3 value should match existing block tag in the device and any other values will cause error. The combination of the BLK_TAG_3 and PARAM_INDEX_3 are used to uniquely identify the specific parameter in the device that will be displayed.	O/S, Auto
BLK_TAG_4 (34)	ALL	32_spaces	[None]	The tag of the block containing Advanced Config Display Parameter (DP) slot #4. Block Tag -- a string of 1-32 characters that uniquely identifies each block. BLK_TAG_4 value should match existing block tag in the device and any other values will cause error.The combination of the BLK_TAG_4 and PARAM_INDEX_4 are used to uniquely identify the specific parameter in the device that will be displayed.	O/S, Auto
BLK_TYPE_1 (15)	0x0000: Uninitialized 0x0101: AI Block 0x0108: PID Block 0x011D: Signal Characterizer Block 0x0120: Integrator Block 0x0126: Input Selector Block 0x0127: Arithmetic Block 0x010A: Control Selector 0x011C: Output Splitter	0x0000	Enumeration	Specifies the enumerated block type from which the Advanced Config - Display Parameter 1 (DP1) will read its displayed value from. The value of BLK_TYPE_1 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_1 to only those that are valid for the type of block selected.	O/S, Auto
BLK_TYPE_2 (21)	ALL	2.5	Enumeration	Specifies the enumerated block type from which the Advanced Config - Display Parameter 2 (DP2) will read its displayed value from. The value of BLK_TYPE_2 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_2 to only those that are valid for the type of block selected.	O/S, Auto
BLK_TYPE_3 (27)	ALL	2.5	Enumeration	Specifies the enumerated block type from which the Advanced Config - Display Parameter 3 (DP3) will read its displayed value from. The value of BLK_TYPE_3 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_3 to only those that are valid for the type of block selected.	O/S, Auto
BLK_TYPE_4 (33)	ALL	2.5	Enumeration	Specifies the enumerated block type from which the Advanced Config - Display Parameter 4 (DP4) will read its displayed value from. The value of BLK_TYPE_4 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_4 to only those that are valid for the type of block selected.	O/S, Auto

Table A-4. LCD Display Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
BLOCK_ALM (8)	ALL	2.5	[None]	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.	Mixed
COLLECTION_DIRECTORY (13)	0	0	[None]	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer block. Directory has a value of zero if only a single data collection exists.	Read-Only
CUSTOM_TAG_1 (18)	ALL	PARAM1	[None]	The block description displayed for DP1 (See DISPLAY_PARAM_SEL)	O/S, Auto
CUSTOM_TAG_2 (24)	ALL	PARAM2	[None]	The block description displayed for Advanced Config Display Parameter (DP) slot #2 (See DISPLAY_PARAM_SEL)	O/S, Auto
CUSTOM_TAG_3 (30)	ALL	PARAM3	[None]	The block description displayed for Advanced Config Display Parameter (DP) slot #3 (See DISPLAY_PARAM_SEL)	O/S, Auto
CUSTOM_TAG_4 (36)	ALL	PARAM4	[None]	The block description displayed for Advanced Config Display Parameter (DP) slot #4 (See DISPLAY_PARAM_SEL)	O/S, Auto
CUSTOM_UNITS_1 (20)	ALL	5_spaces	[None]	User entered units displayed when UNITS_TYPE_1 are set to Custom	O/S, Auto
CUSTOM_UNITS_2 (26)	ALL	5_spaces	[None]	User entered units that are displayed when UNITS_TYPE_2 are set to Custom	O/S, Auto
CUSTOM_UNITS_3 (32)	ALL	5_spaces	[None]	User entered units that are displayed when UNITS_TYPE_3 are set to Custom	O/S, Auto
CUSTOM_UNITS_4 (38)	ALL	5_spaces	[None]	User entered units that are displayed when UNITS_TYPE_4 are set to Custom	O/S, Auto
DISPLAY_PARAM_SEL (14)	0x0001: Basic config - Pressure (sensor tblk PRIMARY_VALUE) 0x0002: Basic config - Sensor Temperature (sensor tblk SECONDARY_VALUE) 0x0004: Basic config - Pressure percent of range (% AI.OUT) 0x0008: Basic config - Pressure scaled (AI.OUT) 0x0100: Advanced config - DP1 0x0200: Advanced config - DP2 0x0400: Advanced config - DP3 0x0800: Advanced config - DP4	0x0001	Enumeration	"Basic" configuration involves specifying an internal value that the user wants displayed (pressure, sensor temp, % of AI.OUT, AI.OUT). "Advanced" configuration involves specifying parameters from function blocks for display. DP1 is Display Parameter 1.	O/S, Auto

Table A-4. LCD Display Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
PARAM_INDEX_1 (17)	0: Not Initialized 7: AI.PV, PID.PV, CHAR.OUT_1, ARITH.PV, OSPL.SP, ISEL.OUT, CSEL.OUT 8: AI.OUT, PID.SP, CHAR.OUT_2, ARITH.OUT, OSPL.OUT_1, INTG.OUT 9: PID.OUT, ARITH.PRE_OUT, OSPL.OUT_2 11: ISEL.IN_1, CSEL.SEL_1 12: ISEL.IN_2, CHAR.IN_1, INTG.IN_1, CSEL.SEL_2 13: ISEL.IN_3, CHAR.IN_2, INTG.IN_2, CSEL.SEL_3 14: ISEL.IN_4, ARITH.IN, OSPL.CAS_IN 15: PID.IN, ARITH.IN_LO, OSPL.BKCAL_OUT, CSEL.BKCAL_IN 16: ARITH.IN_1 17: ARITH.IN_2 18: PID.CAS_IN, ARITH.IN_3, CSEL.BKCAL_SEL_1 19: AI.FIELD_VAL, OSPL.BKCAL_IN_1, CSEL.BKCAL_SEL_2 20: OSPL.BKCAL_IN_2, CSEL.BKCAL_SEL_3 25: ISEL.IN_5 26: ISEL.IN_6 27: PID.BKCAL_IN, ISEL.IN_7 28: ISEL.IN_8 31: PID.BKCAL_OUT 32: PID.RCAS_IN 33: PID.ROUT_IN 35: PID.RCAS_OUT 36: PID.ROUT_OUT 39: PID.TRK_VAL 40: PID.FF_VAL	0	Enumeration	The parameter for Advanced Config Display Parameter (DP) slot #1. Each value corresponds to parameter selected by BLK_TAG_1 block to be displayed.The value of BLK_TYPE_1 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_1 to only those that are valid for the type of block selected. The combination of block type, block tag, and parameter index are used to determine the parameter to display on the LCD display.	O/S, Auto
PARAM_INDEX_2 (23)	0: Not Initialized 7: AI.PV, PID.PV, CHAR.OUT_1, ARITH.PV, OSPL.SP, ISEL.OUT, CSEL.OUT 8: AI.OUT, PID.SP, CHAR.OUT_2, ARITH.OUT, OSPL.OUT_1, INTG.OUT 9: PID.OUT, ARITH.PRE_OUT, OSPL.OUT_2 11: ISEL.IN_1, CSEL.SEL_1 12: ISEL.IN_2, CHAR.IN_1, INTG.IN_1, CSEL.SEL_2 13: ISEL.IN_3, CHAR.IN_2, INTG.IN_2, CSEL.SEL_3 14: ISEL.IN_4, ARITH.IN, OSPL.CAS_IN 15: PID.IN, ARITH.IN_LO, OSPL.BKCAL_OUT, CSEL.BKCAL_IN 16: ARITH.IN_1 17: ARITH.IN_2 18: PID.CAS_IN, ARITH.IN_3, CSEL.BKCAL_SEL_1 19: AI.FIELD_VAL, OSPL.BKCAL_IN_1, CSEL.BKCAL_SEL_2 20: OSPL.BKCAL_IN_2, CSEL.BKCAL_SEL_3 25: ISEL.IN_5 26: ISEL.IN_6 27: PID.BKCAL_IN, ISEL.IN_7 28: ISEL.IN_8 31: PID.BKCAL_OUT 32: PID.RCAS_IN 33: PID.ROUT_IN 35: PID.RCAS_OUT 36: PID.ROUT_OUT 39: PID.TRK_VAL 40: PID.FF_VAL	PARAM1	Enumeration	The parameter for Advanced Config Display Parameter (DP) slot #2. Each value corresponds to parameter selected by BLK_TAG_2 block to be displayed.The value of BLK_TYPE_2 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_2 to only those that are valid for the type of block selected. The combination of block type, block tag, and parameter index are used to determine the parameter to display on the LCD display.	O/S, Auto

Table A-4. LCD Display Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
PARAM_INDEX_3 (29)	0: Not Initialized 7: AI.PV, PID.PV, CHAR.OUT_1, ARITH.PV, OSPL.SP, ISEL.OUT, CSEL.OUT 8: AI.OUT, PID.SP, CHAR.OUT_2, ARITH.OUT, OSPL.OUT_1, INTG.OUT 9: PID.OUT, ARITH.PRE_OUT, OSPL.OUT_2 11: ISEL.IN_1, CSEL.SEL_1 12: ISEL.IN_2, CHAR.IN_1, INTG.IN_1, CSEL.SEL_2 13: ISEL.IN_3, CHAR.IN_2, INTG.IN_2, CSEL.SEL_3 14: ISEL.IN_4, ARITH.IN, OSPL.CAS_IN 15: PID.IN, ARITH.IN_LO, OSPL.BKCAL_OUT, CSEL.BKCAL_IN 16: ARITH.IN_1 17: ARITH.IN_2 18: PID.CAS_IN, ARITH.IN_3, CSEL.BKCAL_SEL_1 19: AI.FIELD_VAL, OSPL.BKCAL_IN_1, CSEL.BKCAL_SEL_2 20: OSPL.BKCAL_IN_2, CSEL.BKCAL_SEL_3 25: ISEL.IN_5 26: ISEL.IN_6 27: PID.BKCAL_IN, ISEL.IN_7 28: ISEL.IN_8 31: PID.BKCAL_OUT 32: PID.RCAS_IN 33: PID.ROUT_IN 35: PID.RCAS_OUT 36: PID.ROUT_OUT 39: PID.TRK_VAL 40: PID.FF_VAL	PARAM1	Enumeration	The parameter for Advanced Config Display Parameter (DP) slot #3. Each value corresponds to parameter selected by BLK_TAG_3 block to be displayed.The value of BLK_TYPE_3 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_3 to only those that are valid for the type of block selected. The combination of block type, block tag, and parameter index are used to determine the parameter to display on the LCD display.	O/S, Auto
PARAM_INDEX_4 (35)	0: Not Initialized 7: AI.PV, PID.PV, CHAR.OUT_1, ARITH.PV, OSPL.SP, ISEL.OUT, CSEL.OUT 8: AI.OUT, PID.SP, CHAR.OUT_2, ARITH.OUT, OSPL.OUT_1, INTG.OUT 9: PID.OUT, ARITH.PRE_OUT, OSPL.OUT_2 11: ISEL.IN_1, CSEL.SEL_1 12: ISEL.IN_2, CHAR.IN_1, INTG.IN_1, CSEL.SEL_2 13: ISEL.IN_3, CHAR.IN_2, INTG.IN_2, CSEL.SEL_3 14: ISEL.IN_4, ARITH.IN, OSPL.CAS_IN 15: PID.IN, ARITH.IN_LO, OSPL.BKCAL_OUT, CSEL.BKCAL_IN 16: ARITH.IN_1 17: ARITH.IN_2 18: PID.CAS_IN, ARITH.IN_3, CSEL.BKCAL_SEL_1 19: AI.FIELD_VAL, OSPL.BKCAL_IN_1, CSEL.BKCAL_SEL_2 20: OSPL.BKCAL_IN_2, CSEL.BKCAL_SEL_3 25: ISEL.IN_5 26: ISEL.IN_6 27: PID.BKCAL_IN, ISEL.IN_7 28: ISEL.IN_8 31: PID.BKCAL_OUT 32: PID.RCAS_IN 33: PID.ROUT_IN 35: PID.RCAS_OUT 36: PID.ROUT_OUT 39: PID.TRK_VAL 40: PID.FF_VAL	PARAM1	Enumeration	The parameter for Advanced Config Display Parameter (DP) slot #4. Each value corresponds to parameter selected by BLK_TAG_4 block to be displayed.The value of BLK_TYPE_4 is used by the conditional DD to reduce the list of parameter indices in PARAM_INDEX_4 to only those that are valid for the type of block selected. The combination of block type, block tag, and parameter index are used to determine the parameter to display on the LCD display.	O/S, Auto
PRESSURE_SCALED_UNITS (39)	5 character alphanumeric string	“CUSTM”	[None]	User entered units displayed for the Basic config - Pressure Scaled Value Units Screen	O/S, Auto

Table A-4. LCD Display Transducer Block Parameters

Parameter (index number)	Valid range	Initial value	Units	Description	Writeable mode
TRANSDUCER_DIRECTORY (9)	0	0	[None]	Directory that specifies the number and starting indices of the transducers in the transducer block	Read-Only
TRANSDUCER_TYPE (10)	65535	65535	Enumeration	Identifies the transducer that follows	Read-Only
TRANSDUCER_TYPE_VER (11)	0x0001	0x0001	[None]	The version of the transducer identified by TRANSDUCER_TYPE in the form 0xAABB where AA is the major revision of the transducer specification on which the transducer is based, and BB is a revision number assigned and controlled by the manufacturer of the device	Read-Only
UNITS_TYPE_1 (19)	1: Auto (units come from associated block parameter); 2: Custom (See CUSTOM_UNITS_1); 3: None (units are not displayed)	1	Enumeration	Determines where the units for the display parameter come from	O/S, Auto
UNITS_TYPE_2 (25)	1: Auto (units come from associated block parameter); 2: Custom (See CUSTOM_UNITS_2); 3: None (units are not displayed)	1	Enumeration	Determines where the units for the display parameter come from	O/S, Auto
UNITS_TYPE_3 (31)	1: Auto (units come from associated block parameter); 2: Custom (See CUSTOM_UNITS_3); 3: None (units are not displayed)	1	Enumeration	Determines where the units for the display parameter come from	O/S, Auto
UNITS_TYPE_4 (37)	1: Auto (units come from associated block parameter); 2: Custom (See CUSTOM_UNITS_4); 3: None (units are not displayed)	1	Enumeration	Determines where the units for the display parameter come from	O/S, Auto
UPDATE_EVT (7)	[None]	[None]	[None]	Alert generated by any change to the static data	Mixed
XD_ERROR (12)	0: No Error 19: Configuration Error 22: I/O Failure (An I/O failure has occurred)	0	Enumeration	Indicates the most important error in the LCD display transducer block	Read-Only

A.5 Performance specifications

These specifications cover HART®, Wireless, FOUNDATION fieldbus, and PROFIBUS® PA protocols unless specified.

A.5.1 Conformance to specification (±3σ [Sigma])

Technology leadership, advanced manufacturing techniques, and statistical process control ensure specification conformance to at least ±3σ.

A.5.2 Reference accuracy

Stated reference accuracy equations include terminal based linearity, hysteresis, and repeatability. For Wireless, FOUNDATION fieldbus, and PROFIBUS PA devices, use calibrated range in place of span.

Models	Standard	High performance option, P8	
2051C			
Range 1	±0.10% of span For spans less than 15:1, accuracy = $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	N/A	N/A
Ranges 2-4	±0.065% of span For spans less than 10:1, accuracy = $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	Ranges 2-4	High Accuracy Option, P8 ±0.05% of span For spans less than 10:1(1), accuracy = $\pm\left[0.015 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span
Range 5	±0.075% of span For spans less than 10:1, accuracy= $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	Range 5	High Performance Option, P8 ±0.065% of span For spans less than 10:1, accuracy= $\pm\left[0.015 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span
2051T Ranges 1-4	±0.065% of span For spans less than 10:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span	Ranges 1-4	High Accuracy Option, P8 ±0.05% of span For spans less than 10:1(1), accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span
Range 5	±0.075% of span For spans less than 10:1, accuracy = $\pm\left[.0075\left(\frac{URL}{Span}\right)\right]$% of Span	N/A	N/A
2051L Ranges 2-4	±0.075% of span For spans less than 10:1, accuracy = $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	N/A	N/A

(1) For protocol code F, accuracy specification is for spans less than 7:1.

Flow performance - Flow reference accuracy

2051CFA Annubar Flowmeter		
Ranges 2-3		±2.00% of Flow Rate at 5:1 flow turndown
2051CFC Compact Orifice Flowmeter – conditioning option C		
Ranges 2-3	β =0.4	±2.25% of Flow Rate at 5:1 flow turndown
	β =0.50, 0.65	±2.45% of Flow Rate at 5:1 flow turndown
2051CFC Compact Orifice Flowmeter – orifice type option P(1)		
Ranges 2-3	β =0.4	±2.50% of Flow Rate at 5:1 flow turndown
	β =0.65	±2.50% of Flow Rate at 5:1 flow turndown
2051CFP Integral Orifice Flowmeter		
Ranges 2-3	β <0.1	±3.10% of Flow Rate at 5:1 flow turndown
	0.1<β <0.2	±2.75% of Flow Rate at 5:1 flow turndown
	0.2<β <0.6	±2.25% of Flow Rate at 5:1 flow turndown
	0.6<β <0.8	±3.00% of Flow Rate at 5:1 flow turndown

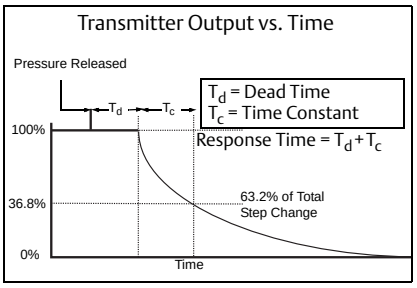
(1) For smaller line sizes, see Rosemount Compact Orifice

Long term stability

± 50 °F (28 °C) temperature changes and up to 1000 psi (6,9 MPa) line pressure.

Models	Standard	High performance option, P8
2051C Range 1 (CD) Ranges 2-5	 ±0.2% of URL for 1 year ±0.1% of URL for 3 years	 ±0.125% of URL for 5 years
2051T Ranges 1-5	 ±0.1% of URL for 3 years	 ±0.125% of URL for 5 years

Dynamic performance

	4-20 mA HART(1) 1-5 Vdc HART Low Power	FOUNDATION fieldbus and PROFIBUS PA protocols (2)	Typical HART transmitter response time
Total Response Time ($T_d + T_c$)(3):			
2051C, Range 3-5: Range 1: Range 2: 2051T: 2051L:	115 ms 270 ms 130 ms 100 ms See *Instrument Toolkit*™	152 ms 307 ms 152 ms 152 ms See *Instrument Toolkit*	
Dead Time (Td)	60 ms (nominal)	97 ms	
Update Rate(4)	22 times per second	22 times per second	

(1) Dead time and update rate apply to all models and ranges; analog output only.
(2) Transducer block response time, Analog Input block execution time not included.
(3) Nominal total response time at 75 °F (24 °C) reference conditions.
(4) Does not apply to wireless (Output Code X). See <Footnote_ref>"PROFIBUS PA (Output Code W)" on page 127 for wireless update rate.

Line pressure effect per 1000 psi (6,9 MPa)

For line pressures above 2000 psi (13,7 MPa) and Ranges 4-5, see user manual (document number 00809-0100-4001 for HART, 00809-0100-4102 for *Wireless*HART®, 00809-0100-4774 for FOUNDATION fieldbus, and 00809-0300-4101 for PROFIBUS PA)

Models	Line pressure effect
2051CD, 2051CF	Zero Error(1)
Range 1	±0.25% of URL/1000 psi (68.9 bar)
Ranges 2-3	±0.05% of URL/1000 psi (68.9 bar) for line pressures from 0 to 2000 psi (0 to 13.7 MPa)
	Span Error
Range 1	±0.4% of reading/1,000 psi (68.9 bar)
Ranges 2-3	±0.1% of reading/1,000 psi (68.9 bar)

(1) Can be calibrated out at line pressure.

Ambient temperature effect per 50 °F (28 °C)

Models	Ambient temperature effect	High performance option, P8
2051C, 2051CF		
Ranges 2-5	±(0.025% URL + 0.125% span) from 1:1 to 5:1 ±(0.05% URL + 0.25% span) from 5:1 to 100:1	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1 ±(0.025% URL + 0.125% span) from 5:1 to 100:1
Range 1	±(0.1% URL + 0.25% span) from 1:1 to 30:1	
2051T Range 2-4	±(0.05% URL + 0.25% span) from 1:1 to 30:1 ±(0.07% URL + 0.25% span) from 30:1 to 100:1	±(0.025% URL + 0.125% span) from 1:1 to 30:1 ±(0.035% URL + 0.125% span) from 30:1 to 100:1
Range 1	±(0.05% URL + 0.25% span) from 1:1 to 10:1 ±(0.10% URL + 0.25% span) from 10:1 to 100:1	±(0.025% URL + 0.125% span) from 1:1 to 10:1 ±(0.05% URL + 0.125% span) from 10:1 to 100:1
Range 5	±(0.1% URL + 0.15% span)	
2051L	See *Instrument Toolkit*	

Mounting position effects

Models	Mounting position effects
2051C	Zero shifts up to ±1.25 inH_2O (3.1 mbar), which can be calibrated out. No span effect.
2051T	Zero shifts up to ±2.5 inH_2O (6.2 mbar), which can be calibrated out. No span effect.
2051L	With liquid level diaphragm in vertical plane, zero shift of up to 1 inH_2O (2.49 mbar). With diaphragm in horizontal plane, zero shift of up to 5 inH_2O (12.43 mbar) plus extension length on extended units. Zero shifts can be calibrated out. No span effect.

Vibration effect

Less than ±0.1% of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21mm displacement peak amplitude / 60-2000 Hz 3g).

Power supply effect

Less than ±0.005% of calibrated span per volt.(1)

Electromagnetic Compatibility (EMC)

Meets all relevant requirements of EN 61326 and NAMUR NE-21.(2)

(1) Does not apply to Wireless (Output Code X).

(2) NAMUR NE-21 does not apply to wireless output code X.

Transient protection (Option Code T1)

Meets IEEE C62.41, Category Location B
6 kV crest (0.5 µs - 100 kHz)
3 kA crest (8 × 20 microseconds)
6 kV crest (1.2 × 50 microseconds)

A.6 Functional specifications

A.6.1 Range and sensor limits

Table A-5. Range and Sensor Limits

Range	2051CD, 2051CF, 2051CG, 2051L					
		Range and sensor limits				
	Minimum span	Upper (URL)	Lower (LRL)			
			2051C Differential 2051CF Flowmeters	2051C Gage[1]	2051L Differential	2051L Gage[1]
1	0.5 inH_2O (1.2 mbar)	25 inH_2O (62.3 mbar)	–25 inH_2O (–62.1 mbar)	–25 inH_2O (–62.1 mbar)	N/A	N/A
2	2.5 inH_2O (6.2 mbar)	250 inH_2O (0.62 bar)	–250 inH_2O (–0.62 bar)	–250 inH_2O (–0.62 bar)	–250 inH_2O (–0.62 bar)	–250 inH_2O (–0.62 bar)
3	10 inH_2O (24.9 mbar)	1000 inH_2O (2.49 bar)	-1000 inH_2O (-2.49 bar)	–393 inH_2O (–979 mbar)	–1000 inH_2O (–2.49 bar)	–393 inH_2O (–979 mbar)
4	3 psi (0.207 bar)	300 psi (20.7 bar)	-300 psi (-20,7 bar)	–14.2 psig (–979 mbar)	–300 psi (–20.7 bar)	–14.2 psig (–979 mbar)
5	20 psi (1.38 bar)	2000 psi (137.9 bar)	-2000 psi (-137.9 bar)	–14.2 psig (–979 mbar)	N/A	N/A

(1) Assumes atmospheric pressure of 14.7 psig.

Table A-6. Range and Sensor Limits

Range	2051T			
	Minimum span	Range and sensor limits		
		Upper (URL)	Lower (LRL) (Abs)	Lower[1] (LRL) (Gage)
1	0.3 psi (20.7 mbar)	30 psi (2.07 bar)	0 psia (0 bar)	–14.7 psig (–1.01 bar)
2	1.5 psi (0.103 bar)	150 psi (10.3 bar)	0 psia (0 bar)	–14.7 psig (–1.01 bar)
3	8 psi (0.55 bar)	800 psi (55.2 bar)	0 psia (0 bar)	–14.7 psig (–1.01 bar)
4	40 psi (2.76 bar)	4000 psi (275.8 bar)	0 psia (0 bar)	–14.7 psig (–1.01 bar)
5	2,000 psi (137.9 bar)	10,000 psi (689.5 bar)	0 psia (0 bar)	–14.7 psig (–1.01 bar)

(1) Assumes atmospheric pressure of 14.7 psig.

A.6.2 Service

Liquid, gas, and vapor applications

A.6.3 Protocols

4–20 mA HART (Output Code A)

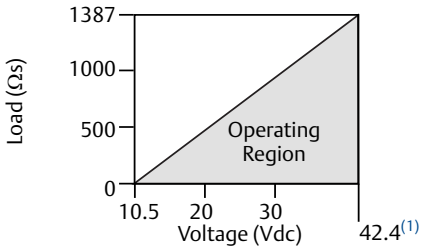
Power supply

External power supply required. Standard transmitter operates on 10.5 to 42.4 Vdc with no load.

Load limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Max. Loop Resistance = 43.5 (Power Supply Voltage – 10.5)



Communication requires a minimum loop resistance of 250 ohms.

(1) For CSA approval, power supply must not exceed 42.4 V.

Indication

Optional 2-line LCD/LOI Display

Zero and span adjustment requirements

Zero and span values can be set anywhere within the range limits stated in Table A-5 and Table A-6.

Span must be greater than or equal to the minimum span stated in Table A-5 and Table A-6.

Output

Two-wire 4-20mA, user selectable for linear or square root output. Digital process variable superimposed on 4-20 mA signal, available to any host that conforms to HART protocol.

2051

Digital communications based on HART Revision 5 protocol.

2051 with selectable HART

The 2051 with Selectable HART comes with Selectable HART Revisions. Digital communications based on HART Revision 5 (default) or Revision 7 (option code HR7) protocol can be selected. The HART revision can be switched in the field using any HART based configuration tool or the optional local operator interface (LOI).

Local operator interface

The LOI utilizes a 2 button menu with internal and external configuration buttons. Internal buttons are always configured for Local Operator Interface. External Buttons can be configured for either LOI, (option code M4), Analog Zero and Span (option code D4) or Digital Zero Trim (option code DZ). See 2051 with Selectable HART product manual (00809-0100-4107) for LOI configuration menu.

A.6.4 FOUNDATION fieldbus (Output code F)

Power supply

The transmitter requires between 9 and 32 V dc (9 and 30 V dc for intrinsic safety, and 9 and 17.5 V dc for FISCO intrinsic safety) to operate and provide complete functionality.

Current draw

17.5 mA for all configurations (including LCD display option)

Indication

Optional 2-line LCD display

FOUNDATION fieldbus function block execution times

Block	Execution time
Resource	N/A
Transducer	N/A
LCD Display Block	N/A
Analog Input 1, 2	20 milliseconds
PID	25 milliseconds
Input Selector	20 milliseconds
Arithmetic	20 milliseconds
Signal Characterizer	20 milliseconds
Integrator	20 milliseconds
Control Selector	20 milliseconds
Output Splitter	20 milliseconds

FOUNDATION fieldbus parameters

Schedule Entries	7 (max.)
Links	25 (max.)
Virtual Communications Relationships (VCR)	20 (max.)

A.6.5 Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

A.6.6 Standard function blocks

Resource block

This block contains hardware, electronics, and diagnostic information.

Transducer block

This block contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD display block

This block configures the local display.

2 analog input blocks

These blocks process the measurements for input into other function blocks. The output value is in engineering units or custom and contains a status indicating measurement quality.

PID block

This block contains all logic to perform PID control in the field including cascade and feedforward.

Input selector block

This block selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average or first “good.”

Arithmetic block

This block provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal characterizer block

This block characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator block

This block compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

Control selector

The control selector is designed to select one of two or three inputs for control. The selection can be the highest, middle, or lowest. The inputs are normally connected to the outputs of PID or other function blocks. The block is configured to use one of the inputs to control its output. The other two inputs can be configured to override the selected input if the process conditions so require.

Output splitter

The output splitter is designed to split the output of one PID or other control blocks so it can control two valves or actuators. Although there are many uses for the block, the example below is controlling the temperature inside a reactor with exothermic reaction. In order to start the reaction, the reactants have to be heated. The controller signal is split in a way to have the heating fluid valve controlling the temperature while the cooling valve remains closed. When the reaction starts, heat is liberated and the heating valve is closed. The coolant valve takes over. The block allows different combinations of actions.

Physical block

The physical block defines the physical resources of the device including type of memory, hardware, electronics and diagnostic information.

Transducer block

This block contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

Indication

Optional 2-line LCD display.

Local Operator Interface

Optional external configuration buttons.

A.6.7 PROFIBUS PA (Output Code W)

Profile version

3.02

Power supply

External power supply required; transmitters operate on 9.0 to 32.0 Vdc transmitter terminal voltage.

Current draw

17.5 mA for all configurations (including LCD display option)

Output update rate

Four times per second

Standard function blocks

Analog Input (AI Block)

The AI function block processes the measurements and makes them available to the host device. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement.

Physical block

The physical block defines the physical resources of the device including type of memory, hardware, electronics, and diagnostic information.

Transducer block

Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

Indication

Optional 2-line LCD display.

Local Operator Interface

Optional external configuration buttons.

A.6.8 Wireless (Output Code X)

Output

IEC 62591 (*Wireless*HART), 2.4 GHz DSSS

Wireless radio (internal antenna, WP5 option)

- Frequency: 2.400 - 2.485 GHz
- Channels: 15
- Modulation: IEEE 802.15.4 compliant DSSS
- Transmission: Maximum of 10 dBm EIRP

Local display

The optional 3-line, 7-digit LCD display can display user-selectable information such as primary variable in engineering units, scaled variable, percent of range, sensor module temperature, and electronics temperature. The display updates based on the wireless update rate.

Digital zero trim

Digital Zero trim (option DZ) is an offset adjustment to compensate for mounting position effects, up to 5% of URL.

Update rate

User selectable 1 sec. to 60 min.

Wireless sensor module for in-line transmitters

The 2051 Wireless transmitter requires the engineered polymer housing to be selected. The standard sensor module will come with aluminum material. If stainless steel is required, the option WSM must be selected.

Power module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with PBT/PC enclosure. Ten-year life at one minute update rate.(1)

(1) Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.
Note: Continuous exposure to ambient temperature limits of -40 °F to 185 °F (-40 °C to 85 °C) may reduce specified life by less than 20 percent.

A.6.9 HART 1-5 Vdc Low Power (Output Code M)

Output

Three wire 1–5 Vdc output, user-selectable for linear or square root output. Digital process variable superimposed on voltage signal, available to any host conforming to the HART protocol.

2051

Digital communications based on HART Revision 5 protocol.

2051 with selectable HART

The 2051 with Selectable HART comes with Selectable HART Revisions. Digital communications based on HART Revision 5 (default) or Revision 7 (option code HR7) protocol can be selected. The HART revision can be switched in the field using any HART based configuration tool or the optional local operator interface (LOI).

Local Operator Interface

The LOI utilizes a 2 button menu with internal and external configuration buttons. Internal buttons are always configured for Local Operator Interface. External Buttons can be configured for either LOI, (option code M4), Analog Zero and Span (option code D4) or Digital Zero Trim (option code DZ). See 2051 with Selectable HART product manual (00809-0100-4107) for LOI configuration menu.

Power supply

External power supply required. Standard transmitter operates on 9 to 28 Vdc with no load.

Power consumption

3.0 mA, 27–84 mW

Output load

100 kΩ or greater (meter input impedance)

A.6.10 Overpressure limits

Transmitters withstand the following limits without damage:

2051C, 2051CF

- Ranges 2–5: 3,626 psig (250 bar)
  4,500 psig (310,3 bar) for option code P9
- Range 1: 2,000 psig (137,9 bar)

2051T

- Range 1: 750 psi (51,7 bar)
- Range 2: 1,500 psi (103,4 bar)
- Range 3: 1,600 psi (110,3 bar)
- Range 4: 6,000 psi (413,7 bar)
- Range 5: 15,000 psi (1034,2 bar)

2051L

Limit is flange rating or sensor rating, whichever is lower (<page_ref>Table A-7 on page 130).

Table A-7. 2051L Flange Rating

Standard	Type	CS Rating	SST Rating
ANSI/ASME	Class 150	285 psig	275 psig
ANSI/ASME	Class 300	740 psig	720 psig
At 100 °F (38 °C), the rating decreases with increasing temperature, per ANSI/ASME B16.5.			
DIN	PN 10–40	40 bar	40 bar
DIN	PN 10/16	16 bar	16 bar
At 248 °F (120 °C), the rating decreases with increasing temperature, per DIN 2401.			

A.6.11 Static pressure limit

2051CD, 2051CF

- Operates within specifications between static line pressures of -14.2 psig (0.034 bar) and 3,626 psig (250 bar)
- For Option Code P9, 4,500 psig (310,3 bar)
- Range 1: 0.5 psia to 2,000 psig (34 mbar and 137,9 bar)

A.6.12 Burst pressure limits

2051C, 2051CF Coplanar or traditional process flange

- 10,000 psig (689.5 bar)

2051T In-Line

- Ranges 1–4: 11,000 psi (758.4 bar)
- Range 5: 26,000 psi (1792.6 bar)

A.6.13 Temperature limits

Ambient

–40 to 185 °F (–40 to 85 °C)

With LCD display[(1)(2)]: –40 to 175 °F (–40 to 80 °C)

Storage[(1)]

–50 to 230 °F (–46 to 110 °C)

With LCD display: –40 to 185 °F (–40 to 85 °C)

With Wireless Output: -40 °F to 185 °F (-40 °C to 85 °C)

(1) 2051 LCD display may not be readable and LCD display updates may be slower at temperatures below -22 °F (-30 °C).
(2) Wireless LCD display may not be readable and LCD display updates will be slower at temperatures below -4 °F (-20 °C).

Process

At atmospheric pressures and above. See Table A-8.

Table A-8. Process Temperature Limits

2051C, 2051CF	
Silicone Fill Sensor[(1)]	
with Coplanar Flange	–40 to 250 °F (–40 to 121 °C)[(2)]
with Traditional Flange	–40 to 300 °F (–40 to 149 °C)[(2)(3)]
with Level Flange	–40 to 300 °F (–40 to 149 °C)[(2)]
with 305 Integral Manifold	–40 to 300 °F (–40 to 149 °C)[(2)]
Inert Fill Sensor[(1)]	–40 to 185 °F (–40 to 85 °C)[(3)]

Table A-8. Process Temperature Limits

2051T (process fill fluid)	
Silicone Fill Sensor(1)	-40 to 250 °F (-40 to 121 °C)(2)
Inert Fill Sensor(1)	-22 to 250 °F (-30 to 121 °C)(2)
2051L low-side temperature limits	
Silicone Fill Sensor(1)	–40 to 250 °F (–40 to 121 °C)(2)
Inert Fill Sensor(1)	-40 to 185 °F (-40 to 85 °C)(2)
2051L high-side temperature limits (process fill fluid)	
Sylthern® XLT	–102 to 293 °F (–75 to 145°C)
D.C. Silicone 704®	32 to 401 °F (0 to 205 °C)
D.C. Silicone 200	–49 to 401 °F (–45 to 205 °C)
Inert	–49 to 320 °F (–45 to 160 °C)
Glycerin and Water	5 to 203 °F (–15 to 95 °C)
Neobee M-20	5 to 401 °F (–15 to 205 °C)
Propylene Glycol and Water	5 to 203 °F (–15 to 95 °C)

(1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio.
(2) 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.
(3) 160 °F (71 °C) limit in vacuum service.

A.6.14 Humidity limits

0–100% relative humidity

A.6.15 Turn-on time

Performance within specifications less than 2.0 seconds after power is applied to the transmitter.(1)

A.6.16 Volumetric displacement

Less than 0.005 in^3 (0.08 cm^3)

A.6.17 Damping

FOUNDATION fieldbus

Transducer block: 0.4 to 60.0 seconds.
1-second factory default damping.

AI Block: User configurable

(1) Does not apply to wireless option code X.

A.6.18 Failure mode alarm

HART 4-20 mA (Output Code A)

If self-diagnostics detect a sensor or microprocessor failure, the analog signal is driven either high or low to alert the user. High or low failure mode is user-selectable with a jumper on the transmitter. The values to which the transmitter drives its output in failure mode depend on whether it is factory-configured to standard or NAMUR-compliant operation. The values for each are as follows:

Standard operation			
Output code	**Linear output**	**Fail high**	**Fail low**
A	$3.9 \leq I \leq 20.8$	$I \geq 21.75$ mA	$I \leq 3.75$ mA
M	$0.97 \leq V \leq 5.2$	$V \geq 5.4$ V	$V \leq 0.95$ V

NAMUR-compliant operation			
Output code	**Linear output**	**Fail high**	**Fail low**
A	$3.8 \leq I \leq 20.5$	$I \geq 22.5$ mA	$I \leq 3.6$ mA

Output code F and X

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable.

A.7 Physical specifications

A.7.1 Material selection

Emerson provides a variety of Rosemount product with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Emerson Process Management is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

A.7.2 Electrical connections

$^1/_2$–14 NPT, G$^1/_2$, and M20 × 1.5 conduit

A.7.3 Process connections

2051C

- 1/4–18 NPT on 2 1/8-in. centers
- 1/2–14 NPT and RC 1/2 on 2-in.(50,8 mm), 2 1/8-in. (54,0 mm), or 2 1/4-in. (57,2 mm) centers (process adapters)

2051T

- 1/2–14 NPT female
- G 1/2 A DIN 16288 Male (available in SST for Range 1–4 transmitters only)
- Autoclave type F-250-C (Pressure relieved 9/16–18 gland thread; 1/4 OD high pressure tube 60° cone; available in SST for Range 5 transmitters only)

2051L

- High pressure side: 2-in.(50,8 mm), 3-in. (72 mm), or 4-in. (102 mm), ASME B 16.5 (ANSI) Class 150 or 300 flange;
  50, 80, or 100 mm, DIN 2501 PN 40 or 10/16 flange
- Low pressure side: 1/4–18 NPT on flange, 1/2–14 NPT on process adapter

2051CF

- For 2051CFA wetted parts, see 00813-0100-4485 in the 485 section
- For 2051CFC wetted parts, see 00813-0100-4485 in the 405 section
- For 2051CFP wetted parts, see 00813-0100-4485 in the 1195 section

2051C process wetted parts

Drain/vent valves

316 SST or Alloy C-276

Process flanges and adapters

Plated carbon steel, SST CF-8M (cast version of 316 SST, material per ASTM-A743), or CW2M (cast version of Alloy C)

Wetted O-rings

Glass-filled PTFE or Graphite-filled PTFE

Process isolating diaphragms

316L SST, Alloy C-276, or Tantalum

2051T process wetted parts

Process connections

- 316L SST or Alloy C-276

Process isolating diaphragms

- 316L SST or Alloy C-276

2051L process wetted parts

Flanged process connection (Transmitter high side)

Process diaphragms, Including process gasket surface

- 316L SST, Alloy C-276, or Tantalum

Extension

- CF-3M (Cast version of 316L SST, material per ASTM-A743), or Cast C-276. Fits schedule 40 and 80 pipe.

Mounting flange

- Zinc-cobalt plated CS or SST

Reference process connection (transmitter low side)

Isolating diaphragms

- 316L SST or Alloy C-276

Reference flange and adapter

- CF-8M (Cast version of 316 SST, material per ASTM-A743)

Non-wetted parts for 2051C/T/L

Electronics housing

Low-copper aluminum or CF-8M (Cast version of 316 SST). Enclosure Type 4X, IP 65, IP 66, IP68

Housing Material Code P: PBT/PC with NEMA 4X and IP66/67/68

Paint for aluminum housing

Polyurethane

Coplanar sensor module housing

CF-3M (Cast version of 316L SST)

Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)
ASTM F593G, Condition CW1 (Austenitic 316 SST)
ASTM A193, Grade B7M (zinc plated alloy steel)
Alloy K-500

Sensor module fill fluid

Silicone or inert halocarbon

In-Line series uses Fluorinert® FC-43

Process fill fluid (2051L only)

Sylthern XLT, D.C. Silicone 704,
D.C. Silicone 200, inert, glycerin and water, Neobee M-20, or propylene glycol and water

Cover O-rings

Buna-N

Silicone (for wireless option code X)

Power module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with PBT enclosure.

A.7.4 Shipping weights

Table A-9. Transmitter Weights without Options(1)

Transmitter	Standard 2051 In lb. (kg)	Wireless In lb. (kg)
2051C	4.9 (2.2)	3.9 (1,8)
2051L	Table A-10 below	Table A-10 below
2051T	3.1 (1.4)	1.9 (0,86)

(1) Transmitter weights include the sensor module and housing only (aluminum for standard 2051 and polymer for wireless).

Table A-10. 2051L Weights without Options

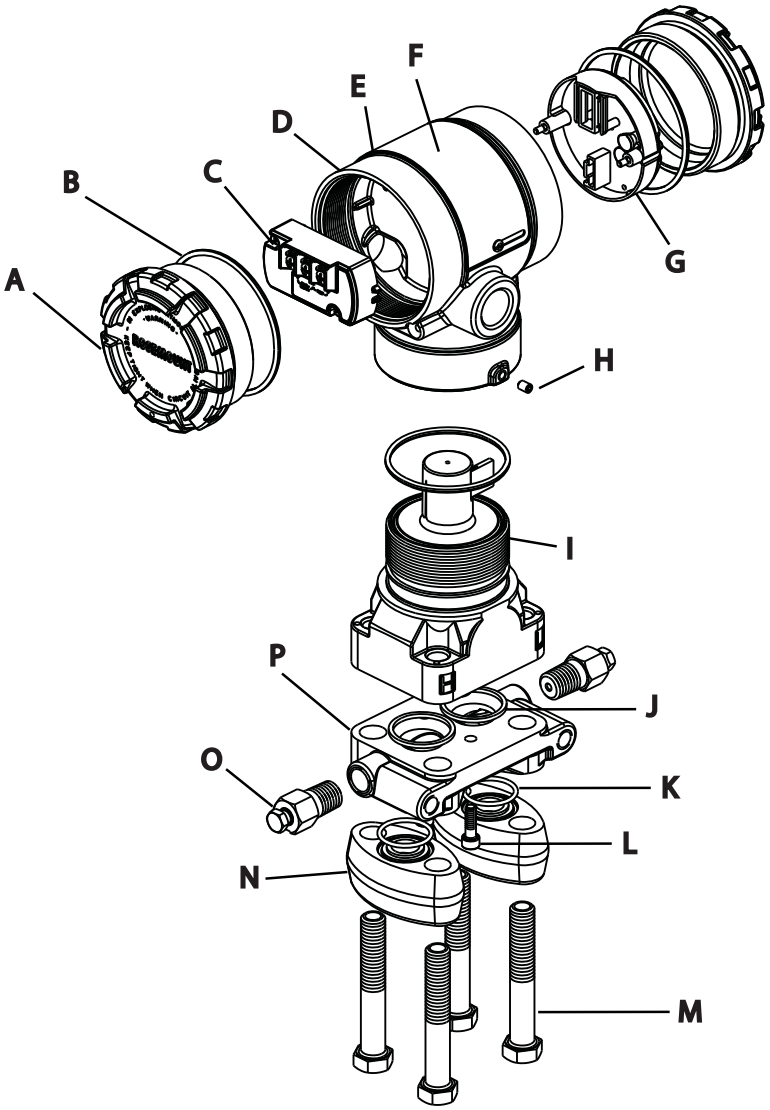
Flange	Flush lb. (kg)	2-in. Ext. lb (kg)	4-in. Ext. lb (kg)	6-in. Ext. lb (kg)
2-in., 150	12.5 (5,7)	N/A	N/A	N/A
3-in., 150	17.5 (7,9)	19.5 (8,8)	20.5 (9,3)	21.5 (9,7)
4-in., 150	23.5 (10,7)	26.5 (12,0)	28.5 (12,9)	30.5 (13,8)
2-in., 300	17.5 (7,9)	N/A	N/A	N/A
3-in., 300	22.5 (10,2)	24.5 (11,1)	25.5 (11,6)	26.5 (12,0)
4-in., 300	32.5 (14,7)	35.5 (16,1)	37.5 (17,0)	39.5 (17,9)
DN 50/PN 40	13.8 (6,2)	N/A	N/A	N/A
DN 80/PN 40	19.5 (8,8)	21.5 (9,7)	22.5 (10,2)	23.5 (10,6)
DN 100/PN 10/16	17.8 (8,1)	19.8 (9,0)	20.8 (9,5)	21.8 (9,9)
DN 100/PN 40	23.2 (10,5)	25.2 (11,5)	26.2 (11,9)	27.2 (12,3)

Table A-11. Transmitter Options Weights

Code	Option	Add lb (kg)
J, K, L, M	Stainless Steel Housing	3.9 (1,8)
M5	LCD Display for Aluminum Housing	0.5 (0,2)
M5	LCD Display for Wireless Output	0.1 (0,04)
B4	SST Mounting Bracket for Coplanar Flange	1.0 (0,5)
B1 B2 B3	Mounting Bracket for Traditional Flange	2.3 (1,0)
B7 B8 B9	Mounting Bracket for Traditional Flange	2.3 (1,0)
BA, BC	SST Bracket for Traditional Flange	2.3 (1,0)
H2	Traditional Flange	2.6 (1,2)
H3	Traditional Flange	3.0 (1,4)
H4	Traditional Flange	3.0 (1,4)
H7	Traditional Flange	2.7 (1,2)
FC	Level Flange—3 in., 150	12.7 (5,8)
FD	Level Flange—3 in., 300	15.9 (7,2)
FA	Level Flange—2 in., 150	8.0 (3,6)
FB	Level Flange—2 in., 300	8.4 (3,3)
FP	DIN Level Flange, SST, DN 50, PN 40	7.8 (3,5)
FQ	DIN Level Flange, SST, DN 80, PN 40	12.7 (5,8)
WSM	SST Sensor Module	1.0 (0,45)
	Power Module (701PGNKF)	0.4 (0,18)

A.8 Dimensional drawings

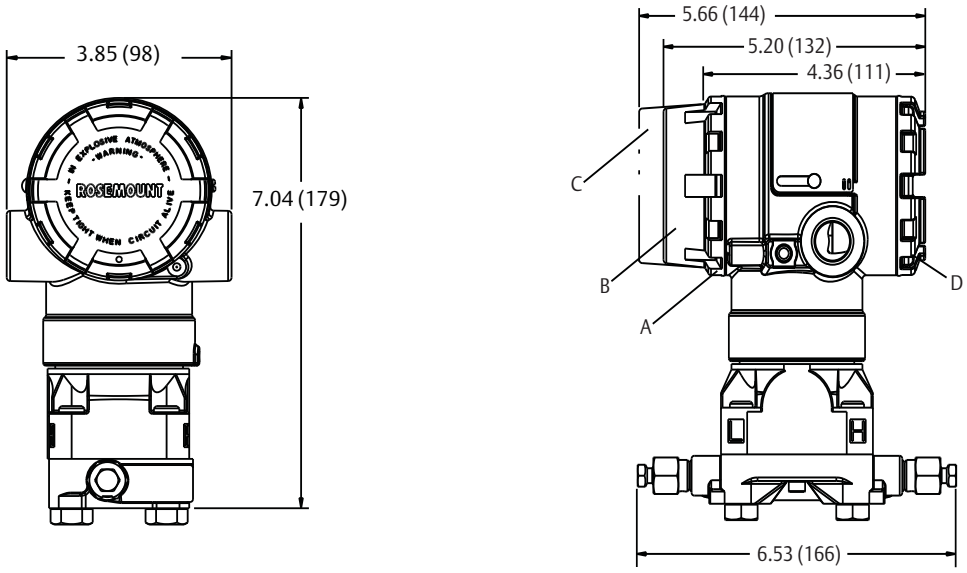
Figure A-2. 2051C Exploded View



A. Cover
B. Cover O-ring
C. Terminal Block
D. Electronics Housing
E. Local Configuration Buttons(1)
F. Name Plate
G. Electronics Board
H. Housing Rotation Set Screw (180 degree maximum rotation without further disassembly)
I. Sensor Module
J. Process O-Ring
K. Flange Adapter O-Ring
L. Flange Alignment Screw (not pressure retaining)
M. Flange Bolts
N. Flange Adapters
O. Drain/Vent Valve
P. Coplanar Flange

(1) Span and Zero Adjustment Buttons are optional with 4-20 mA and 1-5 Vdc HART protocol. Local Operator Interface buttons are optional for PROFIBUS PA protocol. Local Configuration Buttons are not available with Foundation fieldbus.

Figure A-3. 2051C Coplanar Flange



A. Transmitter Circuitry
B. HART and FOUNDATION fieldbus Device Rev 2 Display Cover
C. FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA Display Cover
D. Terminal Connections

Figure A-4. 2051 Wireless Housing with Coplanar Platform

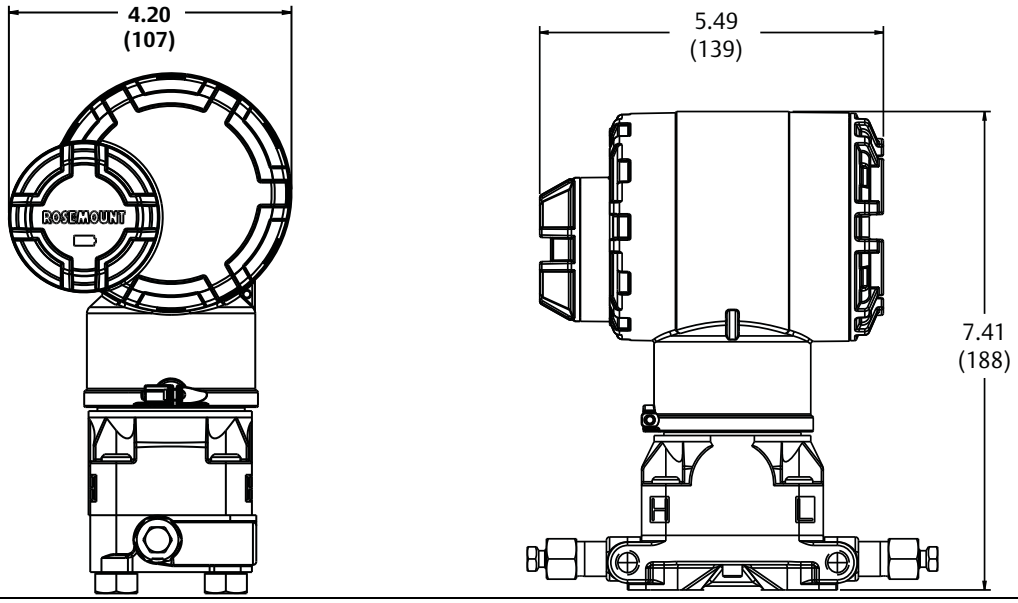
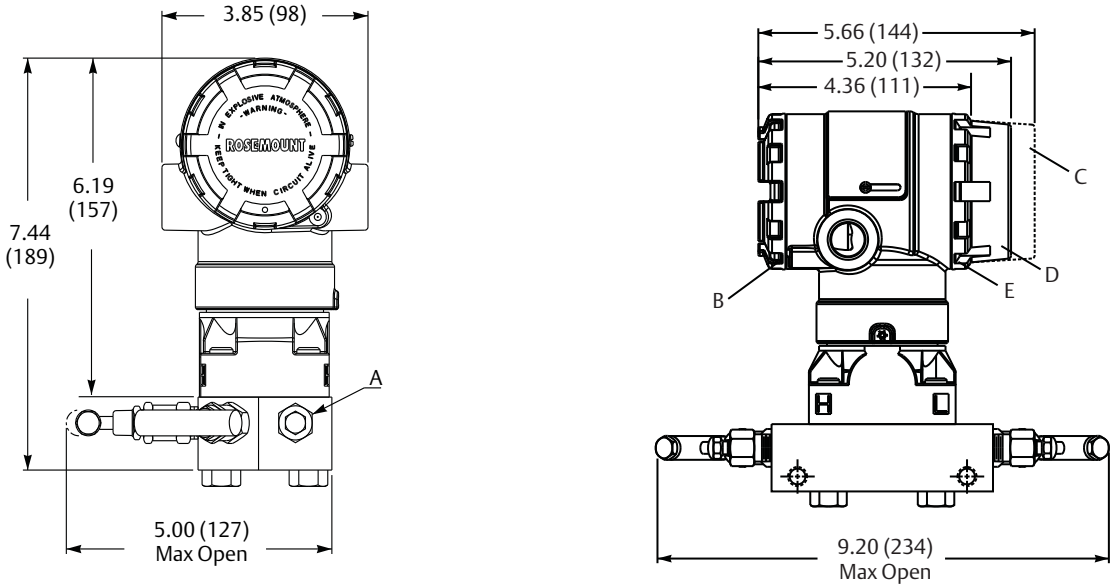
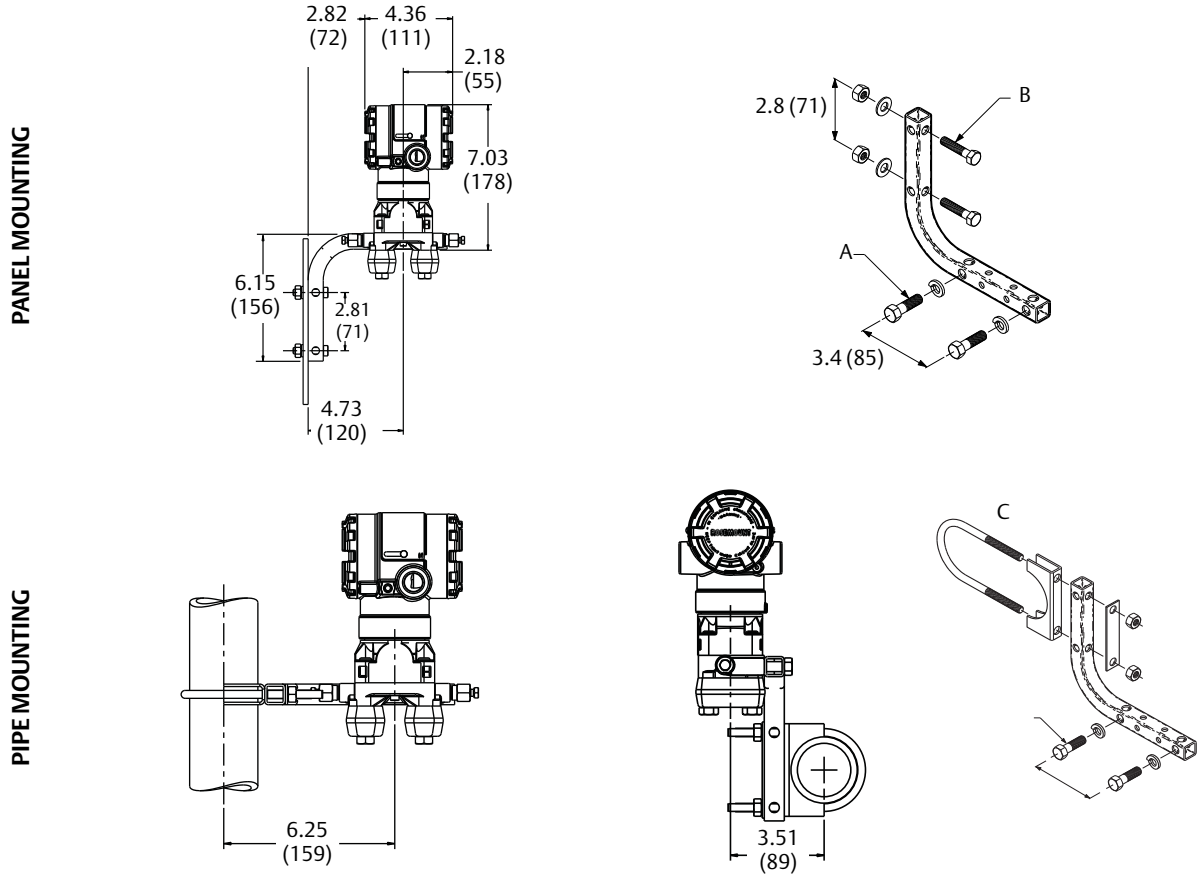


Figure A-5. 2051C Coplanar with Rosemount 305 3-Valve Coplanar Integral Manifold



A. Drain/Vent Valve
B. Terminal Connections
C. FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA Display Cover
D. HART and FOUNDATION fieldbus Device Rev 2 Display Cover
E. Transmitter Circuitry
Dimensions are in inches (millimeters).

Figure A-6. Coplanar Flange Mounting Configurations with Optional Bracket (B4) for 2-in. Pipe or Panel Mounting



A. 3/8–16 × 11/4 Bolts for Mounting to Transmitter
B. 5/16 3 11/2 Bolts for Panel Mounting (Not Supplied)
C. 2-in. U-Bolt for Pipe Mounting
Dimensions are in inches (millimeters).

Figure A-7. 2051C Coplanar with Traditional Flange

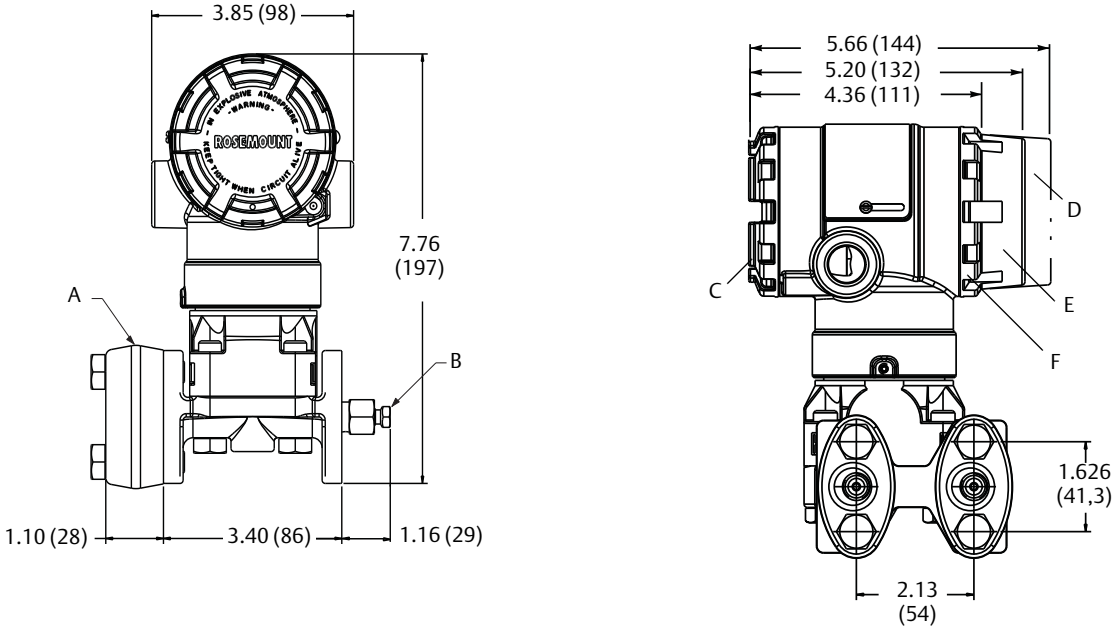
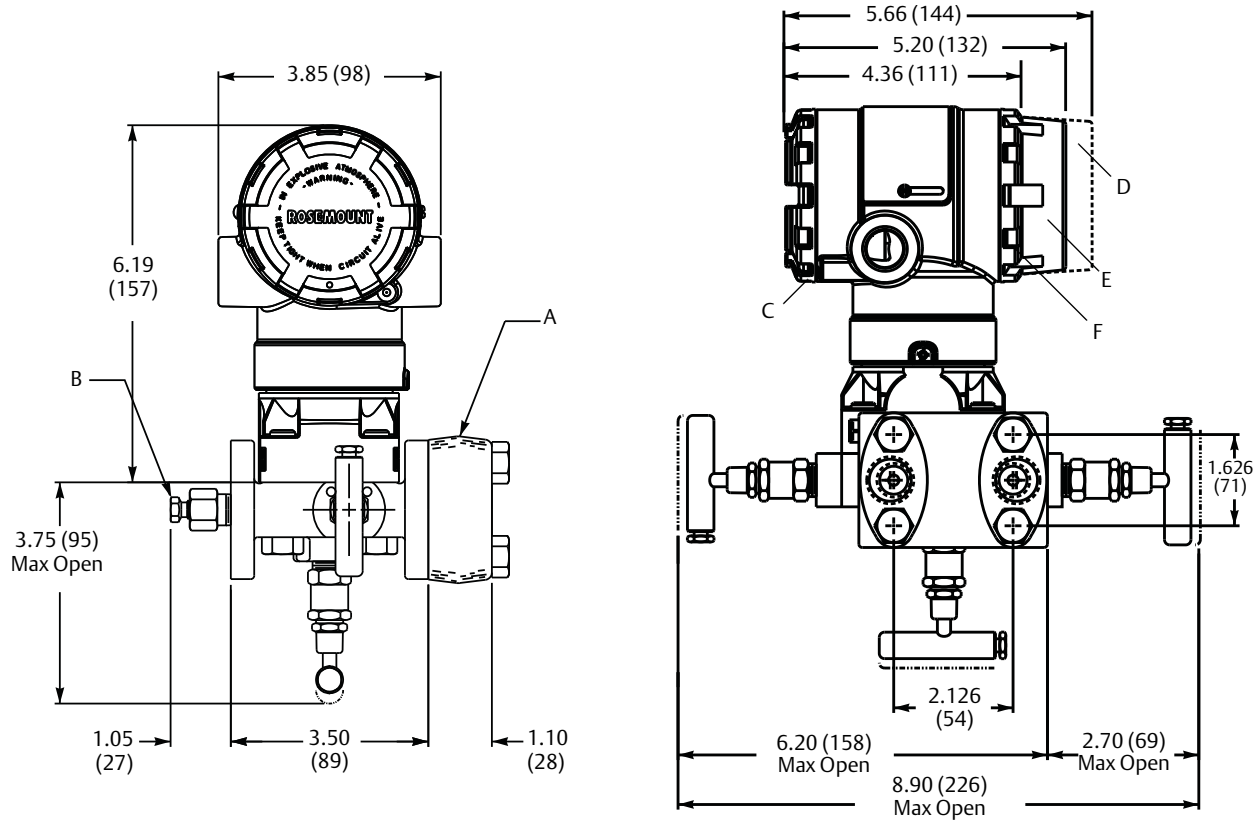


Figure A-8. 2051C Coplanar with Rosemount 305 3-Valve Traditional Integral Manifold

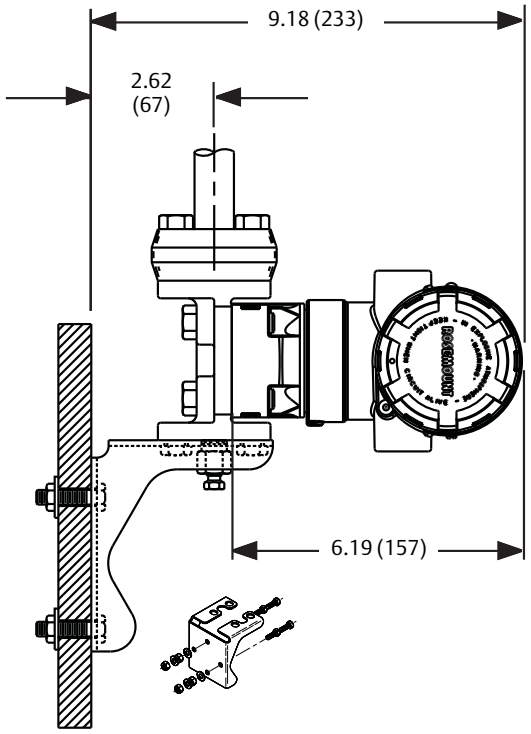


A. 1/2-14 NPT Flange Adapter (optional)
B. Drain/Vent Valve
C. Terminal Connections
Dimensions are in inches (millimeters).

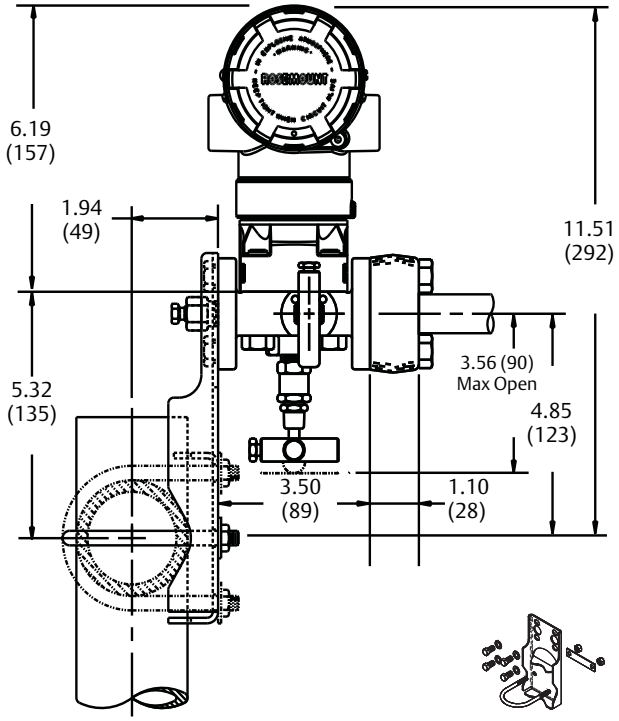
D. FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA Display Cover
E. HART and FOUNDATION fieldbus Device Rev 2Display Cover
F. Transmitter Circuitry

Figure A-9. Traditional Flange Mounting Configurations with Optional Brackets for 2-in. Pipe or Panel Mounting

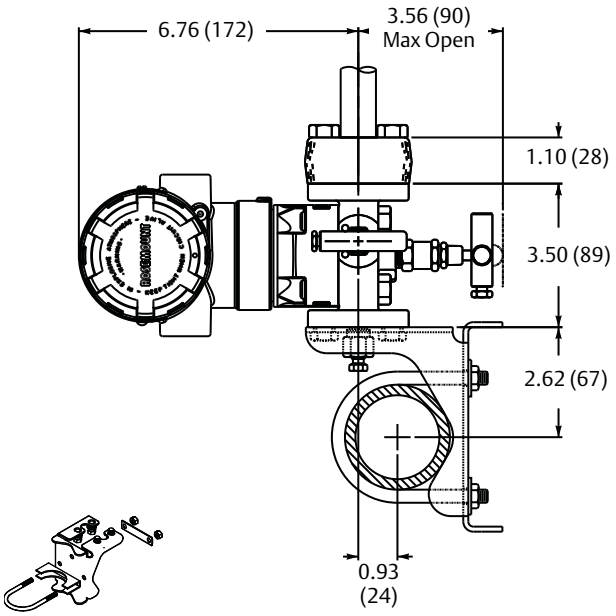
Panel Mount (Bracket Option B2/B8)



Pipe Mount (Bracket Option B3/B9/BC)

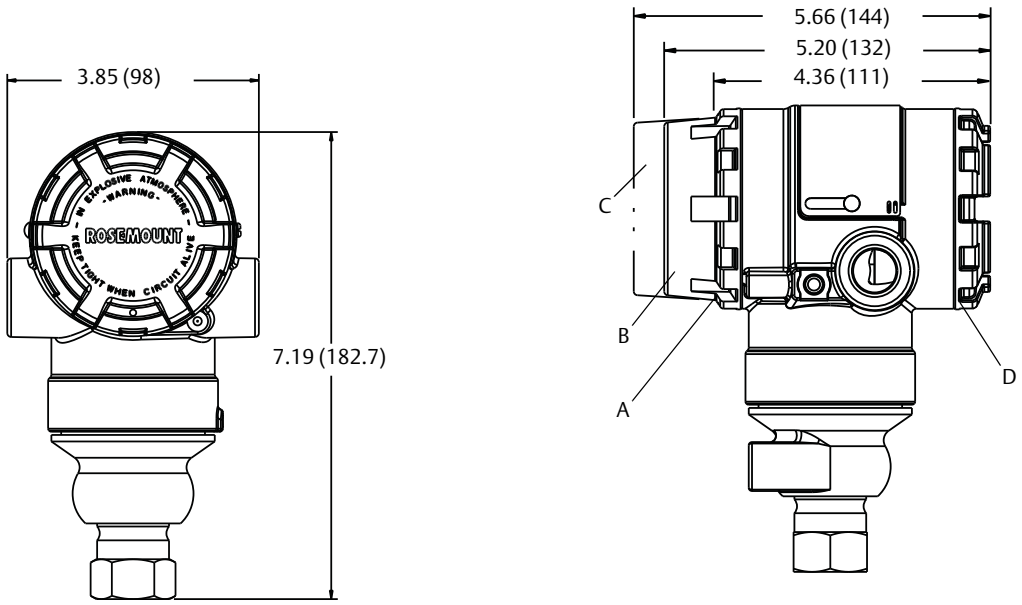


Pipe Mount (Bracket Option B1/ B7/BA)

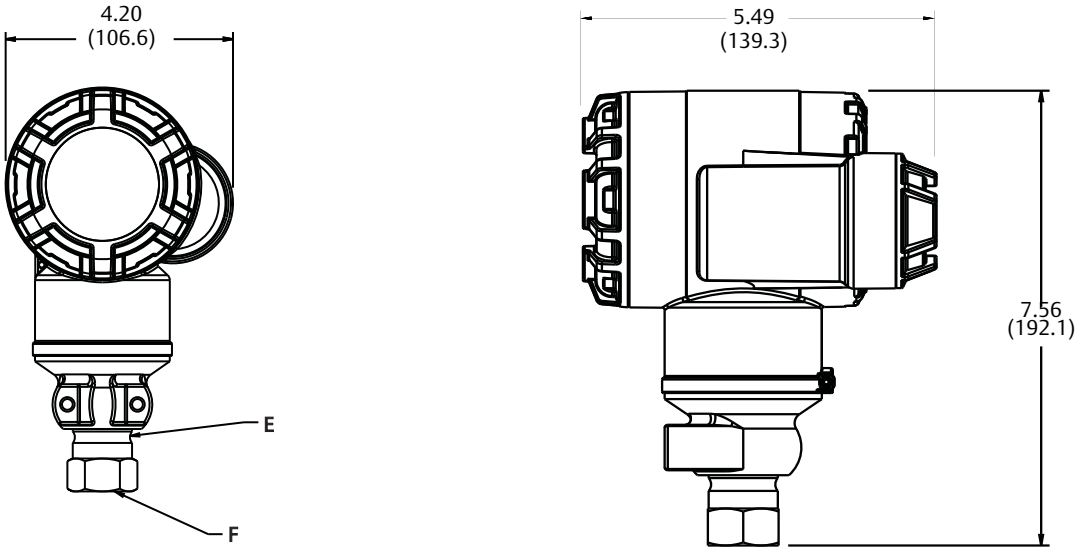


Dimensions are in inches (millimeters).

Figure A-10. 2051T Dimensional Drawings



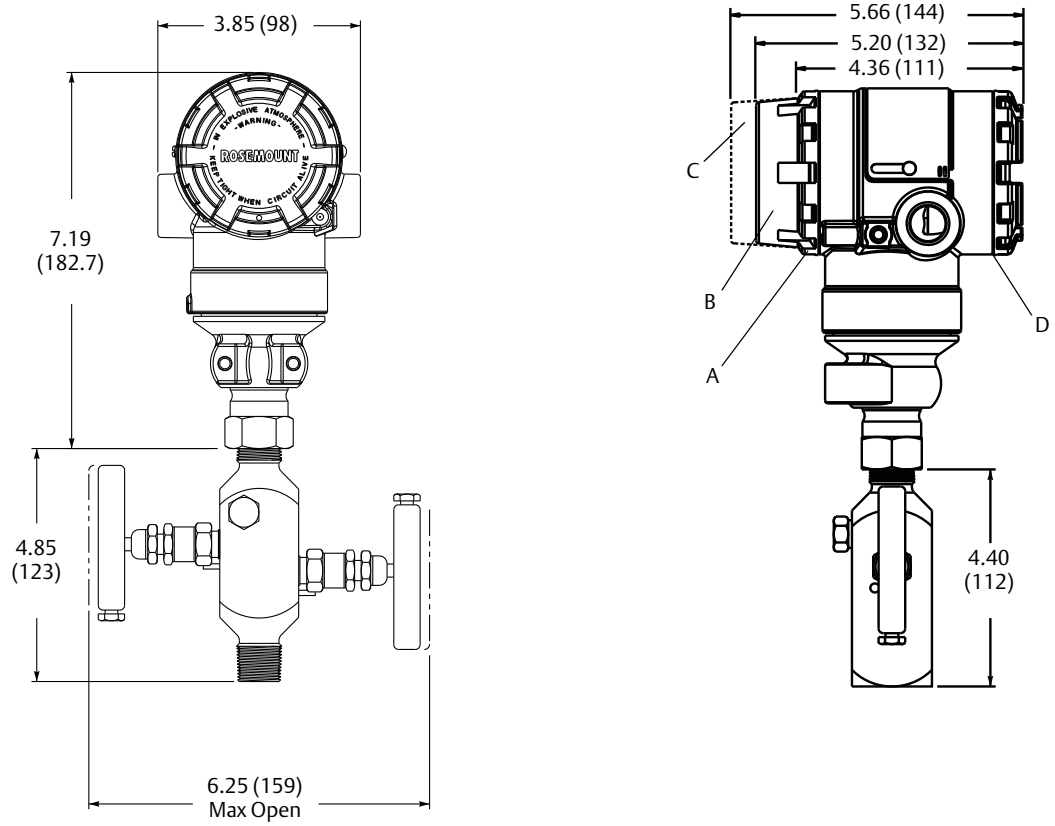
2051 Wireless Housing with In-Line Platform



A. Transmitter Circuitry
B. HART and FOUNDATION fieldbus Device Rev 2Display Cover
C. FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA Display Cover
D. Terminal Connections
E. U-Bolt Bracket
F. $^{1}/_{2}$-14 NPT Female or G$^{1}/_{2}$ A DIN 16288 Male Process Connection
Dimensions are in inches (millimeters).

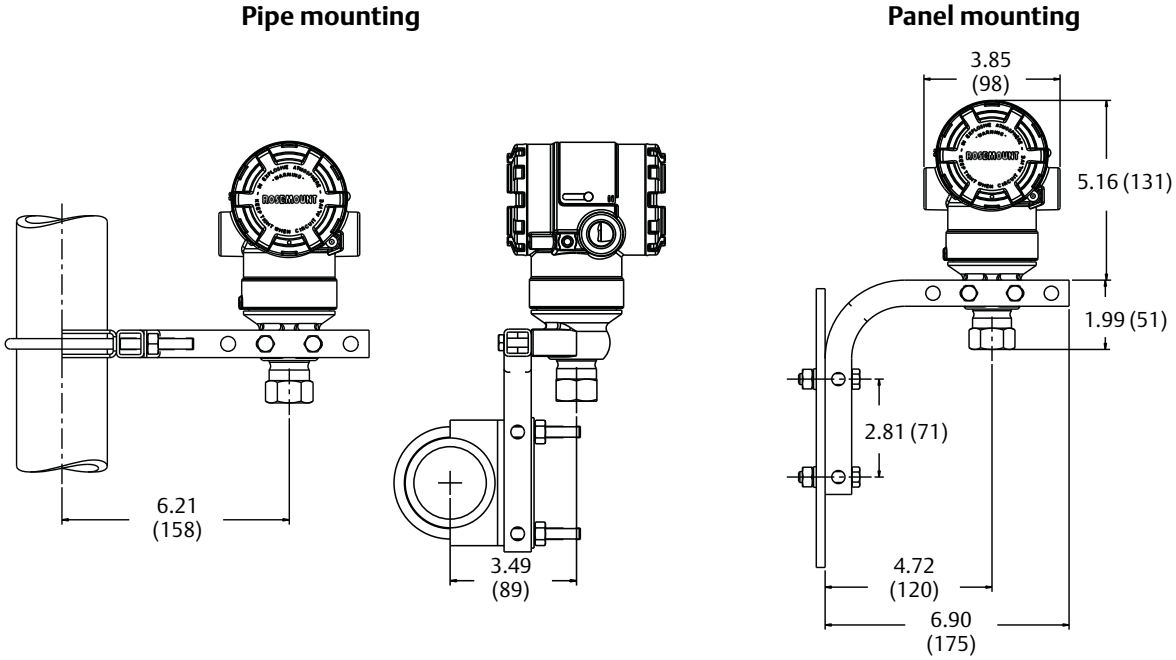
Figure A-10. 2051T Dimensional Drawings

2051T with Rosemount 306 2-Valve Integral Manifold



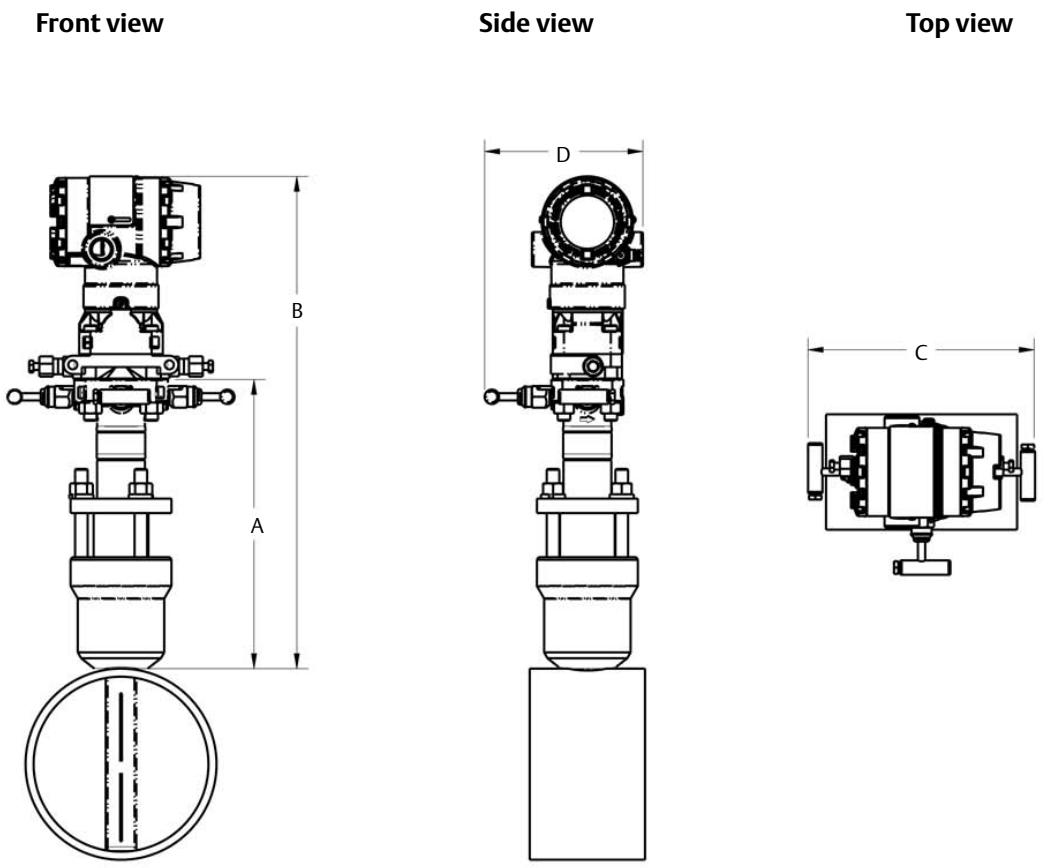
A. Transmitter Circuitry
B. HART and FOUNDATION fieldbus Device Rev 2Display Cover
Dimensions are in inches (millimeters).
C. FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA Display Cover
D. Terminal Connections

Figure A-11. 2051T Typical Mounting Configurations with Optional Mounting Bracket



Dimensions are in inches (millimeters).

Figure A-12. Rosemount 2051CFA Pak-Lok Annubar Flowmeter(1)



(1) The Pak-Lok Annubar model is available up to 600# ANSI (1,440 psig at 100 °F (99 bar at 38 °C)).

Table A-12. 2051CFA Pak-Lok Annubar Flowmeter Dimensional Data

Sensor size	A (Max)	B (Max)	C (Max)	D (Max)
1	8.50 (215.9)	14.55 (369.6)	9.00 (228.6)	6.00 (152.4)
2	11.00 (279.4)	16.30 (414.0)	9.00 (228.6)	6.00 (152.4)
3	12.00 (304.8)	19.05 (483.9)	9.00 (228.6)	6.00 (152.4)

Dimensions are in inches (millimeters)

Figure A-13. Rosemount 2051CFC Compact Orifice Flowmeter

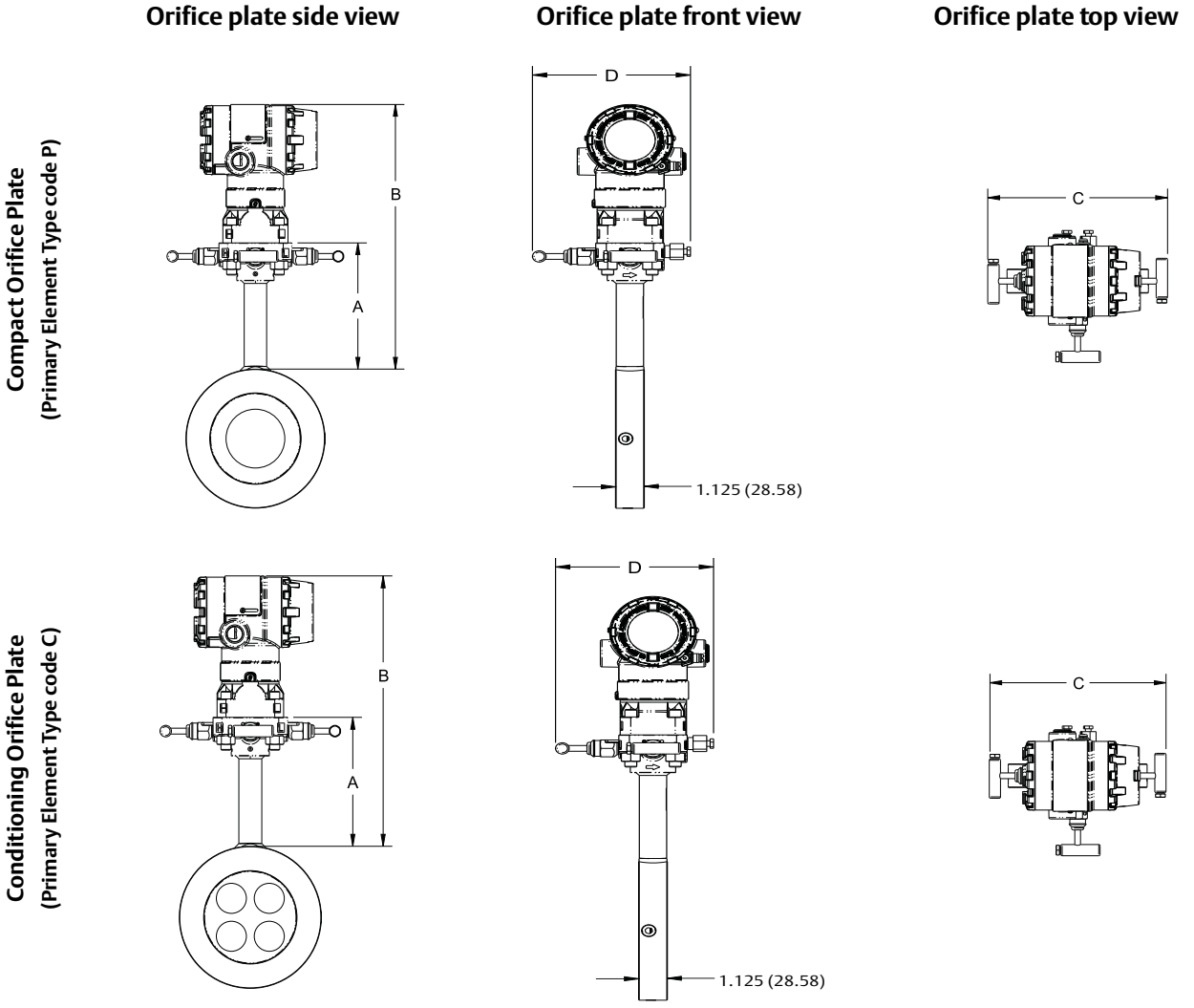
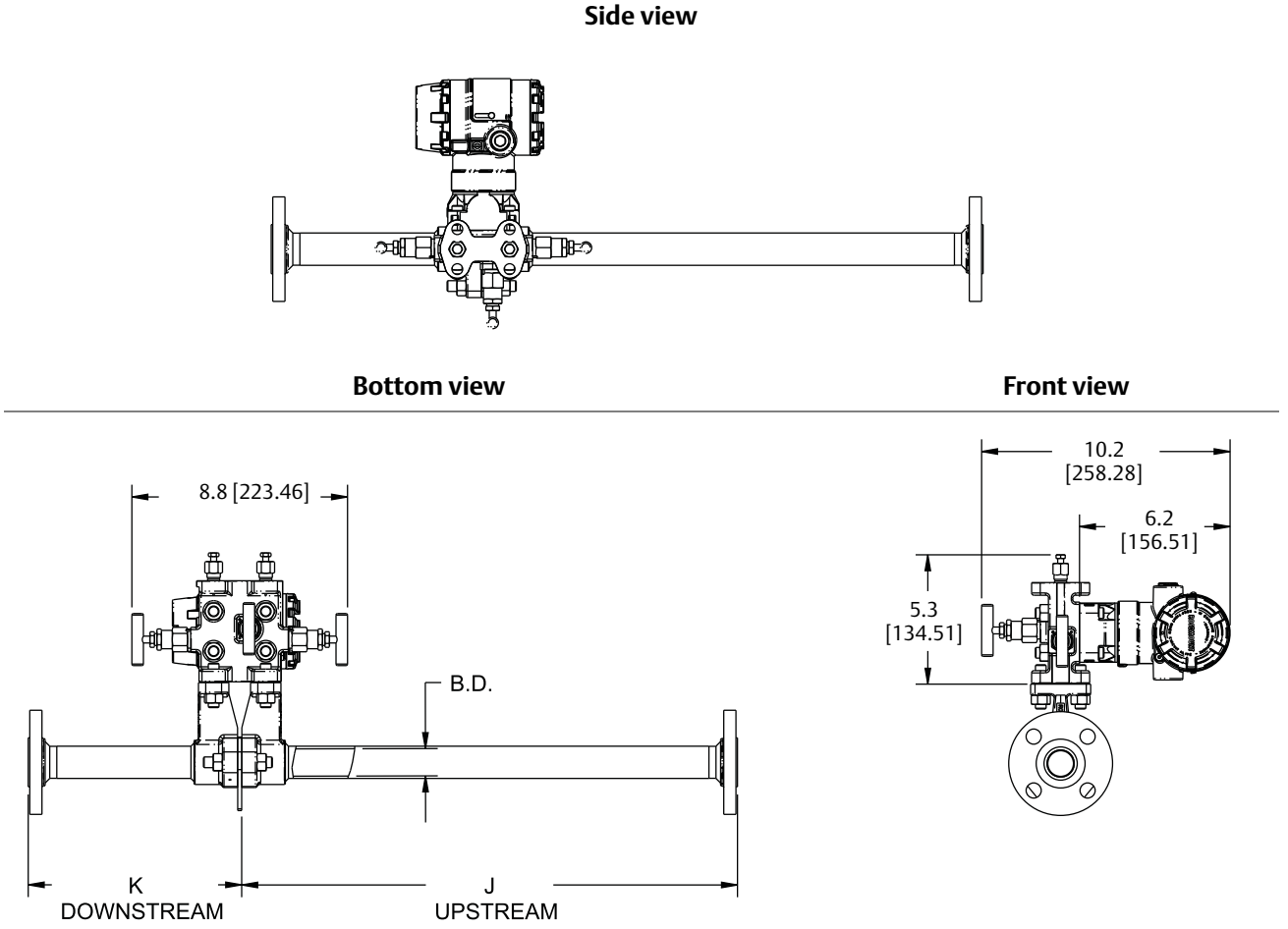


Table A-13. 2051CFC Dimensional Drawings

Primary element type	A	B	Transmitter height	C	D
Type P and C	5.62 (143)	Transmitter Height + A	6.27 (159)	7.75 (197) - closed 8.25 (210) - open	6.00 (152) - closed 6.25 (159) - open

Dimensions are in inches (millimeters).

Figure A-14. Rosemount 2051CFP Integral Orifice Flowmeter



Dimensions are in inches (millimeters).

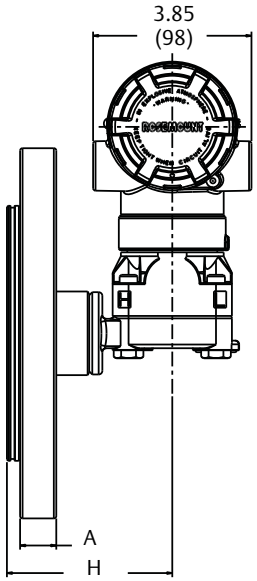
Table A-14. 2051CFP Dimensional Drawings

	Line size		
Dimension	**1/2-in. (15 mm)**	**1-in. (25 mm)**	**1 1/2-in. (40 mm)**
J (Beveled/Threaded pipe ends)	12.54 (318.4)	20.24 (514.0)	28.44 (722.4)
J (RF slip-on, RTJ slip-on, RF-DIN slip on)	12.62 (320.4)	20.32 (516.0)	28.52 (724.4)
J (RF 150#, weld neck)	14.37 (364.9)	22.37 (568.1)	30.82 (782.9)
J (RF 300#, weld neck)	14.56 (369.8)	22.63 (574.7)	31.06 (789.0)
J (RF 600#, weld neck)	14.81 (376.0)	22.88 (581.0)	31.38 (797.1)
K (Beveled/Threaded pipe ends)	5.74 (145.7)	8.75 (222.2)	11.91 (302.6)
K (RF slip-on, RTJ slip-on, RF-DIN slip on)(1)	5.82 (147.8)	8.83 (224.2)	11.99 (304.6)
K (RF 150#, weld neck)	7.57 (192.3)	10.88 (276.3)	14.29 (363.1)
K (RF 300#, weld neck)	7.76 (197.1)	11.14 (282.9)	14.53 (369.2)
K (RF 600#, weld neck)	8.01 (203.4)	11.39 (289.2)	14.85 (377.2)
B.D. (Bore Diameter)	0.664 (16.87)	1.097 (27.86)	1.567 (39.80)
Dimensions are in inches (millimeters).			

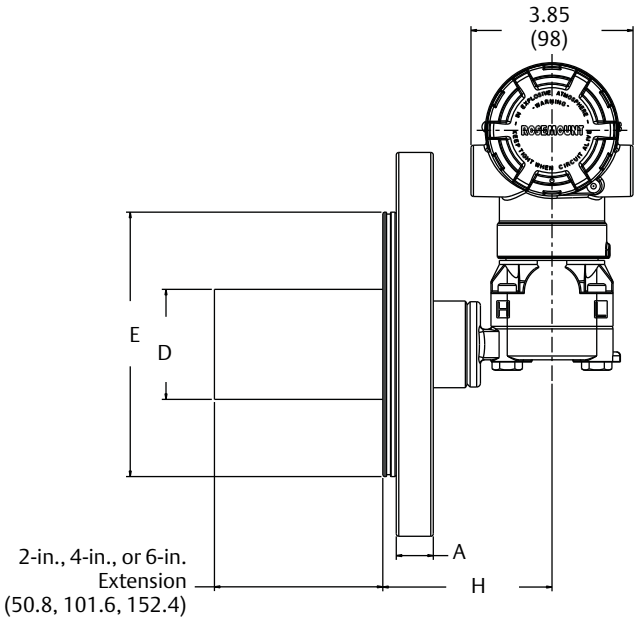
(1) Downstream length shown here includes plate thickness of 0.162-in. (4.11 mm).

Figure A-15. 2051L Liquid Level

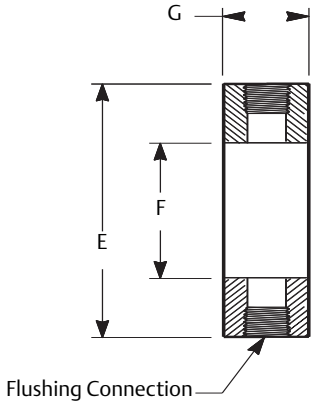
2-in. flange configuration (flush mount only)



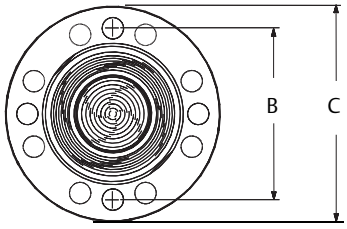
3- and 4-in. flange configuration

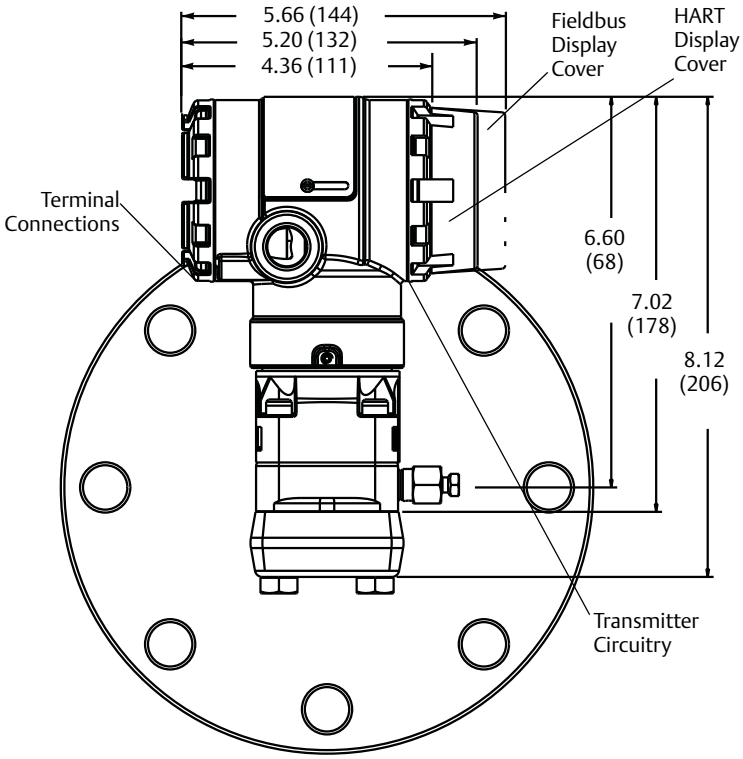


Optional flushing connection ring (lower housing)



Diaphragm assembly and mounting flange





Dimensions are in inches (millimeters).

Table A-15. 2051L Dimensional Specifications

Class[1]	Pipe size	Flange thickness A	Bolt circle diameter B	Outside diameter C	No. of bolts	Bolt hole diameter	Extension diameter[1] D	O.D. gasket surface E
ASME B16.5 (ANSI) 150	2 (51)	0.69 (18)	4.75 (121)	6.0 (152)	4	0.75 (19)	N/A	3.6 (92)
	3 (76)	0.88 (22)	6.0 (152)	7.5 (191)	4	0.75 (19)	2.58 (66)	5.0 (127)
	4 (102)	0.88 (22)	7.5 (191)	9.0 (229)	8	0.75 (19)	3.5 (89)	6.2 (158)
ASME B16.5 (ANSI) 300	2 (51)	0.82 (21)	5.0 (127)	6.5 (165)	8	0.75 (19)	N/A	3.6 (92)
	3 (76)	1.06 (27)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)
	4 (102)	1.19 (30)	7.88 (200)	10.0 (254)	8	0.88 (22)	3.5 (89)	6.2 (158)
DIN 2501 PN 10–40	DN 50	20 mm	125 mm	165 mm	4	18 mm	N/A	4.0 (102)
DIN 2501 PN 25/40	DN 80	24 mm	160 mm	200 mm	8	18 mm	66 mm	5.4 (138)
	DN 100	24 mm	190 mm	235 mm	8	22 mm	89 mm	6.2 (158)

Dimensions are in inches (millimeters).

Class[1]	Pipe size	Process side F	Lower housing G		H
			1/4 NPT	1/2 NPT	
ASME B16.5 (ANSI) 150	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
ASME B16.5 (ANSI) 300	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 10–40	DN 50	2.4 (61)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 25/40	DN 80	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	DN 100	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)

(1) Tolerances are -0.020 and +0.040 (-0,51 and +1,02).

A.9 Ordering information

A.9.1 Rosemount 2051C Coplanar Pressure Transmitter

2051C Coplanar
Pressure Transmitter

Configuration	Transmitter output code
4-20 mA HART 2051 2051 with Selectable HART(1)	A
Lower Power 2051 2051 with Selectable HART(1)	M
FOUNDATION fieldbus	F
PROFIBUS	W
Wireless	X

(1) The 4-20mA with Selectable HART device can be ordered with Transmitter Output option code A plus any of the following options codes: M4, QT, DZ, CR, CS, CT, HR5, HR7.

Additional Information
Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 133 for more information on Material Selection.

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Transmitter type		
2051C	Coplanar Pressure Transmitter		
Measurement type			
D	Differential		★
G	Gage		★
Pressure range			
	2051CD	2051CG	
1	-25 to 25 inH_2O (-62.2 to 62.2 mbar)	-25 to 25 inH_2O (-62.2 to 62.2 mbar)	★
2	-250 to 250 inH_2O (-623 to 623 mbar)	-250 to 250 inH_2O (-623 to 623 mbar)	★
3	-1000 to 1000 inH_2O (-2.5 to 2.5 bar)	-393 to 1000 inH_2O (-0.98 to 2.5 bar)	★
4	-300 to 300 psi (-20.7 to 20.7 bar)	-14.2 to 300 psi (-0.98 to 20.7 bar)	★
5	-2000 to 2000 psi (-137.9 to 137.9 bar)	-14.2 to 2000 psi (-0.98 to 137.9 bar)	★
Transmitter output			
A(1)	4–20 mA with Digital Signal Based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W	PROFIBUS PA Protocol		★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

X	Wireless			★
M	Low-Power, 1–5 Vdc with Digital Signal Based on HART Protocol			
Materials of construction				
	Process flange type	**Flange material**	**Drain/vent**	
2	Coplanar	SST	SST	★
3[(2)]	Coplanar	Cast C-276	Alloy C-276	★
5	Coplanar	Plated CS	SST	★
7[(2)]	Coplanar	SST	Alloy C-276	★
8[(2)]	Coplanar	Plated CS	Alloy C-276	★
0	Alternate Process Connection			★
Isolating diaphragm				
2[(2)]	316L SST			★
3[(2)]	Alloy C-276			★
5[(3)(4)]	Tantalum			
O-ring				
A	Glass-filled PTFE			★
B	Graphite-filled PTFE			★
Sensor fill fluid				
1	Silicone			★
2[(4)]	Inert			★
Housing material			**Conduit entry size**	
A	Aluminum		½–14 NPT	★
B	Aluminum		M20 × 1.5	★
J	SST		½–14 NPT	★
K[(5)]	SST		M20 × 1.5	★
P[(6)]	Engineered Polymer		No Conduit Entries	★
D	Aluminum		G½	
M[(5)]	SST		G½	

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Options (Include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
HART revision configuration		
HR5[7][19]	Configured for HART Revision 5	★
HR7[8][19]	Configured for HART Revision 7	★
PlantWeb control functionality		
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Alternate flange[9]		
H2	Traditional Flange, 316 SST, SST Drain/Vent	★
H3[2]	Traditional Flange, Cast C-276, Alloy C-276 Drain/Vent	★
H7[2]	Traditional Flange, 316 SST, Alloy C-276 Drain/Vent	★
HJ	DIN Compliant Traditional Flange, SST, 7/16 in. Adapter/Manifold Bolting	★
FA	Level Flange, SST, 2 in., ANSI Class 150, Vertical Mount	★
FB	Level Flange, SST, 2 in., ANSI Class 300, Vertical Mount	★
FC	Level Flange, SST, 3 in., ANSI Class 150, Vertical Mount	★
FD	Level Flange, SST, 3 in., ANSI Class 300, Vertical Mount	★
FP	DIN Level Flange, SST, DN 50, PN 40, Vertical Mount	★
FQ	DIN Level Flange, SST, DN 80, PN 40, Vertical Mount	★
Alternate flange[10]		
HK[11]	DIN Compliant Traditional Flange, SST, 10 mm Adapter/Manifold Bolting	
HL	DIN Compliant Traditional Flange, SST, 12 mm Adapter/Manifold Bolting	
Manifold assembly[11][12]		
S5	Assemble to Rosemount 305 Integral Manifold	★
S6	Assemble to Rosemount 304 Manifold or Connection System	★
Integral mount primary element[11][12]		
S4[13]	Assemble to Rosemount 405A, 485, or 585 Annubar® primary element or 1195 Integral Orifice primary element	★
S3	Assemble to Rosemount 405C or 405P Compact Orifice Plate	★
Seal assemblies[12]		
S1[14]	Assemble to one Rosemount 1199 diaphragm seal	★
S2[15]	Assemble to two Rosemount 1199 diaphragm seals	★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Mounting brackets		
B1	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	★
B2	Traditional Flange Bracket for Panel Mounting, CS Bolts	★
B3	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	★
B4	Coplanar Flange Bracket for 2-in. Pipe or Panel Mounting, all SST	★
B7	B1 Bracket with Series 300 SST Bolts	★
B8	B2 Bracket with Series 300 SST Bolts	★
B9	B3 Bracket with Series 300 SST Bolts	★
BA	SST B1 Bracket with Series 300 SST Bolts	★
BC	SST B3 Bracket with Series 300 SST Bolts	★
Product certifications		
E1[5]	ATEX Flameproof	★
E2[5]	INMETRO Flameproof	★
E3[5]	China Flameproof	★
E4[5]	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[5]	IECEx Flameproof	★
EW	India (CCOE) Flameproof Approval	★
I1[5]	ATEX Intrinsic Safety	★
I2[5]	INMETRO Intrinsically Safe	★
I3[5]	China (NEPSI) Intrinsic Safety	★
I4[5][6]	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[5]	IECEx Intrinsic Safety	★
IA[16]	ATEX FISCO Intrinsic Safety	★
IE[16]	FM FISCO Intrinsically Safe	★
IF[16]	CSA FISCO Intrinsically Safe	★
IG[16]	IECEx FISCO Intrinsically Safe	★
IW[5]	India (CCOE) Intrinsically Safe	★
K1[5]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K2	INMETRO Flameproof and Intrinsic Safety	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K7[5]	IECEx Flameproof, Intrinsic Safety, Type n and Dust	★
KA[5]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC[5]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[5]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

N1[5]	ATEX Type n	★
N7[5]	IECEx Type n	★
ND[5]	ATEX Dust	★
EM	Technical Regulations Customs Union (EAC) Flameproof	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	★
KM	Technical Regulations Customs Union (EAC) Flameproof and Intrinsic Safety	★
Drinking water approval		
DW[17]	NSF Drinking Water Approval	★
Shipboard approvals		
SBS[4]	American Bureau of Shipping (ABS) Type Approval	★
SBV[4]	Bureau Veritas (BV) Type Approval	★
SDN[4]	Det Norske Veritas (DNV) Type Approval	★
SLL[4]	Lloyds Register (LR) Type Approval	★
Bolting materials		
L4	Austenitic 316 SST Bolts	★
L5	ASTM A 193, Grade B7M Bolts	★
L6	Alloy K-500 Bolts	★
L8	ASTM A 193 Class 2, Grade B8M Bolts	★
Display and interface options		
M4[18]	LCD Display with Local Operator Interface	★
M5	LCD Display	★
Hardware adjustments		
D4[19]	Zero and Span Configuration Buttons	★
DZ[20]	Digital Zero Trim	★
Flange adapters		
DF[21]	1/2-14 NPT Flange Adapters	★
Conduit plug		
DO[4][22]	316 SST Conduit Plug	★
RC 1/4 RC 1/2 process connection		
D9[23]	RC 1/4 Flange with RC 1/2 Flange Adapter - SST	
Ground screw		
V5[4][24]	External Ground Screw Assembly	★
Performance		
P8[25]	High Performance Option	★
Transient protection		
T1[4][26]	Transient Protection Terminal Block	★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Software configuration		
C1 [20]	Custom Software Configuration (completed CDS 00806-0100-4101 or 00806-0100-4100 for Wireless required with order)	★
Alarm limit		
C4[19][27]	NAMUR alarm and saturation levels, high alarm	★
CN[19][27]	NAMUR alarm and saturation levels, low alarm	★
CR[19]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[19]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[19]	Low Alarm (standard Rosemount alarm and saturation levels)	★
Pressure testing		
P1	Hydrostatic testing with certificate	
Cleaning process area		
P2	Cleaning for Special Service	
P3	Cleaning for < 1 PPM Chlorine/Fluorine	
Maximum static line pressure		
P9	4500 psig (310 bar) Static Pressure Limit (2051CD Ranges 2-5 only)	★
Calibration certification		
D3	¼–18 NPT Process Connections (no flange adapters), Alloy C 276	
D3	¼–18 NPT Process Connections (no flange adapters), Alloy 400	
Q4	Calibration Certificate	★
QG	Calibration Certificate and GOST Verification Certificate	★
QP	Calibration certification and tamper evident seal	★
Material traceability certification		
Q8	Material Traceability Certification per EN 10204 3.1	★
Quality certification for safety		
QS[28]	Prior-use certificate of FMEDA data	★
QT[28]	Safety Certified to IEC 61508 with certificate of FMEDA	★
Surface finish		
Q16	Surface finish certification for sanitary remote seals	★

Table A-16. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Toolkit total system performance reports		
QZ	Remote Seal System Performance Calculation Report	★
Conduit electrical connection		
D3	¼–18 NPT Process Connections (no flange adapters), Alloy C 276	
D3	¼–18 NPT Process Connections (no flange adapters), Alloy 400	
GE(4)	M12, 4-pin, Male Connector (eurofast®)	★
GM(4)	A size Mini, 4-pin, Male Connector (minifast®)	★
NACE certificate		
Q15(29)	Certificate of Compliance to NACE MR0175/ISO 15156 for wetted materials	★
Q25(29)	Certificate of Compliance to NACE MR0103 for wetted materials	★
Typical model number: 2051C D 2 A 2 2 A 1 A B4 M5$13857 780		

(1) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(2) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments. Order with Q15 or Q25 to receive a NACE certificate.
(3) Available in Ranges 2-5 only.
(4) Not available with output code X.
(5) Not available with Low Power output code M.
(6) Only available with output code X.
(7) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(8) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.
(9) Requires 0 code in Materials of Construction for Alternate Process Connection.
(10) Requires 0 code in Materials of Construction for Alternate Process Connection.
(11) Not valid with optional code P9 for 4500 psi Static Pressure.
(12) "Assemble-to" items are specified separately and require a completed model number.
(13) Process Flange limited to Coplanar (codes 2, 3, 5, 7, 8) or Traditional (H2, H3, H7).
(14) Not valid with optional code D9 for RC1/2 Adapters.
(15) Not valid with optional codes DF or D9 for Adapters.
(16) Only valid with FOUNDATION fieldbus output code F.
(17) Not available with Alloy C-276 isolator (3 code), tantalum isolator (5 code), all cast C-276 flanges, all plated CS flanges, all DIN flanges, all Level flanges, assemble-to manifolds (S5 and S6 codes), assemble-to seals (S1 and S2 codes), assemble-to primary elements (S3 and S4 codes), surface finish certification (Q16 code), and remote seal system report (QZ code).
(18) Not available with FOUNDATION fieldbus output code F or Wireless Output Code X.
(19) Only Available with HART 4-20 mA (output codes A and M).
(20) Only available with HART 4-20 mA Output (Output Codes A) and Wireless Output (Output Code X).
(21) Not valid with Alternate Process Connection options S3, S4, S5, S6.
(22) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
(23) Not available with Alternate Process Connection: DIN Flanges and Level Flanges.
(24) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(25) Available with 4-20 mA HART output code A, Wireless output code X, FOUNDATION fieldbus output code F, 2051C Ranges 2-5 or 2051T Ranges 1-4, SST diaphragms and silicone fill fluid. High Performance Option includes 0.05% Reference Accuracy, 5 year stability and improved ambient temperature effect specifications. See Performance specifications for details.
(26) The T1 option is not needed with FISCO Product Certifications; transient protection is included in the FISCO product certification codes IA and IE.
(27) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
(28) Only available with HART 4-20 mA output (output code A).
(29) NACE Compliant wetted materials are identified by Footnote 2.

A.9.2 Rosemount 2051T In-Line Pressure Transmitter

2051T In-Line
Wireless Pressure Transmitter

Configuration	Transmitter output code
4-20 mA HART 2051 2051 with Selectable HART(1)	A
Lower Power 2051 2051 with Selectable HART(1)	M
FOUNDATION fieldbus	F
PROFIBUS	W
Wireless	X

(1) The 4-20mA with Selectable HART device can be ordered with Transmitter Output option code A plus any of the following options codes: M4, QT, DZ, CR, CS, CT, HR5, HR7.

Additional Information
Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 133 for more information on Material Selection.

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model	Transmitter type		
2051T	In-Line Pressure Transmitter		★
Pressure type			
G	Gage		★
A(1)	Absolute		★
Pressure range			
	2051TG	2051TA	★
1	-14.7 to 30 psi (-1.0 to 2.1 bar)	0 to 30 psi (0 to 2.1 bar)	★
2	-14.7 to 150 psi (-1.0 to 10.3 bar)	0 to 150 psi (0 to 10.3 bar)	★
3	-14.7 to 800 psi (-1.0 to 55 bar)	0 to 800 psi (0 to 55 bar)	★
4	-14.7 to 4000 psi (-1.0 to 276 bar)	0 to 4000 psi (0 to 276 bar)	★
5	-14.7 to 10000 psi (-1.0 to 689 bar)	0 to 10000 psi (0 to 689 bar)	★
Transmitter output			
A(2)	4–20 mA with Digital Signal Based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W	PROFIBUS PA Protocol		★

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

X	Wireless		★
M	Low-Power, 1–5 Vdc with Digital Signal Based on HART Protocol		
Process connection style			
2B	1/2–14 NPT female		★
2C[3]	G1/2 A DIN 16288 male		★
2F[4]	Coned and Threaded, Compatible with Autoclave Type F-250-C (Range 5 only)		
Isolating diaphragm		**Process connection wetted parts material**	
2[5]	316L SST	316L SST	★
3[5]	Alloy C-276	Alloy C-276	★
Sensor fill fluid			
1	Silicone		★
2[4]	Inert		★
Housing material		**Conduit entry size**	
A	Aluminum	½–14 NPT	★
B	Aluminum	M20 × 1.5	★
J	SST	½–14 NPT	★
K[6]	SST	M20 × 1.5	★
P[7]	Engineered Polymer	No Conduit Entries	★
D	Aluminum	G½	
M[6]	SST	G½	

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Options (Include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
HART revision configuration		
HR5[8][19]	Configured for HART Revision 5	★
HR7[9][19]	Configured for HART Revision 7	★

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

PlantWeb control functionality		
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Manifold assemblies		
S5[10]	Assemble to Rosemount 306 Integral Manifold	★
Seal assemblies		
S1[10]	Assemble to one Rosemount 1199 diaphragm seal	★
Mounting bracket		
B4	Bracket for 2-in. Pipe or Panel Mounting, All SST	★
Product certifications		
E1[6]	ATEX Flameproof	★
E2[6]	INMETRO Flameproof	★
E3[6]	China Flameproof	★
E4[6]	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[6]	IECEx Flameproof	★
EW[6]	India (CCOE) Flameproof Approval	★
I1[6]	ATEX Intrinsic Safety	★
I2[6]	INMETRO Intrinsically Safe	★
I3[6]	China Intrinsic Safety	★
I4[6][7]	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[6]	IECEx Intrinsic Safety	★
IA[13]	ATEX FISCO Intrinsic Safety	★
IE[11]	FM FISCO Intrinsically Safe	★
IF[11]	CSA FISCO Intrinsically Safe	★
IG[11]	IECEx FISCO Intrinsically Safe	★
IW[6]	India (CCOE) Intrinsic Safety Approval	★
K1[6]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K7[6]	IECEx Flameproof, Intrinsic Safety, Type n, Dust	★
KA[6]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC[6]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[6]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★
N1[6]	ATEX Type n	★
N7[6]	IECEx Type n	★
ND[6]	ATEX Dust	★
EM	Technical Regulations Customs Union (EAC) Flameproof	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	★
KM	Technical Regulations Customs Union (EAC) Flameproof and Intrinsic Safety	★
Drinking water approval		
DW[12]	NSF Drinking Water Approval	★
Shipboard approvals		
SBS[4]	American Bureau of Shipping (ABS) Type Approval	★
SBV[4]	Bureau Veritas (BV) Type Approval	★
SDN[4]	Det Norske Veritas (DNV) Type Approval	★
SLL[4]	Lloyds Register (LR) Type Approval	★
Display and interface options		
M4[13]	LCD Display with Local Operator Interface	★
M5	LCD Display	★
Hardware adjustments		
D4[14]	Zero and Span Configuration Buttons	★
DZ[15]	Digital Zero Trim	★
Wireless SST sensor module		
WSM[7]	Wireless SST Sensor Module	★
Conduit plug		
DO[4][16]	316 SST Conduit Plug	★
Ground screw		
V5[4][17]	External Ground Screw Assembly	★
Performance		
P8[18]	High Performance Option	★
Terminal blocks		
T1[4][19]	Transient Protection Terminal Block	★

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Software configuration		
C1[15]	Custom Software Configuration (completed CDS 00806-0100-4101 or 00806-0100-4100 for Wireless required with order)	★
Alarm limits		
C4[14][20]	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Alarm High	★
CN[14][21]	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Alarm Low	★
CR[14]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[14]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[14]	Low Alarm (standard Rosemount alarm and saturation levels)	★
Pressure testing		
P1	Hydrostatic testing with certificate	
Cleaning process area[22]		
P2	Cleaning for Special Service	
P3	Cleaning for <1 PPM Chlorine/Fluorine	
Calibration certification		
D3	¼–18 NPT Process Connections (No flange adapters), Alloy C 276	
D3	¼–18 NPT Process Connections (No flange adapters), Alloy 400	
Q4	Calibration Certificate	★
QG	Calibration Certificate and GOST Verification Certificate	★
QP	Calibration Certificate and tamper evident seal	★
Material traceability certification		
Q8	Material Traceability Certification per EN 10204 3.1	★
Quality certification for safety		
QS[21]	Prior-use certificate of FMEDA data	★
QT[21]	Safety Certified to IEC 61508 with certificate of FMEDA	★
Surface finish		
Q16	Surface finish certification for sanitary remote seals	★
Toolkit total system performance reports		
QZ	Remote Seal System Performance Calculation Report	★
Conduit electrical connector		
GE[4]	M12, 4-pin, Male Connector (eurofast)	★
GM[4]	A size Mini, 4-pin, Male Connector (minifast)	★

Table A-17. Rosemount 2051T In-Line Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

NACE certificate		
Q15[23]	Certificate of Compliance to NACE MR0175/ISO 15156 for wetted materials	★
Q25[23]	Certificate of Compliance to NACE MR0103 for wetted materials	★
Typical model number:	**2051T G 3 A 2B 2 1 A B4 M5**	

(1) Wireless Output (code X) only available in absolute measurement type (code A) in range 1-5 with 1/2 14 NPT process connection (code 2B), and housing code (code P).
(2) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(3) Wireless output (code X) only available in G1/2 A DIN 16288 Male process connection (code 2C) with range 1-4, 316 SST isolating diaphragm (code 2), silicone fill fluid (code 1), and housing code (code P).
(4) Not available with output code X.
(5) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments. Order with Q15 or Q25 to receive a NACE certificate.
(6) Not available with Low Power output code M.
(7) Only available with output code X.
(8) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(9) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.
(10) “Assemble-to” items are specified separately and require a completed model number.
(11) Only valid with FOUNDATION fieldbus output code F.
(12) Not available with coned and threaded connection (2F code), assemble-to manifold (S5 code), assemble-to seal (S1 code), surface finish certification (Q16 code), remote seal system report (QZ code).
(13) Not available with FOUNDATION fieldbus output code F or Wireless output code X.
(14) Only Available with HART (output codes A and M).
(15) Only available with HART 4-20 mA Output (output code A) and Wireless Output (output code X).
(16) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
(17) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(18) Available with 4-20 mA HART output code A, Wireless output code X, FOUNDATION fieldbus output code F, 2051C Ranges 2-5 or 2051T Ranges 1-4, SST diaphragms and silicone fill fluid. High Performance Option includes 0.05% Reference Accuracy, 5 year stability and improved ambient temperature effect specifications. See Performance Specifications for details.
(19) The T1 option is not needed with FISCO Product Certifications; transient protection is included in the FISCO product certification codes IA and IE.
(20) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
(21) Only available with HART 4-20 mA output (output code A).
(22) Not valid with Alternate Process Connection S5.
(23) NACE Compliant wetted materials are identified by Footnote 2.

A.9.3 Rosemount 2051CF Flowmeters

Configuration	Transmitter output code
4-20 mA HART® 2051 2051 with Selectable HART(1)	A
Lower Power 2051 2051 with Selectable HART(1)	M
FOUNDATION fieldbus	F
PROFIBUS	W
Wireless	X

(1) The 4-20 mA with Selectable HART device can be ordered with Transmitter Output option code A plus any of the following options codes: M4, QT, DZ, CR, CS, CT, HR5, HR7.

Additional Information
Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 133 for more information on Material Selection.

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
2051CFA	Annubar Flowmeter	
Measurement type		
D	Differential Pressure	★
Fluid type		
L	Liquid	★
G	Gas	★
S	Steam	★
Line size		
020	2-in. (50 mm)	★
025	2 1/2-in. (63.5 mm)	★
030	3-in. (80 mm)	★
035	3 1/2-in. (89 mm)	★
040	4-in. (100 mm)	★
050	5-in. (125 mm)	★
060	6-in. (150 mm)	★
070	7-in. (175 mm)	★
080	8-in. (200 mm)	★
100	10-in. (250 mm)	★
120	12-in. (300 mm)	★

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Pipe I.D. range		
C	Range C from the Pipe I.D. table	★
D	Range D from the Pipe I.D. table	★
A	Range A from the Pipe I.D. table	
B	Range B from the Pipe I.D. table	
E	Range E from the Pipe I.D. table	
Z	Non-standard Pipe I.D. Range or Line Sizes greater than 12 in.	
Pipe material/mounting assembly material		
C	Carbon steel (A105)	★
S	316 Stainless Steel	★
0[(1)]	No Mounting (customer supplied)	
G	Chrome-Moly Grade F-11	
N	Chrome-Moly Grade F-22	
J	Chrome-Moly Grade F-91	
Piping orientation		
H	Horizontal Piping	★
D	Vertical Piping with Downwards Flow	★
U	Vertical Piping with Upwards Flow	★
Annubar type		
P	Pak-Lok	★
F	Flanged with opposite side support	★
Sensor material		
S	316 Stainless Steel	★
Sensor size		
1	Sensor size 1 — Line sizes 2-in. (50 mm) to 8-in. (200 mm)	★
2	Sensor size 2 — Line sizes 6-in. (150 mm) to 96-in. (2400 mm)	★
3	Sensor size 3 — Line sizes greater than 12-in. (300 mm)	★
Mounting type		
T1	Compression or Threaded Connection	★
A1	150# RF ANSI	★
A3	300# RF ANSI	★
A6	600# RF ANSI	★
D1	DN PN16 Flange	★
D3	DN PN40 Flange	★
D6	DN PN100 Flange	★
R1	150# RTJ Flange	
R3	300# RTJ Flange	
R6	600# RTJ Flange	
Opposite side support or packing gland		
0	No opposite side support or packing gland (required for Pak-Lok and Flange-Lok models)	★
	Opposite Side Support – **Required for Flanged Models**	

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

C	NPT Threaded Opposite Support Assembly – Extended Tip		★
D	Welded Opposite Support Assembly – Extended Tip		★
Isolation valve for Flo-Tap models			
0[(1)]	Not Applicable or Customer Supplied		★
Temperature measurement			
T	Integral RTD – not available with Flanged model greater than class 600#		★
0	No Temperature Sensor		★
R	Remote Thermowell and RTD		
Transmitter connection platform			
3	Direct-mount, Integral 3-valve Manifold– not available with Flanged model greater than class 600		★
5	Direct -mount, 5-valve Manifold – not available with Flanged model greater than class 600		★
7	Remote-mount NPT Connections ($^1/_2$-in. FNPT)		★
8	Remote-mount SW Connections ($^1/_2$-in.)		
Differential pressure range			
1	0 to 25 in H_2O (0 to 62,3 mbar)		★
2	0 to 250 in H_2O (0 to 623 mbar)		★
3	0 to 1000 in H_2O (0 to 2,5 bar)		★
Transmitter output			
A[(2)]	4–20 mA with digital signal based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W	PROFIBUS PA Protocol		★
X	Wireless		★
M	Low-Power, 1-5 Vdc with Digital Signal Based on HART Protocol		
Transmitter housing material		**Conduit entry size**	
A	Aluminum	$^1/_2$-14 NPT	★
B	Aluminum	M20 x 1.5	★
J	SST	$^1/_2$-14 NPT	★
K[(3)]	SST	M20 x 1.5	★
P[(4)]	Engineered Polymer	No Conduit Entries	★
D	Aluminum	G$^1/_2$	
M[(3)]	SST	G$^1/_2$	
Transmitter performance class			
1	2.0% flow rate accuracy, 5:1 flow turndown, 2-year stability		★

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Options (Include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	
WR5	5-year limited warranty	
Pressure testing		
P1[3][5]	Hydrostatic Testing with Certificate	
PX[3][5]	Extended Hydrostatic Testing	
Special cleaning		
P2[3]	Cleaning for Special Services	
PA[3]	Cleaning per ASTM G93 Level D (Section 11.4)	
Material testing		
V1[3]	Dye Penetrant Exam	
Material examination		
V2[3]	Radiographic Examination	
Special inspection		
QC1[3]	Visual & Dimensional Inspection with Certificate	★
QC7[3]	Inspection & Performance Certificate	★
Surface finish		
RL[3]	Surface finish for Low Pipe Reynolds # in Gas & Steam	★
RH[3]	Surface finish for High Pipe Reynolds # in Liquid	★
Material traceability certification		
Q8[3][6]	Material Traceability Certification per EN 10474:2004 3.1	★
Code conformance		
J2 [3]	ANSI/ASME B31.1	
J3[3]	ANSI/ASME B31.3	
Materials conformance		
J5[3][7]	NACE MR-0175 / ISO 15156	
Country certification		
J6[3]	European Pressure Directive (PED)	★
J1[3]	Canadian Registration	
Instrument connections for remote mount options		
G2[3]	Needle Valves, Stainless Steel	★
G6[3]	OS&Y Gate Valve, Stainless Steel	★
G1[3]	Needle Valves, Carbon Steel	
G3[3]	Needle Valves, Alloy C-276	
G5[3]	OS&Y Gate Valve, Carbon Steel	
G7[3]	OS&Y Gate Valve, Alloy C-276	

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Special shipment		
Y1[3]	Mounting Hardware Shipped Separately	★
Product certifications		
E1[3]	ATEX Flameproof	★
E2[3]	INMETRO Flameproof	★
E3[3]	China Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[3]	IECEx Flameproof	★
I1[3]	ATEX Intrinsic Safety	★
I2[3]	INMETRO Intrinsically Safe	★
I3[3]	China Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[3]	IECEx Intrinsic Safety	★
IA[3][8]	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
IE[3][8]	FM FISCO Intrinsically Safe	★
IF[3][8]	CSA FISCO Intrinsically Safe	★
IG[3][8]	IECEx FISCO Intrinsically Safe	★
K1[3]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
K7[3]	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	★
KA[3]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC[3]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[3]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1)	★
N1[3]	ATEX Type n	★
N7[3]	IECEx Type n	★
ND[3]	ATEX Dust	★
Sensor fill fluid and O-ring options		
L1[3][9]	Inert Sensor Fill Fluid	★
L2[3]	Graphite-Filled (PTFE) O-ring	★
LA[3][9]	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	★
Display and interface options		
M4[3][10]	LCD Display with Local Operator Interface	★
M5[3]	LCD Display	★
Transmitter calibration certification		
Q4[3]	Calibration Certificate for Transmitter	★
Quality certification for safety		
QS[3][11]	Prior-use certificate of FMEDA data	★
QT[3][11]	Safety Certified to IEC 61508 with certificate of FMEDA	★

Table A-18. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Transient protection		
T1[(3)(9)(12)]	Transient terminal block	★
Manifold for remote mount option		
F2[(3)]	3-Valve Manifold, Stainless Steel	★
F6[(3)]	5-Valve Manifold, Stainless Steel	★
F1[(3)]	3-Valve Manifold, Carbon Steel	
F5[(3)]	5-Valve Manifold, Carbon Steel	
PlantWeb control functionality		
A01[(3)(8)]	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Hardware adjustments		
D4[(3)(13)]	Zero and Span Hardware Adjustments	★
DZ[(3)(14)]	Digital Zero Trim	★
Alarm limit		
C4[(3)(13)(15)]	NAMUR Alarm and Saturation Levels, High Alarm	★
CN[(3)(13)(15)]	NAMUR Alarm and Saturation Levels, Low Alarm	★
CR[(3)(13)]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[(3)(13)]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[(3)(13)]	Low Alarm (standard Rosemount alarm and saturation levels)	★
Ground screw		
V5[(3)(9)(16)]	External Ground Screw Assembly	★
HART revision configuration		
HR5[(3)(13)(17)]	Configured for HART Revision 5	★
HR7[(3)(13)(18)]	Configured for HART Revision 7	★
Typical model number: 2051CFA D L 060 D C H P S 2 T1 0 0 0 3 2A A 1A 3		

(1) Provide the "A" dimension for Flanged (page 147) and Pak-Lok (page 147).

(2) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(3) Not available with Low Power Output Code M.
(4) Only available with output code X.
(5) Applies to assembled flowmeter only, mounting not tested.
(6) Instrument Connections for Remote Mount Options and Isolation Valves for Flo-tap Models are not included in the Material Traceability Certification.
(7) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
(8) Only valid with FOUNDATION fieldbus Output Code F.
(9) Not available with output code X.
(10) Not available with FOUNDATION fieldbus (Output Code F) or Wireless (Output Code X).
(11) Only available with 4-20 mA HART (Output Code A).
(12) Not available with Housing code 00, 5A or 7J. The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.
(13) Only available with 4-20 mA HART (output codes A and M).
(14) Only available with HART 4-20 mA Output (output codes A and M) and Wireless Output (output code X).
(15) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
(16) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(17) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(18) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.

Rosemount 2051CFC Compact Flowmeter

Additional Information
Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 133 for more information on Material Selection.

Table A-19. Rosemount 2051CFC Compact Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
2051CFC	Compact Flowmeter	
Measurement type		
D	Differential Pressure	★
Primary element technology		
A	Annubar Averaging Pitot Tube	
C	Conditioning Orifice Plate	★
P	Orifice Plate	★
Material type		
S	316 SST	★
Line size		
005(1)	1/2-in. (15 mm)	★
010(1)	1-in. (25 mm)	★
015(1)	1 1/2-in. (40 mm)	★
020	2-in. (50 mm)	★
030	3-in. (80 mm)	★
040	4-in. (100 mm)	★
060	6-in. (150 mm)	★
080	8-in. (200 mm)	★
100	10-in. (250 mm)	★
120	12-in. (300 mm)	★
Primary element style		
N	Square Edged	★
Primary element type		
N000	Annubar Sensor Size 1	
N040	0.40 Beta Ratio	★
N050	0.50 Beta Ratio	
N065(2)	0.65 Beta Ratio	★

Table A-19. Rosemount 2051CFC Compact Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Temperature measurement		
0	No Temperature Sensor	★
R	Remote Thermowell and RTD	
Transmitter connection platform		
3	Direct-mount, Integral 3-valve Manifold	★
7	Remote-mount, 1/4-in. NPT Connections	★
Differential pressure range		
1	0 to 25 in H_2O (0 to 62,3 mbar)	★
2	0 to 250 in H_2O (0 to 623 mbar)	★
3	0 to 1000 in H_2O (0 to 2,5 bar)	★
Transmitter output		
A[3]	4–20 mA with digital signal based on HART Protocol	★
F	FOUNDATION fieldbus Protocol	★
W	PROFIBUS PA Protocol	★
X	Wireless	★
M	Low-Power, 1-5 Vdc with Digital Signal Based on HART Protocol	
Transmitter housing material	**Conduit entry size**	
A	Aluminum	1/2-14 NPT	★
B	Aluminum	M20 x 1.5	★
J	SST	1/2-14 NPT	★
K[4]	SST	M20 x 1.5	★
P[5]	Engineered Polymer	No Conduit Entries	★
D	Aluminum	G1/2	
M[4]	SST	G1/2	
Transmitter performance class		
1	up to ±2.25% flow rate accuracy, 5:1 flow turndown, 2-year stability	★

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Options (include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	
WR5	5-year limited warranty	
Installation accessories		
AB[4]	ANSI Alignment Ring (150#) (only required for 10-in. [250 mm] and 12-in. [300 mm] line sizes)	★
AC[4]	ANSI Alignment Ring (300#) (only required for 10-in. [250 mm] and 12-in. [300 mm] line sizes)	★
AD[4]	ANSI Alignment Ring (600#) (only required for 10-in. [250 mm] and 12-in. [300 mm] line sizes)	★
DG[4]	DIN Alignment Ring (PN16)	★

Table A-19. Rosemount 2051CFC Compact Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

DH[4]	DIN Alignment Ring (PN40)	★
DJ[4]	DIN Alignment Ring (PN100)	★
JB[4]	JIS Alignment Ring (10K)	
JR[4]	JIS Alignment Ring (20K)	
JS[4]	JIS Alignment Ring (40K)	
Remote adapters		
FE[4]	Flange Adapters 316 SST (1/2-in NPT)	★
High temperature application		
HT[4]	Graphite Valve Packing (Tmax = 850 °F)	
Flow calibration		
WC[4][6]	Flow Calibration Certification (3 point)	
WD[4][6]	Discharge Coefficient Verification (full 10 point)	
Pressure testing		
P1[4]	Hydrostatic Testing with Certificate	
Special cleaning		
P2[4]	Cleaning for Special Services	
PA[4]	Cleaning per ASTM G93 Level D (Section 11.4)	
Special inspection		
QC1[4]	Visual & Dimensional Inspection with Certificate	★
QC7[4]	Inspection and Performance Certificate	★
Transmitter calibration certification		
Q4[4]	Calibration Certificate for Transmitter	★
Quality certification for safety		
QS[4][7]	Prior-use certificate of FMEDA data	★
QT[4][7]	Safety Certified to IEC 61508 with certificate of FMEDA	★
Material traceability certification		
Q8[4]	Material Traceability Certification per EN 10204:2004 3.1	★
Code conformance		
J2[4]	ANSI/ASME B31.1	
J3[4]	ANSI/ASME B31.3	
J4[4]	ANSI/ASME B31.8	
Materials conformance		
J5[4][8]	NACE MR-0175 / ISO 15156	
Country certification		
J1[4]	Canadian Registration	
Product certifications		
E1[4]	ATEX Flameproof	★
E2[4]	INMETRO Flameproof	★
E3[4]	China Flameproof	★

Table A-19. Rosemount 2051CFC Compact Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[4]	IECEx Flameproof	★
I1[4]	ATEX Intrinsic Safety	★
I2[4]	INMETRO Intrinsically Safe	★
I3[4]	China Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[4]	IECEx Intrinsic Safety	★
IA[4][9]	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
IE[4][9]	FM FISCO Intrinsically Safe	★
IF[4][9]	CSA FISCO Intrinsically Safe	★
IG[4][9]	IECEx FISCO Intrinsically Safe	★
K1[4]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
K7[4]	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	★
KA[4]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC[4]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[4]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1)	★
N1[4]	ATEX Type n	★
N7[4]	IECEx Type n	★
ND[4]	ATEX Dust	★
Sensor fill fluid and O-ring options		
L1[4][10]	Inert Sensor Fill Fluid	★
L2[4]	Graphite-Filled (PTFE) O-ring	★
LA[4][10]	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	★
Display and interface options		
M4[4][7]	LCD Display with Local Operator Interface	★
M5[4]	LCD Display	★
Transient protection		
T1[4][10][11]	Transient terminal block	★
Manifold for remote mount option		
F2[4]	3-Valve Manifold, Stainless Steel	★
F6[4]	5-Valve Manifold, Stainless Steel	★
Alarm limit		
C4[4][12][13]	NAMUR Alarm and Saturation Levels, High Alarm	★
CN[4][12][13]	NAMUR Alarm and Saturation Levels, Low Alarm	★
CR[4][12]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[4][12]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[4][12]	Low Alarm (standard Rosemount alarm and saturation levels)	★

Table A-19. Rosemount 2051CFC Compact Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

PlantWeb control functionality		
A01[4][9]	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Hardware adjustments		
D4[4][12]	Zero and Span Hardware Adjustments	★
DZ[4][14]	Digital Zero Trim	★
Ground screw		
V5[4][10][15]	External Ground Screw Assembly	★
HART revision configuration		
HR5[4][12][16]	Configured for HART Revision 5	★
HR7[4][12][17]	Configured for HART Revision 7	★
Typical model number: 2051CFC D C S 060 N 065 0 3 2 A A 1 WC E5 M5		

(1) Not available for Primary Element Technology C.

(2) For 2-in. (50 mm) line sizes the Primary Element Type is 0.6 for Primary Element Technology Code C.
(3) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(4) Not available with Low Power Output Code M.
(5) Only available with output code X.
(6) Not available with Primary Element Technology P.
(7) Not available with FOUNDATION fieldbus (Output Code F) or Wireless (Output Code X).
(8) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
(9) Only valid with FOUNDATION fieldbus Output Code F.
(10) Not available with output code X.
(11) Not available with Housing code 00, 5A, or 7J. The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.
(12) Only available with 4-20 mA HART (output codes A and M).
(13) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
(14) Only available with HART 4-20 mA (Output Codes A and M) and Wireless (Output Code X).
(15) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(16) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(17) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if 14 needed.

Rosemount 2051CFP Integral Orifice Flowmeter

Additional Information
Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 133 for more information on Material Selection.

Table A-20. Rosemount 2051CFP Integral Orifice Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
2051CFP	Integral Orifice Flowmeter	
Measurement type		
D	Differential Pressure	★
Material type		
S	316 SST	★
Line size		
005	1/2-in. (15 mm)	★
010	1-in. (25 mm)	★
015	1 1/2-in. (40 mm)	★
Process connection		
T1	NPT Female Body (not available with Remote Thermowell and RTD)	★
S1(1)	Socket Weld Body (not available with Remote Thermowell and RTD)	★
P1	Pipe Ends: NPT Threaded	★
P2	Pipe ends: Beveled	★
D1	Pipe Ends: Flanged, DIN PN16, slip-on	★
D2	Pipe Ends: Flanged, DIN PN40, slip-on	★
D3	Pipe Ends: Flanged, DIN PN100, slip-on	★
W1	Pipe Ends: Flanged, RF, ANSI Class 150, weld-neck	★
W3	Pipe Ends: Flanged, RF, ANSI Class 300, weld-neck	★
W6	Pipe Ends: Flanged, RF, ANSI Class 600, weld-neck	★
Process connection		
A1	Pipe Ends: Flanged, RF, ANSI Class 150, slip-on	
A3	Pipe Ends: Flanged, RF, ANSI Class 300, slip-on	
A6	Pipe Ends: Flanged, RF, ANSI Class 600, slip-on	
R1	Pipe Ends: Flanged, RTJ, ANSI Class 150, slip-on	
R3	Pipe Ends: Flanged, RTJ, ANSI Class 300, slip-on	
R6	Pipe Ends: Flanged, RTJ, ANSI Class 600, slip-on	
Orifice plate material		
S	316 SST	★

Table A-20. Rosemount 2051CFP Integral Orifice Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Bore size option			
0066	0.066-in. (1.68 mm) for 1/2-in. Pipe		★
0109	0.109-in. (2.77 mm) for 1/2-in. Pipe		★
0160	0.160-in. (4.06 mm) for 1/2-in. Pipe		★
0196	0.196-in. (4.98 mm) for 1/2-in. Pipe		★
0260	0.260-in. (6.60 mm) for 1/2-in. Pipe		★
0340	0.340-in. (8.64 mm) for 1/2-in. Pipe		★
0150	0.150-in. (3.81 mm) for 1-in. Pipe		★
0250	0.250-in. (6.35 mm) for 1-in. Pipe		★
0345	0.345-in. (8.76 mm) for 1-in. Pipe		★
0500	0.500-in. (12.70 mm) for 1-in. Pipe		★
0630	0.630-in. (16.00 mm) for 1-in. Pipe		★
0800	0.800-in. (20.32 mm) for 1-in. Pipe		★
0295	0.295-in. (7.49 mm) for 1 1/2-in. Pipe		★
0376	0.376-in. (9.55 mm) for 1 1/2-in. Pipe		★
0512	0.512-in. (13.00 mm) for 1 1/2-in. Pipe		★
0748	0.748-in. (19.00 mm) for 1 1/2-in. Pipe		★
1022	1.022-in. (25.96 mm) for 1 1/2-in. Pipe		★
1184	1.184-in. (30.07 mm) for 1 1/2-in. Pipe		★
0010	0.010-in. (0.25 mm) for 1/2-in. Pipe		
0014	0.014-in. (0.36 mm) for 1/2-in. Pipe		
0020	0.020-in. (0.51 mm) for 1/2-in. Pipe		
0034	0.034-in. (0.86 mm) for 1/2-in. Pipe		
Transmitter connection platform			
D3	Direct-mount, 3-Valve Manifold, SST		★
D5	Direct-mount, 5-Valve Manifold, SST		★
R3	Remote-mount, 3-Valve Manifold, SST		★
R5	Remote-mount, 5-Valve Manifold, SST		★
Differential pressure ranges			
1	0 to 25 in H_2O (0 to 62,3 mbar)		★
2	0 to 250 in H_2O (0 to 623 mbar)		★
3	0 to 1000 in H_2O (0 to 2,5 bar)		★
Transmitter output			
A[(2)]	4–20 mA with digital signal based on HART protocol		★
F	FOUNDATION fieldbus protocol		★
W	PROFIBUS PA Protocol		★
X	Wireless		★
M	Low-Power, 1-5 Vdc with Digital Signal Based on HART Protocol		
Transmitter housing material		**Conduit entry size**	
A	Aluminum	1/2-14 NPT	★
B	Aluminum	M20 x 1.5	★
J	SST	1/2-14 NPT	★

Table A-20. Rosemount 2051CFP Integral Orifice Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

K[3]	SST	M20 x 1.5	★
P[4]	Engineered Polymer	No Conduit Entries	★
D	Aluminum	G1/2	
M[3]	SST	G1/2	
Transmitter performance class			
1	up to ±2.25% flow rate accuracy, 5:1 flow turndown, 2-year stability		★

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Options (include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	
WR5	5-year limited warranty	
Temperature sensor		
RT[3][5]	Thermowell and RTD	
Optional connection		
G1[3]	DIN 19213 Transmitter Connection	★
Pressure testing		
P1[3][6]	Hydrostatic Testing with Certificate	
Special cleaning		
P2[3]	Cleaning for Special Services	
PA[3]	Cleaning per ASTM G93 Level D (Section 11.4)	
Material testing		
V1[3]	Dye Penetrant Exam	
Material examination		
V2[3]	Radiographic Examination	
Flow calibration		
WD[3][7]	Discharge Coefficient Verification	
Special inspection		
QC1[3]	Visual & Dimensional Inspection with Certificate	★
QC7[3]	Inspection and Performance Certificate	★
Material traceability certification		
Q8[3]	Material Traceability Certification per EN 10204:2004 3.1	★
Code conformance		
J2[3][8]	ANSI/ASME B31.1	

Table A-20. Rosemount 2051CFP Integral Orifice Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

J3[3][8]	ANSI/ASME B31.3	
J4[3][8]	ANSI/ASME B31.8	
Materials conformance		
J5[3][9]	NACE MR-0175 / ISO 15156	
Country certification		
J6[3]	European Pressure Directive (PED)	★
J1[3]	Canadian Registration	
Transmitter calibration certification		
Q4[3]	Calibration Certificate for Transmitter	★
Quality certification for safety		
QS[3][10]	Prior-use certificate of FMEDA data	★
QT[3][13]	Safety Certified to IEC 61508 with certificate of FMEDA	★
Product certifications		
E1[3]	ATEX Flameproof	★
E2[3]	INMETRO Flameproof	★
E3[3]	China Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[3]	IECEx Flameproof	★
I1[3]	ATEX Intrinsic Safety	★
I2[3]	INMETRO Intrinsically Safe	★
I3[3]	China Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[3]	IECEx Intrinsic Safety	★
IA[3][11]	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
IE[3][11]	FM FISCO Intrinsically Safe	★
IF[3][11]	CSA FISCO Intrinsically Safe	★
IG[3][11]	IECEx FISCO Intrinsically Safe	★
K1[3][11]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
K7[3]	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	★
KA[3]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC[3]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[3]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1)	★
N1[3]	ATEX Type n	★
N7[3]	IECEx Type n	★
ND[3]	ATEX Dust	★

Table A-20. Rosemount 2051CFP Integral Orifice Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Sensor fill fluid and O-ring options		
L1[3][12]	Inert Sensor Fill Fluid	★
L2[3]	Graphite-Filled (PTFE) O-ring	★
LA[3][12]	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	★
Display and interface options		
M4[3][13]	LCD Display with Local Operator Interface	★
M5[3]	LCD Display	★
Transient protection		
T1[3][12][13]	Transient terminal block	★
Alarm limit		
C4[3][14][15]	NAMUR Alarm and Saturation Levels, High Alarm	★
CN[3][14][15]	NAMUR Alarm and Saturation Levels, Low Alarm	★
CR[3][14]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[3][14]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[3][14]	Low Alarm (standard Rosemount alarm and saturation levels)	★
PlantWeb control functionality		
A01[3][11]	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Hardware adjustments		
D4[3][14]	Zero and Span Hardware Adjustments	★
DZ[3][16]	Digital Zero Trim	★
Ground screw		
V5[3][12][17]	External Ground Screw Assembly	★
HART revision configuration		
HR5[3][14][18]	Configured for HART Revision 5	★
HR7[3][14][19]	Configured for HART Revision 7	★
Typical model number: 2051CFP D S 010 W1 S 0500 D3 2 A A 1 E5 M5		

(1) To improve pipe perpendicularity for gasket sealing, socket diameter is smaller than standard pipe O.D.

(2) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(3) Not available with Low Power Output Code M.
(4) Only available with output code X.
(5) Thermowell Material is the same as the body material.
(6) Does not apply to Process Connection codes T1 and S1.
(7) Not available for bore sizes 0010, 0014, 0020, or 0034.
(8) Not available with DIN Process Connection codes D1, D2, or D3.
(9) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
(10) Not available with FOUNDATION fieldbus (Output Code F) or Wireless (Output Code X).
(11) Only valid with FOUNDATION fieldbus Output Code F.
(12) Not available with output code X.
(13) Not available with Housing code 00, 5A, or 7J. The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.
(14) Only available with 4-20 mA HART (output codes A and M).
(15) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
(16) Only available with HART 4-20 mA (Output Codes A and M) and Wireless (Output Code X).
(17) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(18) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(19) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.

A.10 Rosemount 2051L Liquid Level Transmitter

2051L Liquid Level Transmitter

Configuration	Transmitter output code
4-20 mA HART 2051 2051 with Selectable HART(1)	A
Lower Power 2051 2051 with Selectable HART(1)	M
FOUNDATION fieldbus	F
PROFIBUS	W
Wireless	X

(1) The 4-20mA with Selectable HART device can be ordered with Transmitter Output option code A plus any of the following options codes: M4, QT, DZ, CR, CS, CT, HR5, HR7.

Additional Information

Specifications: page 120
Certifications: page 200
Dimensional Drawings: page 138

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Transmitter type		
2051L	Liquid Level Transmitter		★
Pressure range			
2	–250 to 250 inH_2O (–0,6 to 0,6 bar)		★
3	–1000 to 1000 inH_2O (–2,5 to 2,5 bar)		★
4	–300 to 300 psi (–20,7 to 20,7 bar)		★
Transmitter output			
A(1)	4–20 mA with Digital Signal Based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W	PROFIBUS PA Protocol		★
X	Wireless		★
M	Low-Power, 1–5 V dc with Digital Signal Based on HART Protocol		
Process connection size, diaphragm material (high side)			
	Process connection size	**Diaphragm**	
G(2)	2 in./DN 50	316L SST	★
H(2)	2 in./DN 50	Alloy C-276	★
J	2 in./DN 50	Tantalum	★
A(2)	3 in./DN 80	316L SST	★
B(2)	4 in./DN 100	316L SST	★
C(2)	3 in./DN 80	Alloy C-276	★

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

D[(2)]	4 in./DN 100	Alloy C-276		★
E	3 in./DN 80	Tantalum		★
F	4 in./DN 100	Tantalum		★
Extension length (high side)				
0	None, Flush Mount			★
2	2 in./50 mm			★
4	4 in./100 mm			★
6	6 in./150 mm			★
Mounting flange size, rating, material (high side)				
	Size	**Rating**	**Material**	
M	2-in.	ANSI/ASME B16.5 Class 150	CS	★
A	3-in.	ANSI/ASME B16.5 Class 150	CS	★
B	4-in.	ANSI/ASME B16.5 Class 150	CS	★
N	2-in.	ANSI/ASME B16.5 Class 300	CS	★
C	3-in.	ANSI/ASME B16.5 Class 300	CS	★
D	4-in.	ANSI/ASME B16.5 Class 300	CS	★
X[(2)]	2-in.	ANSI/ASME B16.5 Class 150	SST	★
F[(2)]	3-in.	ANSI/ASME B16.5 Class 150	SST	★
G[(2)]	4-in.	ANSI/ASME B16.5 Class 150	SST	★
Y[(2)]	Displayed	ANSI/ASME B16.5 Class 300	SST	★
H[(2)]	3-in.	ANSI/ASME B16.5 Class 300	SST	★
J[(2)]	4-in.	ANSI/ASME B16.5 Class 300	SST	★
Q	DN50	PN 10-40 per EN 1092-1	CS	★
R	DN80	PN 40 per EN 1092-1	CS	★
K[(2)]	DN50	PN 10-40 per EN 1092-1	SST	★
T[(2)]	DN80	PN 40 per EN 1092-1	SST	★

Seal fill fluid (high side)		**Specific gravity**	**Temperature limits (ambient temperature of 70 °F (21 °C))**	
A	Syltherm XLT	0.85	-102 to 293 °F (-75 to 145 °C)	★
C	Silicone 704	1.07	32 to 401 °F (0 to 205 °C)	★
D	Silicone 200	0.93	-49 to 401 °F (-45 to 205 °C)	★
H	Inert (Halocarbon)	1.85	5 to 401 °F (-15 to 205 °C)	★
G	Glycerin and Water	1.13	-49 to 320 °F (-45 to 160 °C)	★
N	Neobee M-20	0.92	5 to 401 °F (-15 to 205 °C)	★
P	Propylene Glycol and Water	1.02	5 to 203 °F (-15 to 95 °C)	★

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Sensor module configuration, flange adapter (low side)			
	Configuration	**Flange adapter**	
1	Gage	SST	★
2	Differential	SST	★
3[3]	Tuned-System with Remote Seal	None	★
Sensor module diaphragm material, sensor fill fluid (low side)			
	Diaphragm material	**Sensor fill fluid**	
1	316L SST	Silicone	★
2	Alloy C-276 (SST Valve Seat)	Silicone	★
7	Alloy C-276 (Alloy C-276 Valve Seat)	Silicone	★
A[4]	316L SST	Inert (Halocarbon)	★
B[2][4]	Alloy C-276 (SST Valve Seat)	Inert (Halocarbon)	★
G[4]	Alloy C-276 (Alloy C-276 Valve Seat)	Inert (Halocarbon)	★
O-ring			
A	Glass-filled PTFE		★
Housing material		**Conduit entry size**	
A	Aluminum	½–14 NPT	★
B	Aluminum	M20 × 1.5	★
J	SST	½–14 NPT	★
K[5]	SST	M20 × 1.5	★
P[6]	Engineered Polymer	No Conduit Entries	★
Housing material		**Conduit entry size**	
D	Aluminum	G½	
M[5]	SST	G½	

Wireless options (requires Wireless output code X and Engineered Polymer housing code P)

Wireless transmit rate, operating frequency and protocol		
WA3	User Configurable Transmit Rate, 2.4GHz *Wireless*HART	★
Antenna and SmartPower		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module Sold Separately)	★

Options (include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
HART revision configuration		
HR5[7][19]	Configured for HART Revision 5	★
HR7[8][19]	Configured for HART Revision 7	★

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

PlantWeb control functionality		
A01[9]	FOUNDATION fieldbus Advanced Control Function Block Suite	★
Seal assemblies		
S1[10]	Assemble to One Rosemount 1199 Seal (requires 1199M)	★
Product certifications		
E1[5]	ATEX Flameproof	★
E2[5]	INMETRO Flameproof	★
E3[5]	China Flameproof	★
E4	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7[5]	IECEx Flameproof	★
EW[5]	India (CCOE) Flameproof Approval	★
I1[5]	ATEX Intrinsic Safety	★
I2[5]	INMETRO Intrinsically Safe	★
I3[5]	China Intrinsic Safety	★
I4[5][6]	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7[5]	IECEx Intrinsic Safety	★
IA[9]	ATEX FISCO Intrinsic Safety	★
IE[9]	FM FISCO Intrinsically Safe	★
IF[9]	CSA FISCO Intrinsically Safe	★
IG[9]	IECEx FISCO Intrinsically Safe	★
IW[5]	India (CCOE) Intrinsically Safety Approval	★
K1[5]	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K2	INMETRO Flameproof and Intrinsic Safety	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K7[5]	IECEx Flameproof, Intrinsic Safety, Type n and Dust	★
KA[5]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC[5]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD[5]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★
N1[5]	ATEX Type n	★
N7[5]	IECEx Type n	★
ND[5]	ATEX Dust	★

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

EM	Technical Regulations Customs Union (EAC) Flameproof	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	★
KM	Technical Regulations Customs Union (EAC) Flameproof and Intrinsic Safety	★
Shipboard approvals		
SBS[4]	American Bureau of Shipping (ABS) Type Approval	★
SBV[4]	Bureau Veritas (BV) Type Approval	★
SDN[4]	Det Norske Veritas (DNV) Type Approval	★
SLL[4]	Lloyds Register (LR) Type Approval	★
Display and interface options		
M4[11]	LCD Display with Local Operator Interface	★
M5	LCD Display	★
Hardware adjustments		
D4[12]	Zero and Span Configuration Buttons	★
DZ[13]	Digital Zero Trim	★
Flange adapters		
DF[14]	1/2-14 NPT Flange Adapters	★
Conduit plug		
DO[4][15]	316 SST Conduit Plug	★
Ground screw		
V5[4][16]	External Ground Screw Assembly	★
Transient protection		
T1[4][17]	Transient Terminal Block	★
Software configuration		
C1[13]	Custom Software Configuration (requires completed Configuration Data Sheet)	★
Alarm limit		
C4[12][18]	NAMUR alarm and saturation levels, high alarm	★
CN[12][18]	NAMUR alarm and saturation levels, low alarm	★
CR[12]	Custom Alarm and saturation signal levels, high alarm (requires C1 and Configuration Data Sheet)	★
CS[12]	Custom Alarm and saturation signal levels, low alarm (requires C1 and Configuration Data Sheet)	★
CT[12]	Low Alarm (standard Rosemount alarm and saturation levels)	★

Table A-21. Rosemount 2051L Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Calibration certification				
D3	¼–18 NPT Process Connections (no flange adapters), Alloy C 276--we cannot use this name			
D3	¼–18 NPT Process Connections (no flange adapters), Alloy 400--we cannot use this name			
Q4	Calibration Certificate			★
QG	Calibration Certificate and GOST Verification Certificate			★
GP	Calibration Certificate and tamper evident seal			★
Material traceability certification				
D3	¼–18 NPT Process Connections (no flange adapters), Alloy C 276--we cannot use this name			
Q8	Material Traceability Certification per EN 10204 3.1			★
Quality certification for safety				
QS(19)	Prior-use certificate of FMEDA data			★
QT(19)	Safety Certified to IEC 61508 with certificate of FMEDA			★
Toolkit total system performance reports				
QZ	Remote Seal System Performance Calculation Report			★
Conduit electrical connector				
GE(4)	M12, 4-pin, Male Connector (eurofast)			★
GM(4)	A size Mini, 4-pin, Male Connector (minifast)			★
NACE certificate				
Q15(20)	Certificate of Compliance to NACE MR0175/ISO 15156 for wetted materials			★
Q25(20)	Certificate of Compliance to NACE MR0103 for wetted materials			★
Lower housing flushing connection options				
	Ring material	**Number**	**Size (NPT)**	
F1	316 SST	1	1/4-18 NPT	★
F2	316 SST	2	1/4-18 NPT	★
F3(21)	Alloy C-276	1	1/4-18 NPT	★
F4(21)	Alloy C-276	2	1/4-18 NPT	★
F7	316 SST	1	1/2-14 NPT	★
F8	316 SST	2	1/2-14 NPT	★
F9	Alloy C-276	1	1/2-14 NPT	★
F0	Alloy C-276	2	1/2-14 NPT	★
Typical model number:	**2051L 2 A A0 X D 21 A A B4 M5 F1**			

(1) HART Revision 5 is the default HART output. The Rosemount 2051 with Selectable HART can be factory or field configured to HART Revision 7. To order HART Revision 7 factory configured, add option code HR7.
(2) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments. Order with Q15 or Q25 to receive a NACE certificate.
(3) Requires option code S1.
(4) Not available with output code X.
(5) Not available with Low Power output code M.
(6) Only available with output code X.
(7) Configures the HART output to HART Revision 5. The device can be field configured to HART Revision 7 if needed.
(8) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.
(9) Only valid with FOUNDATION fieldbus output code F.

(10) “Assemble-to” items are specified separately and require a completed model number.
(11) Not valid with FOUNDATION fieldbus output code F and Wireless Output Code X.
(12) Only available with 4-20 mA HART (output codes A and M).
(13) Only available with HART 4-20 mA output (output codes A) and Wireless output (output code X).
(14) Not available with Remote Mount Seal Assembly option S1.
(15) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
(16) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.
(17) The T1 option is not needed with FISCO Product Certifications; transient protection is included in the FISCO product certification codes IA, IE, IF, and IG.
(18) NAMUR-Compliant operation is pre-set at the factory.
(19) Only available with HART 4-20 mA output (output code A).
(20) NACE Compliant wetted materials are identified by Footnote 2.
(21) Not available with Option Codes A0, B0, and G0.

A.11 Options

A.11.1 Standard configuration

Unless otherwise specified, transmitter is shipped as follows:

ENGINEERING UNITS Differential/Gage 2051TA	inH_2O (Ranges 1, 2, and 3) psi (Ranges 4-5) psi (all ranges)
4 mA (1 Vdc)(1):	0 (engineering units)
20 mA (5 Vdc)(1):	Upper range limit
Output:	Linear
Flange type:	Specified model code option
Flange material:	Specified model code option
O-ring material:	Specified model code option
Drain/vent:	Specified model code option
LCD display:	Installed or none
Alarm(1):	High
Software tag:	(Blank)

(1) Not applicable to Foundation fieldbus, PROFIBUS PA, or Wireless.

A.11.2 Custom configuration(1)

If Option Code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters.

- Output Information
- Transmitter Information
- LCD display Configuration
- Hardware Selectable Information
- Signal Selection
- Wireless Information
- Scaled Variable
- and more

Refer to the “Rosemount 2051 Configuration Data Sheet” document number 00806-0100-4101.

For wireless, refer to the “Rosemount 2051 Wireless Configuration Data Sheet” document number 00806-0100-4102.

(1) Not applicable to FOUNDATION fieldbus or PROFIBUS PA protocols.

Tagging (3 options available)

- Standard SST hardware tag is permanently affixed on transmitter. Tag character height is 0.125 in. (3,18 mm), 84 characters maximum.
- Tag may be wired to the transmitter nameplate upon request, 85 characters maximum.

Tag may be stored in transmitter memory. Character limit is dependent on protocol.

- HART Revision 5: 8 characters
- HART Revision 7 and Wireless: 32 characters
- FOUNDATION fieldbus: 32 characters
- PROFIBUS PA: 32 characters

A.11.3 Commissioning tag(1)

A temporary commissioning tag is attached to all transmitters. The tag indicates the device ID and allows an area for writing the location.

(1)Only applicable to FOUNDATION fieldbus.

A.11.4 Optional Rosemount 304, 305, or 306 Integral Manifolds

Factory assembled to 2051C and 2051T transmitters. Refer to Product Data Sheet (document number 00813-0100-4839 for Rosemount 304 and 00813-0100-4733 for Rosemount 305 and 306) for additional information.

A.11.5 Other seals

Refer to the Rosemount 1199 Seal Systems Product Data Sheet (document number 00813-0100-4016) for additional information.

A.11.6 Output information

Output range points must be the same unit of measure. Available units of measure include:

Pressure			
atm	inH_2O@4 °C(1)	g/cm^2	psi
mbar	mmH_2O	kg/cm^2	torr
bar	mmHg	Pa	cmH_20@4 °C(1)
inH_20	mmH_20@4 °C(1)	kPa	cmHG@0 °C(1)
inHg	ftH_20	MPa(1)(2)	ftH_20@60 °F(1)
hPa(1)	inH_2O@60 °F(1)	kg/SqM(1)	mH_20@4 °C(1)
mHg@0 °C(1)	Psf(1)	ftH_2O@4C(1)	mHg@0 °C(1) hPa(1)
Flow(2)(3)			
bbl	kg	cm^3	
ft^3	lb	m^3	
gal	L	ton	
Level(3)			
%	ft	cm	
in	mm		

(1) Available with enhanced 2051 and Wireless.
(2) Available on PROFIBUS PA.
(3) All flow units are available per second, minute, hour or day.

A.11.7 Display and interface options

M4 Digital Display with Local Operator Interface (LOI)

- Available for 4-20 mA HART, 4-20 mA HART Low Power, and PROFIBUS PA

M5 Digital Display

- 2-Line, 5-Digit LCD display for 4-20 mA HART
- 2-Line, 5-Digit LCD display for 1-5 Vdc HART Low Power
- 2-Line, 8-Digit LCD display for FOUNDATION fieldbus and PROFIBUS PA
- 3-Line, 7-Digit LCD display for Wireless
- Direct reading of digital data for higher accuracy
- Displays user-defined flow, level, volume, or pressure units
- Displays diagnostic messages for local troubleshooting
- 90-degree rotation capability for easy viewing

A.11.8 Configuration buttons

Rosemount 2051 requires option D4 (Analog Zero and Span), DZ (Digital Trim), M4 (LOI) for local configuration buttons.

A.11.9 Transient protection

T1 Integral Transient Protection Terminal Block

Meets IEEE C62.41, Category Location B

6 kV crest (0.5 µs - 100 kHz)
3 kA crest (8 × 20 microseconds)
6 kV crest (1.2 × 50 microseconds)

A.11.10 Bolts for flanges and adapters

- Standard material is plated carbon steel per ASTM A449, Type 1

L4 Austenitic 316 Stainless Steel Bolts
L5 ASTM A 193, Grade B7M Bolts

L6 Alloy K-500 Bolts
L8 ASTM A 193 Class 2, Grade B8M Bolts

A.11.11 Conduit plug

DO 316 SST Conduit Plug

- Single 316 SST conduit plug replaces carbon steel plug

A.11.12 Rosemount 2051C Coplanar Flange and 2051T bracket option

B4 Bracket for 2-in. Pipe or Panel Mounting

- For use with the standard Coplanar flange configuration
- Bracket for mounting of transmitter on 2-in. pipe or panel
- Stainless steel construction with stainless steel bolts

A.11.13 Rosemount 2051C traditional flange bracket options

B1 Bracket for 2-in. Pipe Mounting

- For use with the traditional flange option
- Bracket for mounting on 2-in. pipe
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B2 Bracket for Panel Mounting

- For use with the traditional flange option
- Bracket for mounting transmitter on wall or panel
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B3 Flat Bracket for 2-in. Pipe Mounting

- For use with the traditional flange option
- Bracket for vertical mounting of transmitter on 2-in. pipe
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B7 B1 Bracket with SST Bolts

- Same bracket as the B1 option with Series 300 stainless steel bolts

B8 B2 Bracket with SST Bolts

- Same bracket as the B2 option with Series 300 stainless steel bolts

B9 B3 Bracket with SST Bolts

- Same bracket as the B3 option with Series 300 stainless steel bolts

BA Stainless Steel B1 Bracket with SST Bolts

- B1 bracket in stainless steel with Series 300 stainless steel bolts

BC Stainless Steel B3 Bracket with SST Bolts

- B3 bracket in stainless steel with Series 300 stainless steel bolts

A.12 Spare parts

Rosemount 2051 upgrade kits	Part number
The following come with electronics board and configuration buttons (if applicable).	
Aluminum/SST	
4-20 mA HART with no configuration buttons	02021-0020-2100
4-20 mA HART with Digital Zero Trim	02021-0020-2110
4-20 mA HART with Analog Zero and Span	02021-0020-2120
Rosemount 2051 LOI upgrade kit	**Part number**
The following come with electronics board, LOI display, and LOI configuration buttons. Order display cover if needed.	
4-20 mA HART with LOI	02021-0020-2139
Rosemount 2051 with Selectable HART LCD/LOI Display	**Part number**
The following come with new LCD or LOI display and housing covers.	
4-20 mA HART LOI with Aluminum Cover	03031-0199-0012
4-20 mA HART LOI with SST Cover	03031-0199-0022
4-20 mA HART LCD Display with Aluminum Cover	03031-0199-0011
4-20 mA HART LCD Display with SST Cover	03031-0199-0021
PROFIBUS PA LOI Upgrade Kits	**Part number**
Including LCD Display and Aluminum Cover	02051-9030-0001
Including LCD Display and SST Cover	02051-9030-0011
Without LCD Display and Covers for use with Aluminum Housings	02051-9030-1001
Without LCD Display and Covers for use with SST Housings	02051-9030-1011
Terminal block	**Part number**
4-20 mA HART Output	
Standard terminal block assembly	02051-9005-0001
Transient terminal block assembly (option T1)	02051-9005-0002
1-5 Vdc HART Low Power Output	
Standard terminal block assembly	02051-9005-0011
Transient terminal block assembly (option T1)	02051-9005-0012
FOUNDATION fieldbus Output	
Standard terminal block assembly(1)	02051-9005-0024
Transient terminal block assembly (option T1)(1)	02051-9005-0025
FISCO terminal block assembly(1)	02051-9005-0026
Electronics board	**Part number**
Assemblies for 4-20 mA HART	
4-20 mA HART for use without D4 option	02051-9001-0001
4-20 mA HART for use with D4 option	02051-9001-0002
4-20 mA HART NAMUR Compliant (C4/CN option) for use with or without D4 option	02051-9001-0011
Assembly for 1-5 Vdc HART Low Power	
1-5 Vdc HART	02051-9001-1001

Assemblies for FOUNDATION fieldbus	
FOUNDATION fieldbus Device Revision 1	02051-9001-2001
Use these kits when upgrading a Device Revision 1 device to Device Revision 2, or as spare parts for a Device Revision 2 device.	
FOUNDATION fieldbus Device Revision 2[(2)]	02021-0020-5100
FOUNDATION fieldbus Device Revision 2 electronics with LCD no cover[(2)]	02021-0020-5109
FOUNDATION fieldbus Device Revision 2 electronics with LCD and Aluminum cover[(2)]	02021-0020-5209
FOUNDATION fieldbus Device Revision 2 electronics with LCD and SST cover[(2)]	02021-0020-5309
Assemblies for PROFIBUS PA	
PROFIBUS PA for use without LOI	02051-9001-2101
PROFIBUS PA for use with LOI	02051-9001-2102
LCD display	**Part number**
LCD Display Kit[(3)]	
4-20 mA with Aluminum Housing	03031-0193-0101
4-20 mA with SST Housing	03031-0193-0111
1-5 Vdc with Aluminum Housing	03031-0193-0001
1-5 Vdc with SST Housing	03031-0193-0011
For FOUNDATION fieldbus Device Revision 1 and Profibus PA with Aluminum Housing	03031-0193-0104
For FOUNDATION fieldbus Device Revision 2 with Aluminum Housing[(4)]	03031-0199-0013
For FOUNDATION fieldbus Device Revision 1 and Profibus PA with SST Housing	03031-0193-0112
For FOUNDATION fieldbus Device Revision 2 with SST Housing[(4)]	03031-0199-0023
LCD Displays Only[(5)]	
For 4-20 mA output	03031-0193-0103
For 1-5 Vdc Low Power output	03031-0193-0003
For FOUNDATION fieldbus and PROFIBUS PA Output	03031-0193-0105
For FOUNDATION fieldbus Device Revision 2[(4)]	03031-0199-0003
LCD Display Hardware, both 4-20 mA and 1-5 Vdc Low Power	
Aluminum Display Cover Assembly 4-20 mA HART, 1-5 Vdc HART Low Power, and FOUNDATION fieldbus Device Rev 2[(6)]	03031-0193-0002
SST Display Cover Assembly 4-20 mA HART 1-5 Vdc HART Low Power, and FOUNDATION fieldbus Device Rev 2[(6)]	03031-0193-0012
Aluminum Display Cover Assembly, FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA[(6)]	03031-0193-0007
SST Display Cover Assembly, FOUNDATION fieldbus Device Rev 1 and PROFIBUS PA[(6)]	03031-0193-0013
O-ring package for electronics housing cover, pkg of 12	03031-0232-0001
Zero and span hardware adjustments (D4 option)	**Part number**
Zero and Span Kit for 4-20 mA HART[(7)]	
Zero and Span Kit for Aluminum Housing	02051-9010-0001
Zero and Span Kit for SST Housing	02051-9010-0002
Zero and Span Kit for 4-20 mA HART NAMUR Compliant (C4/CN) option[(8)]	
Zero and Span Kit for Aluminum Housing	02051-9010-1001
Zero and Span Kit for SST Housing	02051-9010-1002

O-ring packages (package of 12)	Part number
Electronic housing, cover (standard and meter)	03031-0232-0001
Electronics housing, module	03031-0233-0001
Process flange, glass-filled PTFE	03031-0234-0001
Process flange, graphite-filled PTFE	03031-0234-0002
Flange adapter, glass-filled PTFE	03031-0242-0001
Flange adapter, graphite-filled PTFE	03031-0242-0002
Flanges	**Part number**
Differential Coplanar Flange	
Nickel-plated carbon steel	03031-0388-0025
316 SST	03031-0388-0022
Cast C-276	03031-0388-0023
Gage Coplanar Flange	
Nickel-plated carbon steel	03031-0388-1025
316 SST	03031-0388-1022
Cast C-276	03031-0388-1023
Coplanar Flange Alignment Screw (package of 12)	03031-0309-0001
Traditional Flange	
316 SST	03031-0320-0002
Cast C-276	03031-0320-0003
Level Flange, Vertical Mount	
2 in., class 150, SST	03031-0393-0221
2 in., class 300, SST	03031-0393-0222
3 in., class 150, SST	03031-0393-0231
3 in., class 300, SST	03031-0393-0232
DIN, DN 50, PN 40	03031-0393-1002
DIN, DN 80, PN 40	03031-0393-1012
Flange adapter	**Part number**
Nickel-plated carbon steel	02024-0069-0005
316 SST	02024-0069-0002
Cast C-276	02024-0069-0003
Drain/vent valve kits (each kit contains parts for one transmitter)	**Part number**
Differential Drain/Vent Kits	
316 SST stem and seat kit	01151-0028-0022
Alloy C-276 stem and seat kit	01151-0028-0023
316 SST ceramic ball drain/vent kit	03031-0378-0022
Alloy C-276ceramic ball drain/vent kit	01151-0028-0123
Gage Drain/Vent Kits	
316 SST stem and seat kit	01151-0028-0012
Alloy C-276 stem and seat kit	01151-0028-0013
316 SST ceramic ball drain/vent kit	03031-0378-0012
Alloy C-276 ceramic ball drain/vent kit	01151-0028-0113

Mounting brackets	Part number
2051C and 2051L Coplanar Flange Bracket Kit	
B4 bracket, SST, 2-in. pipe mount, SST bolts	03031-0189-0003
2051T Bracket Kit	
B4 bracket, SST, 2-in. pipe mount, SST bolts	03031-0189-0004
2051C Traditional Flange Bracket Kits	
B1 bracket, 2-in. pipe mount, CS bolts	03031-0313-0001
B2 bracket, panel mount, CS bolts	03031-0313-0002
B3 flat bracket for 2-in. pipe mount, CS bolts	03031-0313-0003
B7 (B1 style bracket with SST bolts)	03031-0313-0007
B8 (B2 style bracket with SST bolts)	03031-0313-0008
B9 (B3 style bracket with SST bolts)	03031-0313-0009
BA (SST B1 bracket with SST bolts)	03031-0313-0011
BC (SST B3 bracket with SST bolts)	03031-0313-0013
Bolt kits	**Part number**
COPLANAR FLANGE	
Flange Bolt Kit (44 mm [1.75 in.]) (Set of 4)	
Carbon steel	03031-0312-0001
316 SST	03031-0312-0002
ASTM A 193, Grade B7M	03031-0312-0003
ASTM A 193, Class 2, Grade B8M	03031-0312-0005
Flange/Adapter Bolt Kit (73 mm [2.88 in.]) (set of 4)	
Carbon steel	03031-0306-0001
316 SST	03031-0306-0002
ASTM A 193, Grade B7M	03031-0306-0003
ASTM A 193, Class 2, Grade B8M	03031-0306-0005
Manifold/Flange Kit (57 mm [2.25 in.]) (set of 4)	
Carbon steel	03031-0311-0001
316 SST	03031-0311-0002
ASTM A 193, Grade B7M	03031-0311-0003
ASTM A 193, Class 2, Grade B8M	03031-0311-0020
TRADITIONAL FLANGE	
Differential Flange and Adapter Bolt Kit (44 mm [1.75 in.]) (set of 8)	
Carbon steel	03031-0307-0001
316 SST	03031-0307-0002
ASTM A 193, Grade B7M	03031-0307-0003
ASTM A 193, Class 2, Grade B8M	03031-0307-0005
Gage Flange and Adapter Bolt Kit (set of 6)	
Carbon steel	03031-0307-1001
316 SST	03031-0307-1002
ASTM A 193, Grade B7M	03031-0307-1003
ASTM A 193, Class 2, Grade B8M	03031-0307-1005

Manifold/Traditional Flange Bolts	
Carbon steel	Use bolts supplied with manifold
316 SST	Use bolts supplied with manifold
LEVEL FLANGE, VERTICAL MOUNT	
Flange Bolt Kit (set of 4)	
Carbon steel	03031-0395-0001
316 SST	03031-0395-0002
Covers	**Part number**
Aluminum terminal cover assembly	03031-0292-0001
316 SST terminal cover assembly	03031-0292-0002
SST FOUNDATION fieldbus Device Rev 1 and PROFIBUS electronics cover assembly(9)	03031-0292-0004
Aluminum FOUNDATION fieldbus Device Rev 1 and PROFIBUS electronics cover assembly(10)	03031-0292-0003
Aluminum HART and FOUNDATION fieldbus Device Rev 2 LCD Display Cover Assembly: Cover + O-ring	03031-0193-0002
SST HART and FOUNDATION fieldbus Device Rev 2 LCD Display Cover Assembly: Cover + O-ring	03031-0193-0012
Aluminum FOUNDATION fieldbus Device Rev 1 and PROFIBUS LCD Display Cover Assembly: Cover + O-ring	03031-0193-0007
SST FOUNDATION fieldbus Device Rev 1 and PROFIBUS LCD Display Cover Assembly: Cover + O-ring	03031-0193-0013
Wireless	**Part number**
Wireless battery compartment cover with O-ring	00708-9050-0001
Wireless LCD display meter with cover and O-ring	02051-9020-0001
Wireless LCD display meter	02051-9020-0002
Wireless LCD display meter cover	02051-9020-0003
Wireless electronics cover	02051-9021-0001
Wireless electronics cover O-ring	02051-9021-0002
Wireless lock ring screw	02051-9022-0001
Miscellaneous	**Part number**
External ground screw assembly (option V5)	03031-0398-0001

(1) For use with Device Revision 1 and Device Revision 2.
(2) Kit upgrades a Revision 1 2051 to a Revision 2 2051 and spares a Device Revision 2.
(3) Kit includes LCD display, captive mounting hardware, 10-pin interconnection header, cover assembly.
(4) For use with Device Revision 2 only.
(5) Displays include LCD display, captive mounting hardware, 10-pin interconnection header. No cover assembly.
(6) Display Cover Assembly includes the cover and O-ring only.
(7) Kit includes zero and span hardware adjustments and electronics board.
(8) Kit includes zero and span hardware adjustments only.
(9) Cover Assemblies include cover and O-ring.
(10) Covers are blind, not for use with LCD display. Refer to LCD display section for LCD display covers.

Appendix B Product Certifications

B.1 Overview

This Appendix contains information on approved manufacturing locations, European directive information, Ordinary Location certification, Hazardous Locations Certifications and approval drawings.

B.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

B.2.1 Warnings

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review this section of the Model 2051 Reference Manual for any restrictions associated with a safe installation.

- Before connecting a communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ WARNING

Cable gland and plug must comply with the requirements listed on the certificates.

B.3 Product certifications

B.3.1 European Directive Information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at www.rosemount.com.

B.3.2 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.3.3 North America

E5 FM Explosionproof (XP) and Dust-Ignitionproof (DIP)

Certificate: 3032938

Standards: FM Class 3600 – 2011, FM Class 3615 – 2006, FM Class 3810 – 2005, ANSI/NEMA 250 – 1991. ANSI/IEC 60529 2004

Markings: XP CL I, DIV 1, GP B, C, D; DIP CL II, DIV 1, GP E, F, G; CL III; T5(-50 °C ≤ Ta ≤ +85 °C); Factory Sealed; Type 4X

I5 FM Intrinsic Safety (IS) and Nonincendive (NI)

Certificate: 3033457

Standards: FM Class 3600 – 1998, FM Class 3610 – 2007, FM Class 3611 – 2004, FM Class 3810 – 2005

Markings: IS CL I, DIV 1, GP A, B, C, D; CL II, DIV 1, GP E, F, G; Class III; DIV 1 when connected per Rosemount drawing 02051-1009; Class I, Zone 0; AEx ia IIC T4; NI CL 1, DIV 2, GP A, B, C, D; T4(-50 °C ≤ Ta ≤ +70 °C); Type 4x

IE FM FISCO

Certificate: 3033457

Standards: FM Class 3600 – 1998, FM Class 3610 – 2007, FM Class 3611 – 2004, FM Class 3810 – 2005

Markings: IS CL I, DIV 1, GP A, B, C, D when connected per Rosemount drawing 02051-1009 (-50°C ≤ Ta ≤ +60°C); Type 4x

E6 CSA Explosion-Proof, Dust Ignition Proof

Certificate: 2041384

Standards: CAN/CSA C22.2 No. 0-10, CSA Std C22.2 No. 25-1966, CSA Std C22.2 No. 30-M1986, CAN/CSA-C22.2 No. 94-M91, CSA Std C22.2 No.142-M1987, CAN/CSA-C22.2 No.157-92, CSA Std C22.2 No. 213-M1987, CAN/CSA-E60079-0:07, CAN/CSA-E60079-1:07, CAN/CSA-E60079-11-02, CAN/CSA-C22.2 No. 60529:05, ANSI/ISA-12.27.01–2003

Markings: Explosion-Proof for Class I, Divisions 1, Groups B, C, and D. Dust-Ignition Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2; Groups A, B, C, and D for indoor and outdoor hazardous locations. Class I Zone 1 Ex d IIC T5. Enclosure type 4X, factory sealed. Single Seal.

I6 CSA Intrinsic Safety

Certificate: 2041384

Standards: CSA Std. C22.2 No. 142 - M1987, CSA Std. C22.2 No. 213 - M1987, CSA Std. C22.2 No. 157 - 92, CSA Std. C22.2 No. 213 - M1987, ANSI/ISA 12.27.01 – 2003, CAN/CSA-E60079-0:07, CAN/CSA-E60079-11:02

Markings: Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 02051-1008. Temperature code T3C. Class I Zone 1 Ex ia IIC T3C. Single Seal. Enclosure Type 4X

B.3.4 Europe

E1 ATEX Flameproof

Certificate: KEMA 08ATEX0090X

Standards: EN60079-0:2006, EN60079-1:2007, EN60079-26:2007

Markings: ⟨Ex⟩II 1/2 G Ex d IIC T6 IP66(–50 °C ≤ Ta ≤ 65 °C);
⟨Ex⟩ II 1/2 G Ex d IIC T5 IP66(–50 °C ≤ Ta ≤ 80 °C)

Special Conditions for Safe Use (X):

1. The Ex d blanking elements, cable glands and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. In case of repair, contact the manufacturer for information on the dimensions of the flameproof joints.

I1 ATEX Intrinsic Safety

Certificate: Baseefa08ATEX0129X

Standards: EN60079-0:2012, EN60079-11:2012

Markings: ⟨Ex⟩II 1 G Ex ia IIC T4 Ga (–60 °C ≤ Ta ≤ +70 °C)

Table B-1. Input Parameters

	HART®	Fieldbus/PROFIBUS®
Voltage U_i	30 V	30 V
Current I_i	200 mA	300 mA
Power P_i	1 W	1.3 W
Capacitance C_i	0.012 µ F	0 µ F
Inductance L_i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V isolation from earth test and this must be taken into account during installation.

2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

IA ATEX FISCO

Certificate: Baseefa08ATEX0129X

Standards: EN60079-0:2012, EN60079-11:2012

Markings: ⟨Ex⟩II 1 G Ex ia IIC T4 Ga (–60 °C ≤ Ta ≤ 60 °C)

Table B-2. Input Parameters

	HART
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0 µ F
Inductance L_i	0 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V isolation from earth test and this must be taken into account during installation.

2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

N1 ATEX Type n

Certificate: Baseefa08ATEX0130X

Standards: EN60079-0:2012, EN60079-15:2010

Markings: ⟨Ex⟩II 3G Ex na IIC T4 Gc (–40 °C ≤ Ta ≤ +70 °C)

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V electrical strength test as defined in clause 6.5.1 of by EN 60079-15:2010. This must be taken into account during installation.

ND ATEX Dust

Certificate: Baseefa08ATEX0182X

Standards: EN60079-0:2012, EN60079-31:2009

Markings: ⟨Ex⟩II 1D Ex ta IIIC T95 °C T_{500} 105 °C Da (–20 °C ≤ Ta ≤ +85 °C)

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V isolation from earth test and this must be taken into account during installation.

B.3.5 International

E7 IECEx Flameproof

Certificate: IECExKEM08.0024X

Standards: IEC60079-0:2004, IEC60079-1:2007-04, IEC60079-26:2006

Markings: Ex d IIC T6/T5 IP66, T6(-50 °C ≤ Ta ≤ +65 °C), T5(-50 °C ≤ Ta ≤ +80 °C)

Table B-3. Process Temperature

Temperature class	Process temperature
T6	-50 °C to +65 °C
T5	-50 °C to +80 °C

Special Conditions for Safe Use (X):

1. The device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
2. The Ex d blanking elements, cable glands, and wiring shall be suitable for a temperature of 90 °C
3. In case of repair, contact the manufacturer for information on the dimensions of the flameproof joints.

I7 IECEx Intrinsic Safety

Certificate: IECExBAS08.0045X

Standards: IEC60079-0:2011, IEC60079-11:2011

Markings: Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ +70 °C)

Table B-4. Input Parameters

	HART	Fieldbus/PROFIBUS
Voltage U_i	30 V	30 V
Current I_i	200 mA	300 mA
Power P_i	1 W	1.3 W
Capacitance C_i	0.012 µ F	0 µ F
Inductance L_i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V isolation from earth test and this must be taken into account during installation.

2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

IG IECEx FISCO

Certificate: IECExBAS08.0045X

Standards: IEC60079-0:2011, IEC60079-11:2011

Markings: Ex ia IIC T4 Ga (–60 °C ≤ Ta ≤ 60 °C)

Table B-5. Input Parameters

	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0 nF
Inductance L_i	0 µ H

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is incapable of withstanding the 500V isolation from earth test and this must be taken into account during installation.

2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

N7 IECEx Type n

Certificate: IECExBAS08.0046X

Standards: IEC60079-0:2011, IEC60079-15:2010

Markings: Ex nA IIC T4 Gc (-40 °C ≤ Ta ≤ +70 °C)

Special Condition for Safe Use (X):

1. If fitted with a 90V transient suppressor, the equipment is not capable of withstanding the 500V electrical strength test as defined in clause 6.5.1 of IEC60079-15:2010. This must be taken into account during installation.

B.3.6 Brazil

E2 INMETRO Flameproof

Certificate: CEPEL 09.1767X, CEPEL 11.2065X, UL-BR 14.0375X

Standards: ABNT NBR IEC60079-0:2008, ABNT NBR IEC60079-1:2009, ABNT NBR IEC60079-26:2008, ABNT NBR IEC60529:2009, ABNT NBR IEC60079-0:2008 + Errata 1:2011, ABNT NBR IEC 60079-1:2009 + Errata 1:2011, ABNT NBR IEC 60079-26:2008 + Errata 1:2009

Markings: Ex d IIC T6/T5 Ga/Gb IP66, T6(-50 °C ≤ Ta ≤ +65 °C), T5(-50 °C ≤ Ta ≤ +80 °C)

Special Conditions for Safe Use (X):

1. The device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. The Ex d blanking elements, cable glands, and wiring shall be suitable for a temperature of 90 °C.
3. In case of repair, contact the manufacturer for information on the dimensions of the flameproof joints

I2 INMETRO Intrinsic Safety

Certificate: CEPEL 09.1768X, CEPEL 11.2066X

Standards: ABNT NBR IEC60079-0:2008, ABNT NBR IEC60079-11:2009, ABNT NBR IEC 60079-26: 2008, ABNT NBR IEC60529:2009

Markings: Ex ia IIC T4 Ga IP66W (-60 °C ≤ Ta ≤ +70 °C)

Table B-6. Input Parameters

	HART	Fieldbus/PROFIBUS
Voltage U_i	30 V	30 V
Current I_i	200 mA	300 mA
Power P_i	0.9 W	1.3 W
Capacitance C_i	0.012 µ F	0 µ F
Inductance L_i	0 mH	0 mH

Specific Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is not capable of withstanding the 500V insulation test required by ABNT NBR IRC 60079-11:2008. This must be taken into account when installing the equipment.

IB INMETRO FISCO

Certificate: CEPEL 09.1768X, CEPEL 11.2066X

Standards: ABNT NBR IEC60079-0:2008, ABNT NBR IEC60079-11:2009, ABNT NBR IEC 60079-26: 2008, ABNT NBR IEC60529:2009

Markings: Ex ia IIC T4 Ga IP66W (–60 °C ≤ Ta ≤ +60 °C)

Table B-7. Input Parameters

	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0 nF
Inductance L_i	0 μ H

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90V transient suppressor, it is not capable of withstanding the 500V insulation test required by ABNT NBR IRC 60079-11:2008. This must be taken into account when installing the equipment.

B.3.7 China

E3 China Flameproof

Certificate: GYJ13.1386X; GYJ101321X [Flowmeters]

Standards: GB3836.1-2000, GB3836.2-2000

Markings: Ex d IIC T6/T5, T6(–50 °C ≤ Ta ≤ +65 °C), T5(–50 °C ≤ Ta ≤ +80 °C)

Specific Conditions for Safe Use:

1. Symbol “X” is used to denote specific conditions of use:
   - The Ex d blanking elements, cable glands, and wiring shall be suitable for a temperature of 90 °C
   - This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environment conditions to which the diaphragm will be subjected.
2. The relation between T code and ambient temperature range is:

Ta	Temperature class
-50 °C ≤ Ta ≤ +80 °C	T5
-50 °C ≤ Ta ≤ +65 °C	T6

3. The earth connection facility in the enclosure should be connected reliably.
4. During installation, use and maintenance of the product, observe the warning “Don’t open the cover when the circuit is alive.”
5. During installation, there should be no mixture harmful to flameproof housing
6. Cable entry and conduit, certified by NEPSI with type of protection Ex d IIC and appropriate thread form, should be applied when installed in a hazardous location. Blanking elements should be used on the redundant cable entries.
7. End users are not permitted to change any internal components, but to settle the problem in conjunction with the manufacturer to avoid damage to the product.

8. Maintenance should be done in a non-hazardous location.

9. During installation, use and maintenance of this product, observe the following standards: GB3836.13-1997, GB3836.15-2000, GB3836.16-2006, GB50257-1996

I3 China Intrinsic Safety

Certificate: GYJ12.1295X; GYJ101320X [Flowmeters]

Standards: GB3836.1-2010, GB3836.4-2010, GB3836.20-2010

Markings: Ex ia IIC T4 Ga

Specific Conditions for Safe Use (X):

1. Symbol "X" is used to denote specific conditions of use:

   a. If the apparatus is fitted with an optional 90V transient suppressor, it is not capable of withstanding the 500V insulation test for 1 minute. This must be taken into account when installing the apparatus.

   b. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

2. The relation between T code and ambient temperature range is:

Model	T code	Temperature range
HART, Fieldbus, PROFIBUS, and Low Power	T4	-60 °C ≤ Ta ≤ +70 °C
FISCO	T4	-60 °C ≤ Ta ≤ +60 °C
Flowmeter with 644 Temp Housing	T4	-40 °C ≤ Ta ≤ +60 °C

3. Intrinsically Safe parameters:

	HART	Fieldbus/PROFIBUS	FISCO
Voltage U_i	30 V	30 V	17.5 V
Current I_i	200 mA	300 mA	380 mA
Power P_i	1 W	1.3 W	5.32 W
Capacitance C_i	0.012 μ F	0 μ F	0 nF
Inductance L_i	0 mH	0 mH	0 μ H

Note 1: FISCO parameters comply with the requirements for FISCO field devices in GB3836.19-2010
Note 2: [For Flowmeters] When 644 temperature transmitter is used, the 644 temperature transmitter should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of both 644 temperature transmitter and associated apparatus. The cables between 644 temperatures transmitter and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.

4. The product should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.

5. The cables between this product and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.

6. End users are not permitted to change any internal components, and needs to settle the problem in conjunction with the manufacturer to avoid damage to the product.

7. During installation, use and maintenance of this product, observe the following standards: GB3836.13-1997, GB3836.15-2000, GB3836.16-2006, GB50257-1996

B.3.8 Japan

E4 Japan Flameproof

Certificate: TC20598, TC20599, TC20602, TC20603 [HART]; TC20600, TC20601, TC20604, TC20605 [Fieldbus]

Markings: Ex d IIC T5

B.3.9 Combinations

K1 Combination of E1, I1, N1, and ND

K2 Combination of E2 and I2

K5 Combination of E5 and I5

K6 Combination of E6 and I6

K7 Combination of E7, I7, and N7

KB Combination of K5 and K6

KD Combination of K1, K5, and K6

B.4 Additional Certifications

SBS American Bureau of Shipping (ABS) Type Approval

Certificate: 09-HS446883B-3-PDA

Intended Use: Marine & Offshore Applications – Measurement of either Gauge or Absolute Pressure for Liquid, Gas, and Vapor.

ABS Rules: 2013 Steel Vessels Rules 1-1-4/7.7, 1-1-Appendix 3, 4-8-3/1.7, 4-8-3/13.1

SBV Bureau Veritas (BV) Type Approval

Certificate: 23157/A2 BV

BV Rules: Bureau Veritas Rules for the Classification of Steel Ships

Application: Class notations: AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS; Pressure transmitter type 2051 cannot be installed on diesel engines

SDN Det Norske Veritas (DNV) Type Approval

Certificate: A-13245

Intended Use: Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft Det Norske Veritas' Offshore Standards

Application:

Location classes	
Type	2051
Temperature	D
Humidity	B
Vibration	A
EMC	B
Enclosure	D

SLL Lloyds Register (LR) Type Approval

Certificate: 11/60002

Application: Environmental categories ENV1, ENV2, ENV3, and ENV5

B.5 Approval drawings

B.5.1 Factory mutual 02051-1009

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB	ADD AMBIENT TEMP LIMITS	RTC1026995	J.G.K.	9/24/08
AC	REMOVE LOW POWER	RTC1027021	J.G.K.	10/2/08
AD	ADD LOW POWER	RTC1027539	J.G.K.	12/22/08

ENTITY APPROVALS FOR

2051C
2051L
2051T

OUTPUT CODE A (4-20 mA HART) I.S. SEE SHEETS 2-5
OUTPUT CODE M (LOW POWER) I.S. SEE SHEETS 6-7
OUTPUT CODE F/W (FIELDBUS) I.S. SEE SHEETS 8-12
ALL OUTPUT CODES NONINCENDIVE SEE SHEET 13

THE ROSEMOUNT TRANSMITTERS LISTED ABOVE ARE F.M. APPROVED AS INTRINSICALLY SAFE WHEN USED IN CIRCUIT WITH F.M. APPROVED BARRIERS WHICH MEET THE ENTITY PARAMETERS LISTED IN THE CLASS I, II, AND III, DIVISION 1 GROUPS INDICATED, TEMP CODE T4. ADDITIONALLY, THE ROSEMOUNT 751 FIELD SIGNAL INDICATOR IS F.M. APPROVED AS INTRINSICALLY SAFE WHEN CONNECTED IN CIRCUIT WITH ROSEMOUNT TRANSMITTERS (FROM ABOVE) AND F.M. APPROVED BARRIERS WHICH MEET THE ENTITY PARAMETERS LISTED FOR CLASS I, II, AND III, DIVISION 1, GROUPS INDICATED, TEMP CODE T4.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

DR. Myles Lee Miller 4/16/08

CHK'D

APP'D.

APP'D. GOVT.

EMERSON. Process Management

ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INDEX OF I.S. & NONINCENDIVE F.M. FOR 2051C/L/T

SIZE A | FSCM NO | DWG NO. 02051-1009

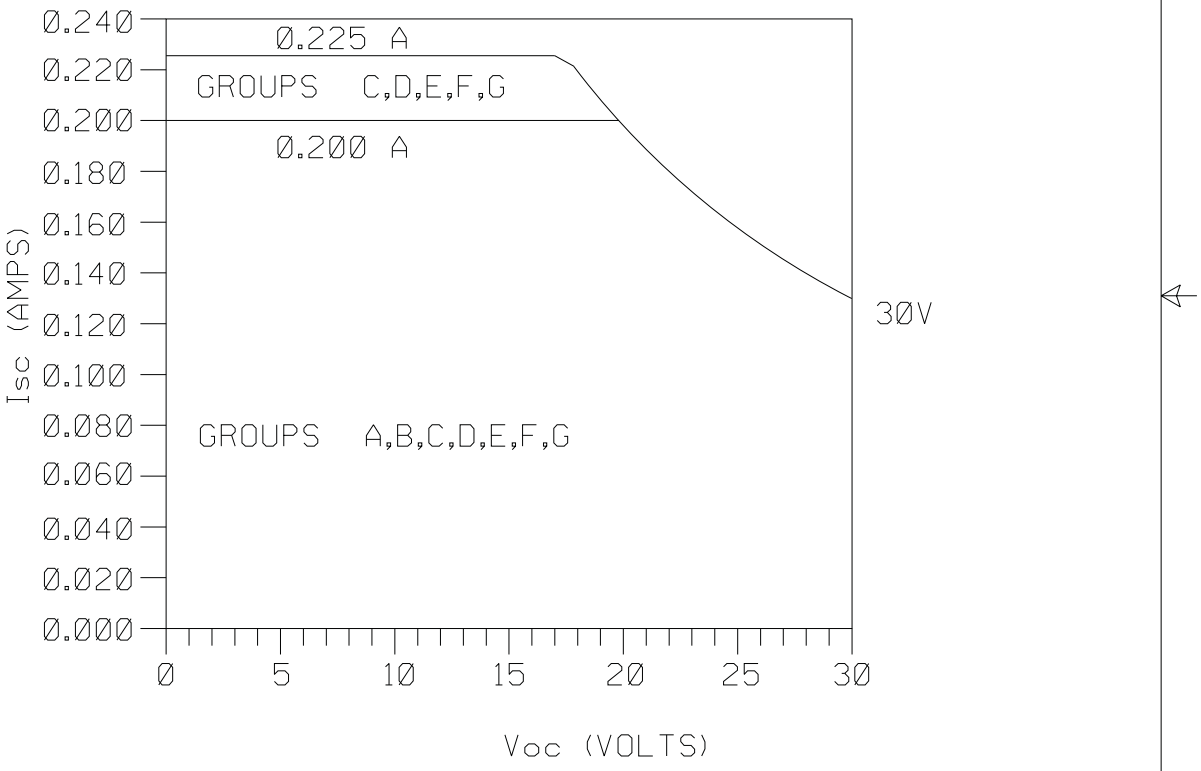
SCALE N/A | WT. | SHEET 1 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

BARRIER PARAMETERS (APPLICABLE TO OUTPUT CODES A & M)

Pmax = 1WATT



Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

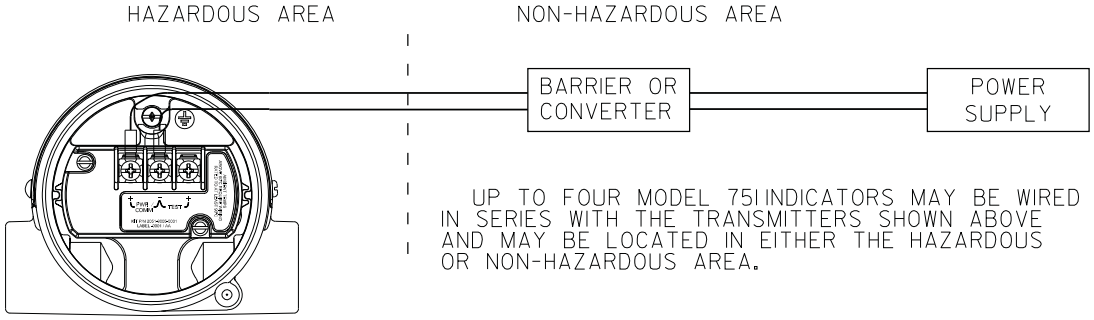
CAD MAINTAINED (MicroStation)

DR.	SIZE	FSCM NO	DWG NO.
Myles Lee Miller	A		02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 2 OF 13

Form Rev AC

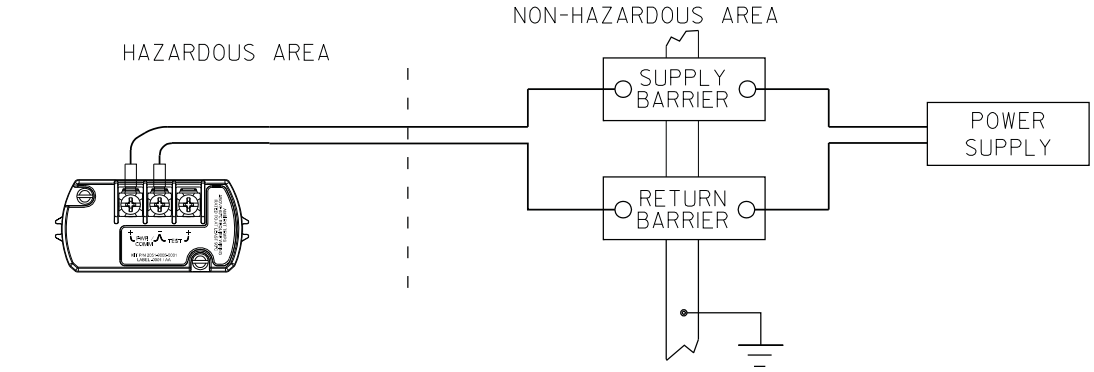
REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

CIRCUIT DIAGRAM 1
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL



OUTPUT CODE A
MODELS INCLUDED
205IC, L, T

CIRCUIT DIAGRAM 2
SUPPLY AND RETURN BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)



OUTPUT CODE A
MODELS INCLUDED
205IC, L, T

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.	SIZE	FSCM NO	DWG NO.
Myles Lee Miller	A		02051-1009
ISSUED	SCALE N/A	WT.	SHEET 3 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc OR Vt) AND MAX. SHORT CIRCUIT CURRENT (Isc OR It) AND MAX. POWER (Voc X Isc/4) OR (Vt X It/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax), MAXIMUM SAFE INPUT CURRENT (Imax), AND MAXIMUM SAFE INPUT POWER (Pmax) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

FOR OUTPUT CODE A

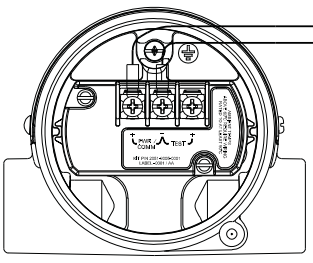
NOTE: ENTITY PARAMETERS LISTED APPLY ONLY TO ASSOCIATED APPARATUS WITH LINEAR OUTPUT.

CLASS I, DIV. 1, GROUPS A AND B

V_T = 30V	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_T = 200mA	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 200mA
P_{MAX} = 1 WATT	$(\frac{V_T \times I_T}{4})$ OR $(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .01µf	C_A IS GREATER THAN .01µf
L_I =10µH	L_A IS GREATER THAN 10µH
T4 (Ta=-50°C to +70°C)	

CLASS I, DIV. 1, GROUPS C AND D

V_T = 30V	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_T = 225mA	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 225mA
P_{MAX} = 1 WATT	$(\frac{V_T \times I_T}{4})$ OR $(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .01µf	C_A IS GREATER THAN .01µf
L_I =10µH	L_A IS GREATER THAN 10µH
T4 (Ta=-50°C to +70°C)	



HAZARDOUS AREA | NON-HAZARDOUS AREA

ASSOCIATED APPARATUS

(SEE SHEET 3)

OUTPUT CODE A
MODELS INCLUDED
205IC, L, T

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)	
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009	
ISSUED	SCALE N/A	WT.	SHEET 4 OF 13	

Form. Rev. AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

FOR OUTPUT CODE M

CLASS I, DIV. 1, GROUPS A AND B

V_{MAX} = 30V	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_{MAX} = 200mA	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 200mA
P_{MAX} = 1 WATT	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .02µf	C_A IS GREATER THAN .02µf
L_I =10µH	L_A IS GREATER THAN 10µH
T4 (Ta=-50°C to +70°C)	

* FOR T1 OPTION:

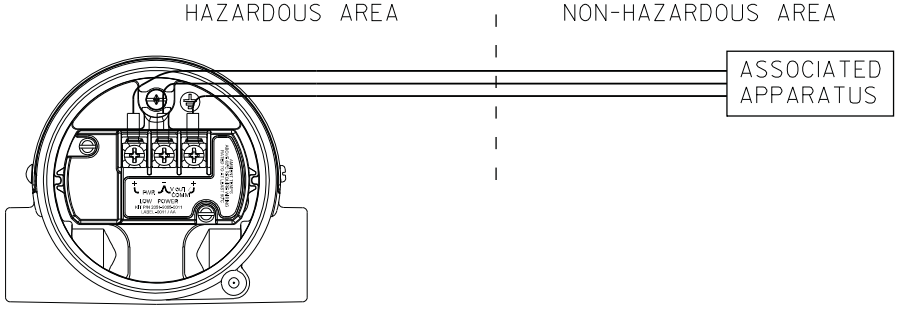
L_I =0.75mH	L_A IS GREATER THAN 0.75mH

CLASS I, DIV. 1, GROUPS C AND D

V_{MAX} = 30V	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_{MAX} = 225mA	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 225mA
P_{MAX} = 1 WATT	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .02µf	C_A IS GREATER THAN .02µf
L_I =10µH	L_A IS GREATER THAN 10µH
T4 (Ta=-50°C to +70°C)	

* FOR T1 OPTION:

L_I =0.75mH	L_A IS GREATER THAN 0.75mH



OUTPUT CODE M
AVAILABLE FOR THE MODELS LISTED

205IC 205IT
205IL

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

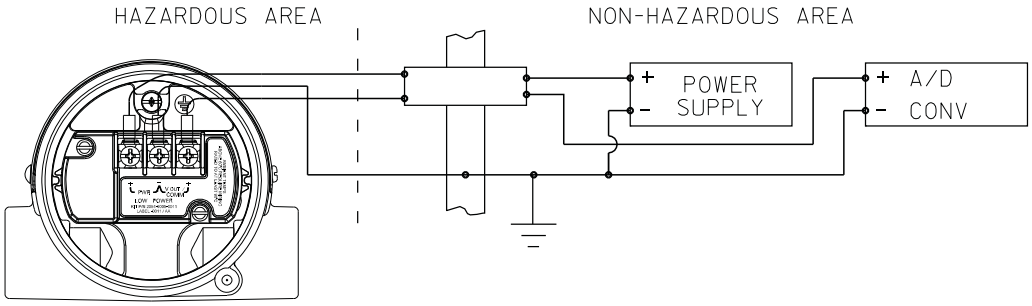
CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 5 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

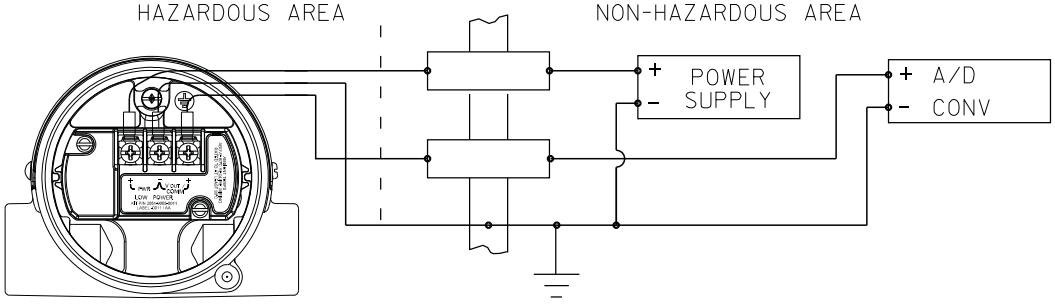
CIRCUIT DIAGRAM 3
ONE DUAL CHANNEL BARRIER



OUTPUT CODE M
AVAILABLE FOR THE MODELS LISTED

205IC 205IT
205IL

CIRCUIT DIAGRAM 4
TWO SINGLE CHANNEL BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED
IN THIS CONFIGURATION)



OUTPUT CODE M
AVAILABLE FOR THE MODELS LISTED

205IC 205IT
205IL

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 6 OF 13

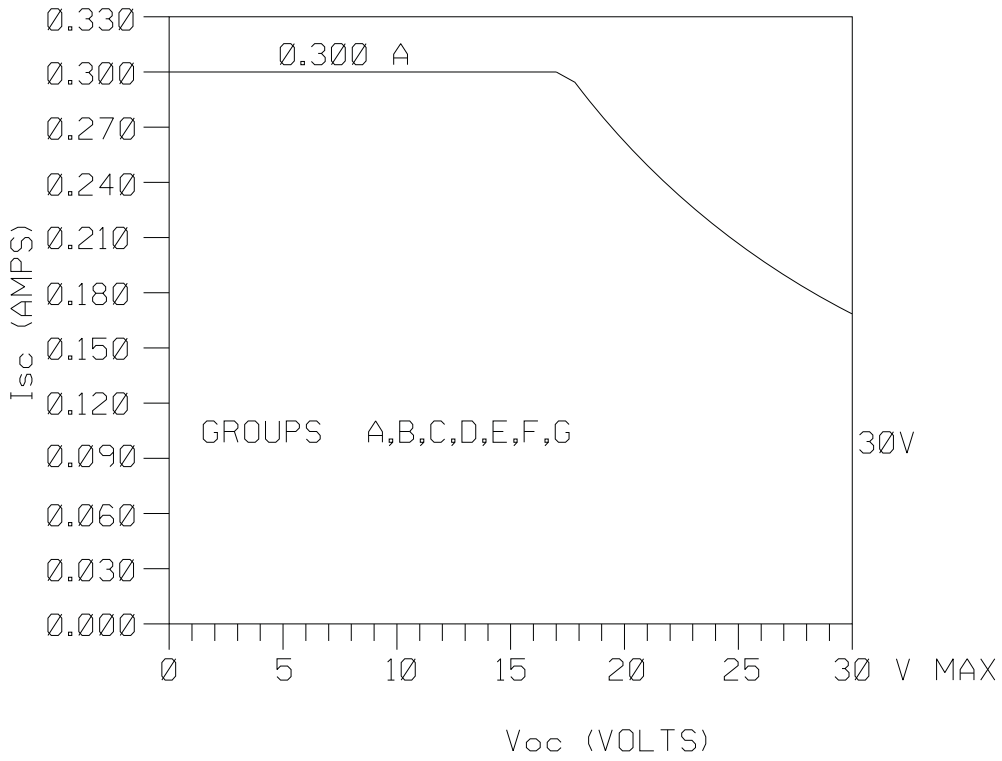
Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

2051 WITH FOUNDATION FIELDBUS OR PROFIBUS. (OUTPUT CODE F OR W)

BARRIER PARAMETERS (APPLICABLE TO OUTPUT CODE F OR W)

Pmax = 1.3 WATT



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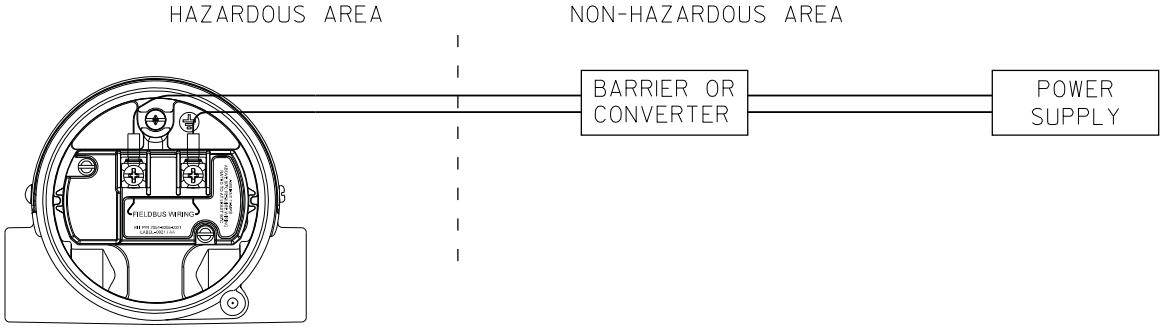
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 7 OF 13

Form Rev AC

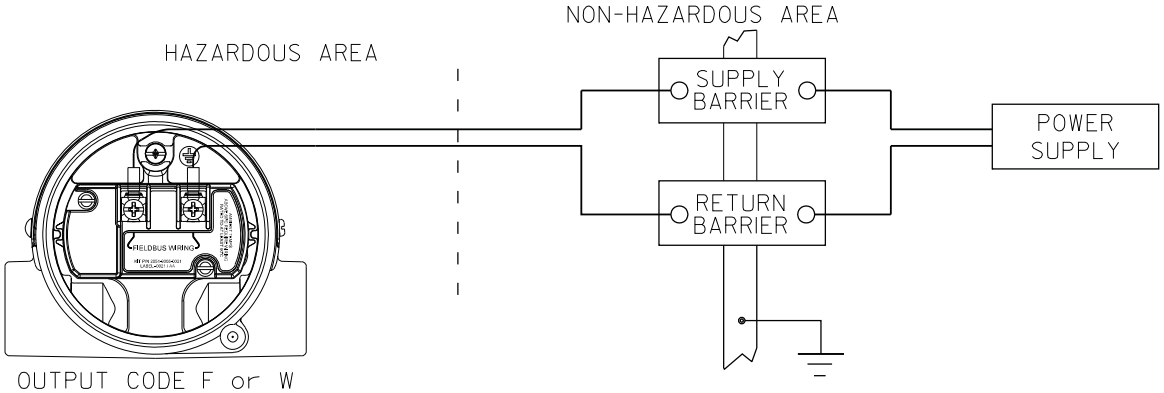
REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

CIRCUIT DIAGRAM 1
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL



OUTPUT CODE F or W
MODELS INCLUDED
205IC, L, T

CIRCUIT DIAGRAM 2
SUPPLY AND RETURN BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)



OUTPUT CODE F or W
MODELS INCLUDED
205IC, L, T

Rosemount Inc.
8200 Market Boulevard
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CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 8 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

ENTITY CONCEPT APPROVALS

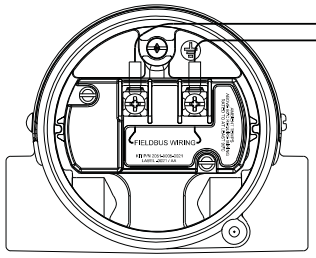
THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc OR Vt) AND MAX. SHORT CIRCUIT CURRENT (Isc OR It) AND MAX. POWER (Voc X Isc/4) OR (Vt X It/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax), MAXIMUM SAFE INPUT CURRENT (Imax), AND MAXIMUM SAFE INPUT POWER (Pmax) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (C_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (L_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

NOTE: ENTITY PARAMETERS LISTED APPLY ONLY TO ASSOCIATED APPARATUS WITH LINEAR OUTPUT.

FOR OUTPUT CODE F or W

CLASS I, DIV. 1, GROUPS A, B, C AND D

V_{MAX} = 30V	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_{MAX} = 300mA	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 300mA
P_{MAX} = 1.3 WATT	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
C_I = 0µf	C_A IS GREATER THAN 0µf
L_I = 0µH	L_A IS GREATER THAN 0µH
T4 (Ta=-50°C to +70°C)	
T4 (Ta=-50°C to +60°C) FISCO	



HAZARDOUS AREA | NON-HAZARDOUS AREA

ASSOCIATED APPARATUS

(SEE SHEET 3)

OUTPUT CODE F
MODELS INCLUDED
205IC, L, T

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8200 Market Boulevard
Chanhassen, MN 55317 USA

DR. Myles Lee Miller

ISSUED

CAD MAINTAINED (MicroStation)

SIZE	FSCM NO	DWG NO.	
A		02051-1009	
SCALE N/A	WT.	SHEET 9 OF 13	

Form. Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

FISCO CONCEPT APPROVALS

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. FOR THIS INTERCONNECTION TO BE VALID THE VOLTAGE (U_i or Vmax), THE CURRENT (I_i or Imax), AND THE POWER (P_i or Pma) THAT INTRINSICALLY SAVE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALY SAFE, INCLUDING FAULTS, MUST BE EQUAL OR GREATER THAN THE VOLTAGE (Uo, Voc, or Vt), THE CURRENT (Io, Isc, or It), AND THE POWER (Po or Pmax) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. ALSO, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (BESIDES THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5nF AND 10µH RESPECTVELY.
ONLY ONE ACTIVE DEVICE IN EACH SECTION (USUALLY THE ASSOCIATED APPARATUS) IS ALLOWED TO CONTRIBUTE THE DESIRED ENERGY FOR THE FIELDBUS SYSTEM. THE ASSOCIATED APPARATUS' VOLTAGE Uo (or Voc or Vt) IS LIMITED TO A RANGE OF 14V TO 24 V.D.C. ALL OTHER EQUIPENT COMBINED IN THE BUS CABLE MUST BE PASSIVE (THEY CANNOT PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50 µA FOR EACH CONNECTED DEVICE) SEPARATELY POWERED EQUIPMENT REQUIRES A GALVANIC ISOLATION TO AFFIRM THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT WILL REMAIN PASSIVE. THE PARAMETER OF THE CABLE USED TO INTERCONNECT THE DEVICES MUST BE IN THE FOLLOWING RANGE:

LOOP RESISTANCE R':	15...150 OHM/km
INDUCTANCE PER UNIT LENGTH L':	0.4...1mH/KM
CAPACITANCE PER UNLIT LENGTH C':	80...200nF

C' = C' LINE/LINE +0.5C' LINE/SCREEN, IF BOTH LINES ARE FLOATING, OR
C' = C' LINE/LINE +C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE

TRUNK CABLE LENGTH:	≤1000 m
SPUR CABLE LENGTH:	≤30 m
SPLICE LENGTH:	≤1 m

AN APPROVED INFALLIBLE LINE TERMINATION TO EACH END OF THE TRUNK CABLE, WITH THE FOLLOWING PARAMETERS IS APPROPRIATE:

R = 90...100 OHMS C = 2.2µF

AN ALLOWED TERMINATION MIGHT ALREADY BE LINKED IN THE ASSOCIATED APPARATUS. DUE TO I.S. REASONS, THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED. IF THE RULES ABOVE ARE FOLLOWED, UP TO A TOTAL LENGTH OF 1000 m (THE SUMMATION OF TRUNK AND ALL SPUR CABLES), THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT DAMAGE THE INTRINSIC SAFETY OF THE SYSTEM.

NOTES:
INTRINSICALLY SAFE CLASS I, DIV. 1, GROUPS A, B, C, D

1. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250 V.
2. CAUTION: ONLY USE SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING TEMPERATURE.
3. WARNING: REPLACEMENT OF COMPONENTS MAY DAMAGE INTRINSIC SAFETY.

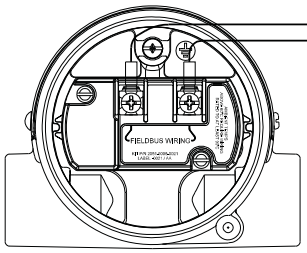
Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 10 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

HAZARDOUS (CLASSIFIED) LOCATION
CLASS I, DIVISION 1, GROUPS A,B,C,D
CLASS II, DIVISION 1, GROUPS E,F,G
CLASS III, DIVISION 1

NON-HAZARDOUS AREA



OUTPUT CODE F or W
MODELS INCLUDED
205IC, L, T

U_1 = 17.5V
I_1 = 380mA
P_1 = 5.32W
C_1 < 5nF
L_1 < 10μH

ANY FM APPROVED ASSOCIATED APPARATUS SUITABLE FOR FISCO CONCEPT

ANY FM APPROVED INTRINSICALLY SAFE APPARATUS SUITABLE FOR FISCO CONCEPT

ANY FM APPROVED TERMINATION WITH
R=90...100 Ohms
C=0...2.2 uF

C R

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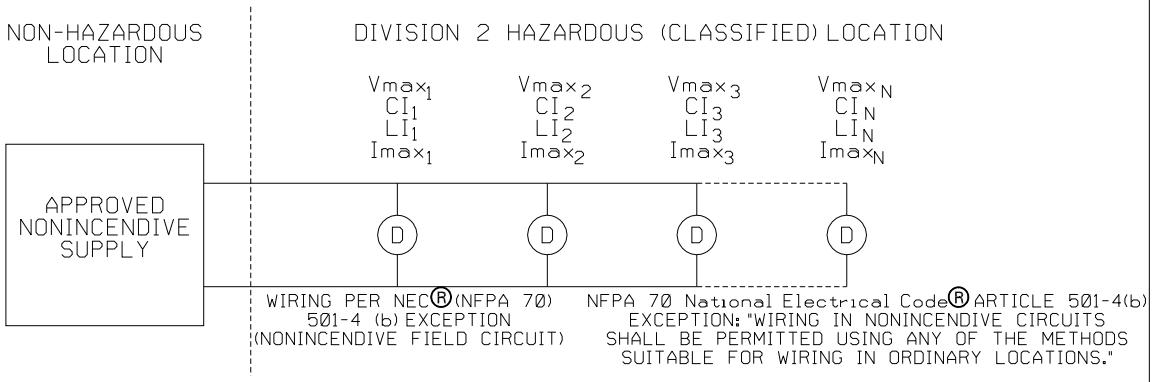
CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009
ISSUED	SCALE N/A	WT. ———	SHEET 11 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

NONINCENDIVE FIELD CIRCUIT
CLASS I, DIV. 2 LOCATIONS



IN NORMAL OPERATION

DEVICES CONTROL THROUGH-CURRENT

PARAMETERS DEVICE

Voc <= Minimum of ($Vmax_1$, $Vmax_2$, ..., $Vmax_N$)

$Imax_1$ >= Iq_1 + $Isignal_1$

$Imax_2$ >= Iq_1 + $Isignal_2$

.

.

.

$Imax_N$ >= Iq_N + $Isignal_N$

Ca <= C_{1_1} + C_{1_2} +... + C_{1_N} + Ccable

La <= L_{1_1} + L_{1_2} +... + L_{1_N} + Lcable

Imax for an individual device = Iq + Isignal

Iq =Quiescent current through device
(Maximum quiescent current for the device)

Isignal =Signaling current through device
(Protocol may limit signaling to one device at a time)

Operating Imax = Iq_1 + Iq_2 +...+ Iq_N + I_{signal} max

I_{signal} max = Max. of ($Isignal_1$, $Isignal_2$,...., $Isignal_N$)

ROSEMOUNT 2051

	4-20mA/ HART	1-5 VDC/ HART	FIELDBUS (F or W)
Vmax	30v	30v	30v
Maximum normal operating current	22mA	3.1mA	27mA
Ca	.010uF	.020uF	0uF
La	10uH	10uH	0uH
La w/T1		.75mH	

ROSEMOUNT 2051 TRANSMITTERS ARE CURRENT CONTROLLERS ON INDIVIDUAL PARALLEL BRANCHES WITH RESPECT TO THE POWER SUPPLY. IN NONINCENDIVE INSTALLATIONS THE Imax FOR EACH TRANSMITTER IS NOT RELATED TO THE MAXIMUM CURRENT OF THE POWER SUPPLY (Isc) IN THE SAME MANNER AS FOR TRANSMITTER INSTALLED PER I.S. REQUIREMENTS, BECAUSE NONINCENDIVE REQUIREMENTS INCLUDE ONLY NORMAL OPERATING CONDITIONS.

REFERENCE: APPENDIX A7.3 (FM3611)

Rosemount Inc.
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Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009	
ISSUED	SCALE N/A	WT.		SHEET 12 OF 13

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AD				

NOTES:

1. NO REVISION TO THIS DRAWING WITHOUT PRIOR FM APPROVAL.
2. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
3. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
4. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms or Vdc.
5. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 OHM.
6. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
7. THE ASSOCIATED APPARATUS MUST BE FM APPROVED.
8. WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
9. THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:
   Vmax or U_i IS GREATER THAN or EQUAL TO Voc, Vt or Uo
   Imax or I_i IS GRETER THAN or EQUAL TO Isc, It or Io
   Pmax or P_i IS GRETER THAN or EQUAL TO Po
   Ca IS GREATER THAN or EQUAL TO THE SUM OF ALL C_i's PLUS Ccable
   La IS GREATER THAN or EQUAL TO THE SUM OF ALL L_i's PLUS Lcable
10. WARNING - TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.
11. THE ASSOCIATED APPARATUS MUST BE A RESISTIVELY LIMITED SINGLE OR MULTIPLE CHANNEL FM APPROVED BARRIER HAVEING PARAMETERS LESS THAN THOSE QUOTED, AND FOR WHICH THE OUTPUT AND THE COMBINATIONS OF OUTPUTS IS NON-IGNITION CAPABLE FOR THE CLASS, DIVISION AND GROUP OF USE.
12. FIELD WIRING SHOULD BE RATED TO 70° C.

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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1009	
ISSUED	SCALE N/A	WT. ———	SHEET 13 OF 13	

Form Rev AC

B.5.2 Canadian Standards Association (CSA) 02051-1008

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1025889	J.G.K.	4/21/08
AB	UPDATE PER CSA REQUIREMENT	RTC1026355	J.G.K.	6/18/08

APPROVALS FOR

2051C
2051L
2051T

OUTPUT CODE A (4-20 mA HART) I.S. SEE SHEETS 2-3
OUTPUT CODE M (LOW POWER) I.S. SEE SHEETS 3-4
OUTPUT CODE F/W (FIELDBUS) I.S. SEE SHEETS 5-7
OUTPUT CODES A,F,W I.S. ENTITY PARAMETERS SHEET 8-9

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION I.

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION I.

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

DR. Myles Lee Miller 4/15/08

CHK'D

APP'D.

APP'D. GOVT.

EMERSON. Process Management

ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INDEX OF I.S. CSA FOR 2051C/L/T

SIZE A | FSCM NO | DWG NO. 02051-1008

SCALE N/A | WT. ——— | SHEET 1 OF 9

Form Rev AC

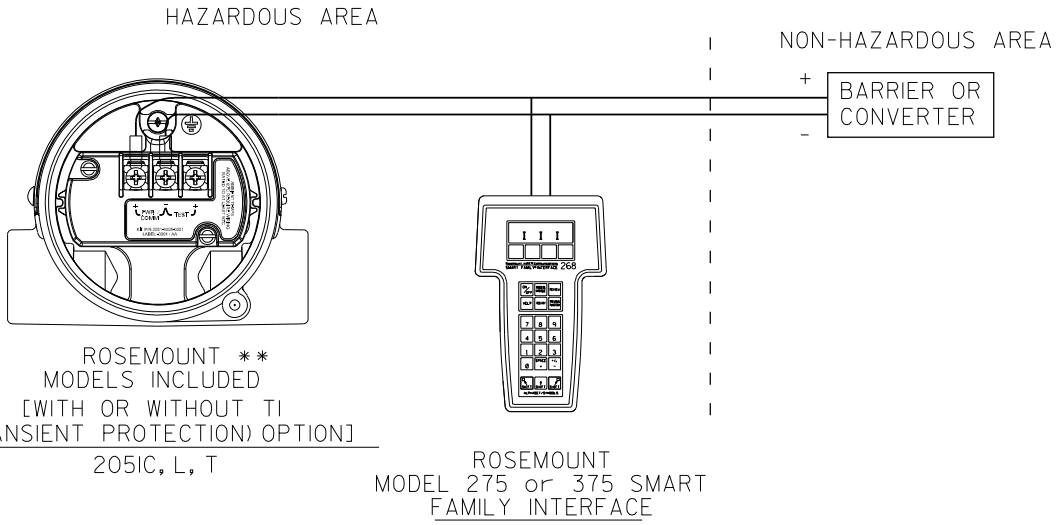
REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

CSA INTRINSIC SAFETY APPROVALS

CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia

INTRINSICALLY SAFE/SECURITE INTRINSEQUE
4-20 mA, ("A" OUTPUT CODE)



ROSEMOUNT **
MODELS INCLUDED
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]
2051C, L, T

ROSEMOUNT
MODEL 275 or 375 SMART
FAMILY INTERFACE

** FOR THE LOW POWER OPTION, SEE PAGE 4 FOR THE CIRCUIT CONNECTION WITH BARRIER OR CONVERTER. FOR FIELDBUS OPTIONS("F" or "W" OUTPUT CODE), SEE PAGE 5 FOR PARAMETERS AND CIRCIUT CONNECTION TO BARRIER.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)
DR. Myles Lee Miller 4/15/08	SIZE A	FSCM NO	DWG NO. 02051-1008
ISSUED	SCALE N/A	WT.	SHEET 2 OF 9

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

4-20 mA, ("A" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I
CSA APPROVED SAFETY BARRIER	30 V OR LESS *330 OHMS OR MORE * 28 V OR LESS 300 OHMS OR MORE 25 V OR LESS 200 OHMS OR MORE * 22 V OR LESS 180 OHMS OR MORE	GROUPS A, B, C, D
FOXBORO CONVERTER 2AI-I2V-CGB, 2AI-I3V-CGB, 2AS-I3I-CGB, 3A2-I2D-CGB, 3A2-I3D-CGB, 3AD-I3I-CGB, 3A4-I2D-CGB, 2AS-I2I-CGB, 3F4-I2DA		GROUPS B, C, D
CSA APPROVED SAFETY BARRIER	30 V OR LESS 150 OHMS OR MORE	GROUPS C, D

LOW POWER, ("M" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I
	Supply ≤ 28V, ≥300 Ω Return ≤ 10V, ≥47 Ω	GROUPS A, B, C, D
CSA APPROVED SAFETY BARRIER	Supply ≤ 30V, ≥150 Ω Return ≤ 10V, ≥47 Ω	GROUPS C, D

* MAY BE USED WITH ROSEMOUNT MODEL 275 or 375 SMART FAMILY INTERFACE.

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1008	
ISSUED	SCALE N/A	WT. ———	SHEET 3 OF 9	

Form Rev AC

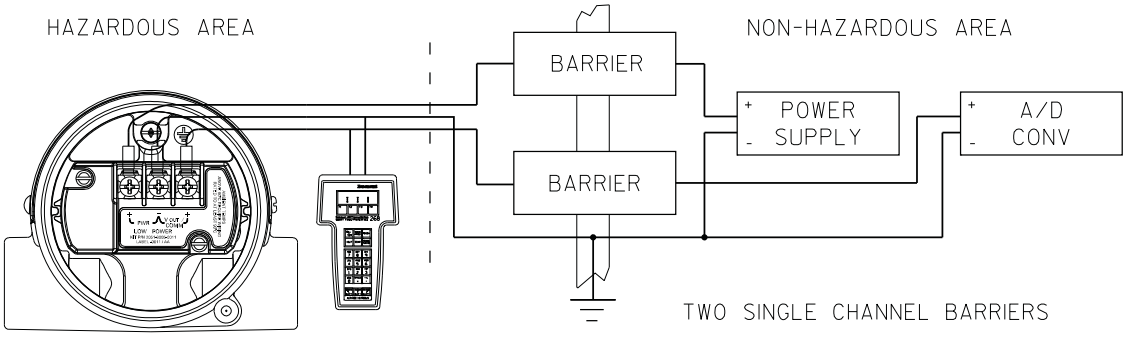
REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

CSA INTRINSIC SAFETY APPROVALS

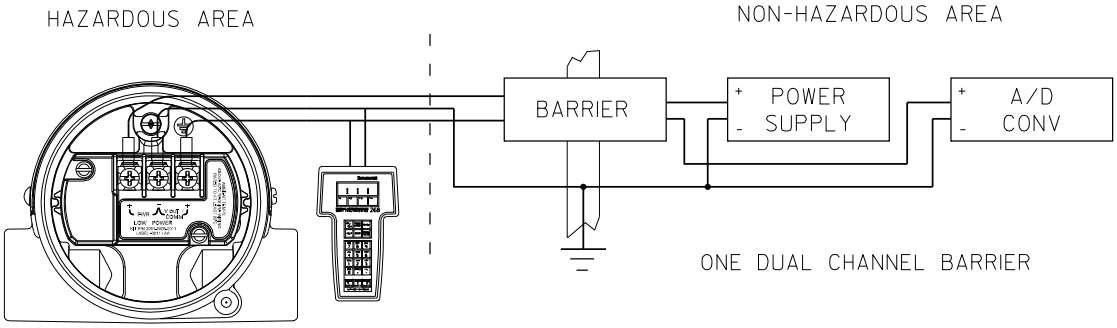
205IC LOW POWER CIRCUIT CONNECTION WITH INTRINSIC SAFETY BARRIERS

Ex ia

INTRINSICALLY SAFE/SECURITE INTRINSEQUE
LOWPOWER, ("M" OUTPUT CODE)



ROSEMOUNT MODEL 275 or 375



ROSEMOUNT MODEL 275 or 375

APPROVED FOR CLASS I, DIVISION I, GROUPS A,B,C,D WHEN USED IN CIRCUIT WITH TWO CSA APPROVED SINGLE CHANNEL SAFETY BARRIERS, ONE WITH APPROVED SAFETY PARAMETERS OF 28 VOLTS OR LESS AND 300 OHMS OR MORE IN +PWR LINE, AND ONE WITH APPROVED SAFETY PARAMETERS OF 10 VOLTS OR LESS AND 47 OHMS OR MORE IN Vout LINE, OR ONE CSA APPROVED DUAL CHANNEL SAFETY BARRIER WITH IDENTICAL APPROVED SAFETY PARAMETERS CONNECTED IN LIKE MANNER, AS ABOVE.

APPROVED FOR CLASS I, DIVISION I, GROUPS C,D WHEN USED IN CIRCUIT WITH TWO CSA APPROVED SINGLE CHANNEL SAFETY BARRIERS, ONE WITH APPROVED SAFETY PARAMETERS OF 30 VOLTS OR LESS AND 150 OHMS OR MORE IN +PWR LINE AND ONE WITH APPROVED SAFETY PARAMETERS OF 10 VOLTS OR LESS AND 47 OHMS OR MORE IN Vout LINE.

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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO.	02051-1008
ISSUED	SCALE N/A	WT. ———	SHEET 4 OF 9	

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

FIELDBUS, ("F" or "W" OUTPUT CODE)

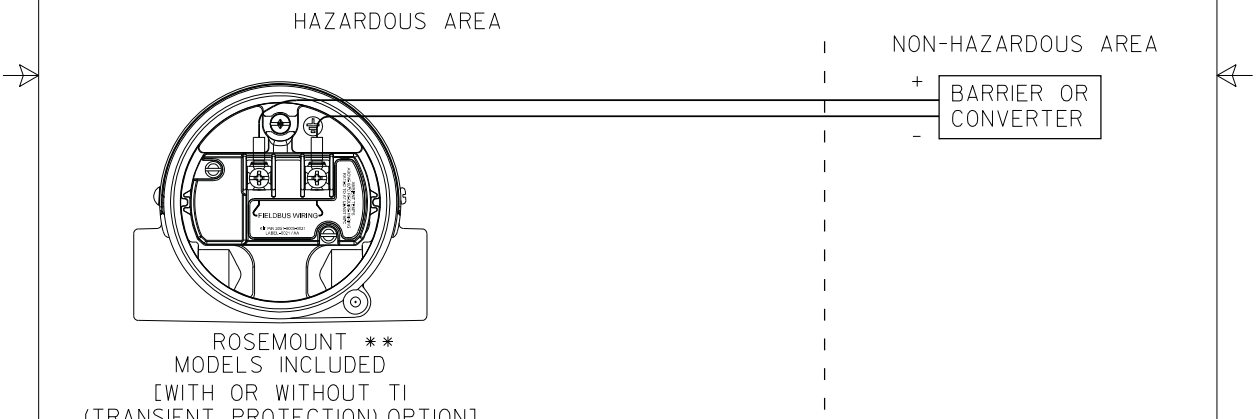
DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I
CSA APPROVED SAFETY BARRIER	30 V OR LESS 300 OHMS OR MORE 28 V OR LESS 235 OHMS OR MORE 25 V OR LESS 160 OHMS OR MORE 22 V OR LESS 100 OHMS OR MORE	GROUPS A, B, C, D

CSA INTRINSIC SAFETY APPROVALS

CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia

INTRINSICALLY SAFE/SECURITE INTRINSEQUE
FIELDBUS, ("F" or "W" OUTPUT CODE)



ROSEMOUNT **
MODELS INCLUDED
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]

205IC, L, T

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION I.

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION I.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 02051-1008
ISSUED	SCALE N/A	WT. ———	SHEET 5 OF 9

Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

FISCO CONCEPT APPROVALS

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. FOR THIS INTERCONNECTION TO BE VALID THE VOLTAGE (U_i or Vmax), THE CURRENT (I_i or Imax), AND THE POWER (P_i or Pma) THAT INTRINSICALLY SAVE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALY SAFE, INCLUDING FAULTS, MUST BE EQUAL OR GREATER THAN THE VOLTAGE (Uo, Voc, or Vt), THE CURRENT (Io, Isc, or It), AND THE POWER (Po or Pmax) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. ALSO, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (BESIDES THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5nF AND 10µH RESPECTVELY.
ONLY ONE ACTIVE DEVICE IN EACH SECTION (USUALLY THE ASSOCIATED APPARATUS) IS ALLOWED TO CONTRIBUTE THE DESIRED ENERGY FOR THE FIELDBUS SYSTEM. THE ASSOCIATED APPARATUS' VOLTAGE Uo (or Voc or Vt) IS LIMITED TO A RANGE OF 14V TO 24 V.D.C. ALL OTHER EQUIPENT COMBINED IN THE BUS CABLE MUST BE PASSIVE (THEY CANNOT PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50 µA FOR EACH CONNECTED DEVICE) SEPARATELY POWERED EQUIPMENT REQUIRES A GALVANIC ISOLATION TO AFFIRM THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT WILL REMAIN PASSIVE. THE PARAMETER OF THE CABLE USED TO INTERCONNECT THE DEVICES MUST BE IN THE FOLLOWING RANGE:

LOOP RESISTANCE R':	15...150 OHM/km
INDUCTANCE PER UNIT LENGTH L':	0.4...1mH/KM
CAPACITANCE PER UNLIT LENGTH C':	80...200nF

C' = C' LINE/LINE +0.5C' LINE/SCREEN, IF BOTH LINES ARE FLOATING, OR
C' = C' LINE/LINE +C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE

TRUNK CABLE LENGTH:	≤1000 m
SPUR CABLE LENGTH:	≤30 m
SPLICE LENGTH:	≤1 m

AN APPROVED INFALLIBLE LINE TERMINATION TO EACH END OF THE TRUNK CABLE, WITH THE FOLLOWING PARAMETERS IS APPROPRIATE:

R = 90...100 OHMS C = 2.2µF

AN ALLOWED TERMINATION MIGHT ALREADY BE LINKED IN THE ASSOCIATED APPARATUS. DUE TO I.S. REASONS, THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED. IF THE RULES ABOVE ARE FOLLOWED, UP TO A TOTAL LENGTH OF 1000 m (THE SUMMATION OF TRUNK AND ALL SPUR CABLES), THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT DAMAGE THE INTRINSIC SAFETY OF THE SYSTEM.

NOTES:
INTRINSICALLY SAFE CLASS I, DIV. 1, GROUPS A, B, C, D

1. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250 V.
2. CAUTION: ONLY USE SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING TEMPERATURE.
3. WARNING: REPLACEMENT OF COMPONENTS MAY DAMAGE INTRINSIC SAFETY.

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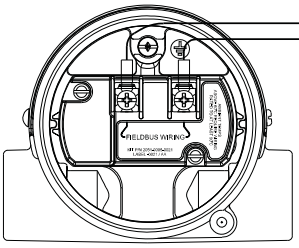
Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

HAZARDOUS (CLASSIFIED) LOCATION
CLASS I, DIVISION I, GROUPS A,B,C,D
CLASS II, DIVISION I, GROUPS E,F,G
CLASS III, DIVISION I

NON-HAZARDOUS AREA



OUTPUT CODE F or W
MODELS INCLUDED
205IC, L, T

ANY CSA APPROVED ASSOCIATED APPARATUS SUITABLE FOR FISCO CONCEPT

ANY CSA APPROVED INTRINSICALLY SAFE APPARATUS SUITABLE FOR FISCO CONCEPT

ANY CSA PPROVED TERMINATION WITH
R=90...100 Ohms
C=0...2.2 uF

C R

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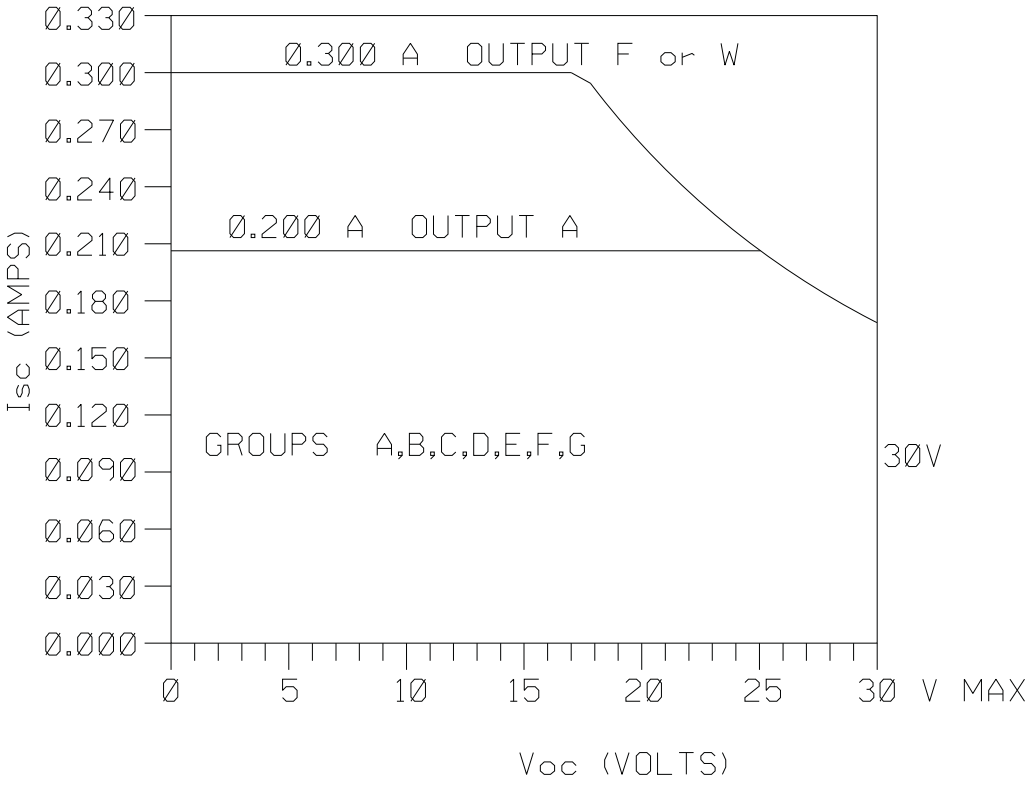
Form, Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

2051 I.S. ENTITY PARAMETERS. (OUTPUT CODE A,F, or W)

BARRIER PARAMETERS (APPLICABLE TO OUTPUT CODE A,F, or W)

Pmax = 1.3 WATT OUTPUT F or W
Pmax = 1.0 WATT OUTPUT A



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Form Rev AC

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB				

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc) AND MAX. SHORT CIRCUIT CURRENT (Isc) AND MAX. POWER (Voc X Isc/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax), MAXIMUM SAFE INPUT CURRENT (Imax), AND MAXIMUM SAFE INPUT POWER (Pmax) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

FOR OUTPUT CODE A
CLASS I, DIV. 1, GROUPS A, B, C AND D: CLASS I, ZONE Ø, GROUP IIC

V_T = 3ØV	V_{OC} IS LESS THAN OR EQUAL TO 3ØV
I_T = 2ØØmA	I_{SC} IS LESS THAN OR EQUAL TO 2ØØmA
P_{MAX} = 1 WATT	$(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .Ø1µf	C_A IS GREATER THAN .Ø1µf + C CABLE
L_I =1Ø µH	L_A IS GREATER THAN 1Ø µH + L CABLE

FOR OUTPUT CODE F or W
CLASS I, DIV. 1, GROUPS A, B, C AND D: CLASS I, ZONE Ø, GROUP IIC

V_T = 3ØV	V_{OC} IS LESS THAN OR EQUAL TO 3ØV
I_T = 3ØØmA	I_{SC} IS LESS THAN OR EQUAL TO 3ØØmA
P_{MAX} = 1.3 WATT	$(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
C_I = Ø µf	C_A IS GREATER THAN Ø µf + C CABLE
L_I = Ø µH	L_A IS GREATER THAN Ø µH + L CABLE

FOR OUTPUT CODE M
CLASS I, DIV. 1, GROUPS A, B, C AND D: CLASS I, ZONE Ø, GROUP IIC

V_T = 3ØV	V_{OC} IS LESS THAN OR EQUAL TO 3ØV
I_T = 2ØØmA	I_{SC} IS LESS THAN OR EQUAL TO 2ØØmA
P_{MAX} = 1 WATT	$(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
C_I = .Ø2 µf	C_A IS GREATER THAN .Ø1µf + C CABLE
L_I =1Ø µH	L_A IS GREATER THAN 1Ø µH + L CABLE

✳ FOR T1 OPTION:

L_I =Ø.75mH	

NOTE: ENTITY PARAMETERS LISTED APPLY ONLY TO ASSOCIATED APPARATUS WITH LINEAR OUTPUT.

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CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. Ø2Ø51-1ØØ8
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Form Rev AC

Reference Manual
00809-0200-4101, Rev BA
October 2014

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