Reference Manual

Original Instructions

PlantPAx
Distributed Control System

Rockwell Automation Library of Process Objects: HART Modules for PlantPAx DCS

Version 3.5





Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Chapter 4

HART Analog Output (P_AOutHART)

Module Messaging Reference

Appendix A

Index

Notes:

The purpose of this manual is to facilitate the integration of HART devices into a PlantPAx® system or integrated architecture. The P_AInHART and P_AOutHART objects are included with the Rockwell Automation Library of Process Objects.

Software Compatibility and Content Revision

Table 1 - Summary of Changes

Topic	Page
Added two 1715 redundant modules with HART and one ControlLogix isolated HART module	9
Added an Important note to the Cfg_CVNavTag	109
Added message configuration settings for redundant I/O (1715) modules	149

For the latest compatible software information and to download the Rockwell Automation® Library of Process Objects, see the Product Compatibility and Download Center at http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page.

Additional Resources

The documents in the following table contain additional information concerning related products from Rockwell Automation.

Table 2 - Additional Resources

Resource	Description
PlantPAx Distributed Control System Selection Guide, publication PROCES-SG001	Provides information to assist with equipment procurement for your PlantPAx® system.
PlantPAx Distributed Control System Reference Manual, publication PROCES-RM001	Provides characterized recommendations for implementing your PlantPAx system.
Logix5000™ Controllers Add-On Instructions Programming Manual, publication 1756-PM010	Provides information for designing, configuring, and programming Add-On Instructions.
1756 ControlLogix® I/O Specifications Technical Data, publication 1756-TD002	Provides technical data for the ControlLogix HART analog I/O Modules.
ControlLogix HART Analog I/O Modules User Manual, publication 1756-UM533	Provides installation, configuration, and troubleshooting information for the ControlLogix HART analog I/O Modules.
Rockwell Automation Library of Process Objects, publication PROCES-RM002	Provides an overview of the code objects, display elements, and faceplates that comprise the Rockwell Automation Library of Process Objects.
Rockwell Automation Library of Process Objects: Analog Input (P_AIn) Reference Manual, publication SYSLIB-RM001	Provides information on how to use the Add-On Instruction to monitor one analog value, typically from a channel of an analog input module.
Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002	Details how to monitor an input condition to raise an alarm. Information includes acknowledging, resetting, inhibiting, and disabling an alarm.

Table 2 - Additional Resources

Resource	Description
Rockwell Automation Library of Process Objects: Interlocks with First Out and Bypass (P_Intlk) Reference Manual, publication SYSLIB-RM004	Explains how to collect (sum up) the interlock conditions that stop or de-energize a running or energized piece of equipment or prevent it from starting or being energized.
Rockwell Automation Library of Process Objects: Common Mode Block (P_Mode) Reference Manual, publication SYSLIB-RM005	Explains how to choose the Mode (owner) of an instruction or control strategy. The Mode instruction is embedded within other instructions to extend their functionality. It is possible to use a standalone Mode instruction to enhance a program where modes are wanted.
Rockwell Automation Library of Process Objects: Condition Gate Delay (P_Gate) Reference Manual, publication SYSLIB-RM041	Provides details of the P_Gate instruction for processing status and alarm conditions, including gate delay, on-delay, and off-delay timing.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Supported Modules and Guidelines

The P_AInHART and P_AOutHART objects that are the subject of this manual provide a common interface point for process control strategies. This organization provides modularity and streamlined integration by separating device-specific connectivity from input and output processing.

This chapter identifies the module families that are supported for use with the P_AInHART and P_AOut HART Instructions, identifies which I/O Module Add-On Instruction to use, and lists required files.

The following table lists the topics in this chapter.

Supported Modules

Table 3 lists the I/O modules that work with P_AInHART and P_AOutHART.

Table 3 - Supported Modules

Module Family	HART Module	Process Library Add-On Instruction	Description
1715 Redundant I/O Modules	1715-IF16(1)	I_1715IF16_FW3	Allen-Bradley Redundant I/O 16-channel Analog Input module with HART
	1715-OF8I(1)	I_1715OF8I_FW3	Allen-Bradley Redundant I/O 8-channel isolated Analog Input module with HART
1734 POINT I/O™ Modules	1734sc-IE2CH	I_1734scIE2CH	Spectrum Controls POINT I/O 2-channel HART Analog Input module
	1734sc-IE4CH	I_1734scIE4CH	Spectrum Controls POINT I/O 4-channel HART Analog Input module
	1734sc-OE2CIH	I_1734scOE2CIH	Spectrum Controls POINT I/O 2-channel Isolated HART Analog Output module
1756 ControlLogix® I/O Modules	1756-IF8H	I_1756IF8H	Allen-Bradley® ControlLogix 8-channel HART Analog Input module
	1756-IF8IH	I_1756IF8IH	Allen-Bradley ControlLogix 8-channel Isolated HART Analog Input module
	1756-IF16H	I_1756IF16H	Allen-Bradley ControlLogix 16-channel HART Analog Input module
	1756-IF16IH		Allen-Bradley ControlLogix 16-channel Isolated HART Analog Input module
	1756-OF8H	I_1756OF8H	Allen-Bradley ControlLogix 8-channel HART Analog Output module
	1756-OF8IH	I_1756-OF8IH	Allen-Bradley ControlLogix 8-channel Isolated HART Analog Output module
1769 Compact I/O™ Modules	1769sc-IF4IH	I_1769scIF4IH	Spectrum Controls Compact I/O 4-channel Isolated HART Analog Input module
	1769sc-OF4IH	I_1794scOF4IH	Spectrum Controls Compact I/O 4-channel Isolated HART Analog Output module

Table 3 - Supported Modules

Module Family	HART Module	Process Library Add-On Instruction	Description
1794 FLEX™ I/O Modules	1794-IF8IH	I_1794IF8IH	Allen-Bradley FLEX I/O 8-channel Isolated HART Analog Input module
	1794-IF8IHNFXT (2)	I_1794IF8IHNFXT	Allen-Bradley FLEX I/O-XT™ Extended Temperature 8-channel Isolated HART Analog Input module
	1794-OF8IH	I_1794OF8IH	Allen-Bradley FLEX I/O 8-channel Isolated HART Analog Output module

(1) Supported in Library Release 3.5-04 and later. Requires controller firmware version 20 or later.

(2) Supported in Library Release 3.5-02 and later. Requires controller firmware version 24 or later.

Guidelines

This section contains a brief description of HART communication, P_AInHART, P_AOutHART, and additional capabilities.

About HART Communication

HART I/O modules communicate with field devices two ways simultaneously: an analog signal and a digital signal. The analog signal uses a range of 4.0...20.0 mA DC, and the digital communication signal is superimposed on the analog signal.

For analog inputs, the field device provides this signal, and the signal usually represents the main measurement that is provided by the device. For example, a temperature transmitter with a range of 0...200° C provides a signal of:

- 4.0 mA DC when it measures 0° C
- 20.0 mA DC when it measures 200° C
- A proportional value in between for temperatures within the range, such as 12 mA DC for 100° C.

For analog outputs, the signal is provided by the analog output module and sent to the field device, such as a valve positioner. A signal of 4.0 mA DC can request the valve be fully closed, and 20.0 mA DC request the valve be fully open, with signal levels in between representing a percentage open.

For both analog input modules and analog output modules, the HART digital signal gathers data and diagnostics from the field device. The HART protocol provides for sending four floating point values, along with the units of measure and status for each:

- Primary Variable (PV)
- Secondary Variable (SV)
- Third Variable (TV)
- Fourth Variable (FV)

Generally, what data values are sent in these variables depend on the device and can be configured in the field device. For the temperature transmitter, the PV can be a digital copy of the main measured process temperature. The SV can be the same value in other units (Fahrenheit). The TV can be the temperature of the transmitter electronics, and the FV can be unused.

For the valve positioner example, the variables can be used to report requested valve position, actual position, air supply pressure, and so on.

P_AInHART

Use an instance of the P_AInHART instruction for each defined HART analog input channel with a connected field device (transmitter).

This instruction provides standard analog input functionality, plus digital HART values, status, enumerations, and diagnostics. The instruction receives the following values from the field device (if so configured):

- Analog Value ('AV' in parameter names)
  - The analog value is scaled to engineering units and filtered by using a simple first-order filter with configurable time constant
- Digital Values:
  - Primary Variable (PV)
  - Secondary Variable (SV)
  - Third Variable (TV)
  - Fourth Variable (FV)

For each value, the instruction provides status, diagnostics, and units of measure. Lookup tables based, on enumeration values received from the HART device, provide diagnostic text and units of measure text. We included generic lookup tables plus lookup tables for specific Endress+Hauser instruments in the Library Template. We have also made sample applications available as part of the Rockwell Automation® Library of Process Objects download set. See Rockwell Automation Library of Process Objects, publication PROCES-RM002 for more information on process objects.

The instruction also retrieves text and analog scaling information from the device and can use this data to populate corresponding configuration fields of the instruction. Retrieval of HART device information can be automatically or manually initiated.

For the Analog Value only, the instruction also provides the following threshold status and alarms, configurable delay times, and deadbands. Thresholds are set by program logic or by an operator:

- High-High
- High
- Low
- Low-Low
- Out of Range (Fail)

To provide threshold alarms for any of the digital values, use an instance of the P_AIn (analog input) instruction tied to the variable for which alarms are required.

The P_AInHART instruction can be used for each channel on a supported HART Analog Input module. The instruction can be used even if a non-HART device is wired to the channel. In this case, this instruction includes a configuration option to turn off display of the HART data on the faceplate.

P_AInHART, the HART Analog Input instruction provides these additional capabilities:

- Provides Maintenance selection of the substitute value function to allow manual override of the analog input signal (AV).
- Monitors input quality and communication status. Provides value and indication of source and quality for the input signal and the final AV value.
- Uses a standard mode model (P_Mode instruction) to provide mode (ownership) selection. See Modes on page 70 for more information.

P_AOutHART

Use an instance of this instruction for each defined HART analog output channel with a connected field device (actuator).

This instruction outputs an analog controlled variable (CV) to the field device. The instruction receives the following values from the module and the field device (if so configured):

- Analog (loopback) Value ('AV' in parameter names)
- Digital Values:
  - Primary Variable (PV)
  - Secondary Variable (SV)
  - Third Variable (TV)
  - Fourth Variable (FV)

For each value, the instruction provides status, diagnostics, and units of measure. Diagnostic text and units of measure text are provided by lookup based on enumeration values received from the HART device. Generic lookup tables, plus a lookup table for specific Neles Metso valve actuators, are included in the Library Template and Sample applications. The library is part of the Rockwell Automation Library of Process Objects download set.

The instruction also retrieves text and analog scaling information from the device and can use this data to populate corresponding configuration fields of the instruction. Retrieval of HART device information can be automatically or manually initiated.

Other than the HART-specific functions, the P_AOutHART instruction functions much like the basic P_AOut Analog Output instruction, and provides these same capabilities:

- Monitors I/O fault input and raises an alarm on an I/O fault.
- Ownership of the analog output through the standard P_Mode Add-On Instruction and modes (refer to Modes in the Operations section).
- Ability for an operator or other Program logic to set an Analog Controlled Variable (CV, or output) to a specific value. The entered CV is scaled from engineering units to raw (output card) units.
- Interlocks (bypassable and non-bypassable) that are conditions that force the analog output to a specific configured (safe) value or cause it to hold its current value (configurable). Provides an alarm when an interlock causes the Analog Output CV to be changed. Provides maintenance personnel the capability to bypass the bypassable interlocks.
- Override CV input, which determines the CV in Override mode. See Modes on page 110 for more information.
- Simulation capability, the output of the analog output is held at zero and I/O faults are ignored. However, the instruction can be manipulated as if a working analog output were present. This capability is often used for activities such as instruction testing and operator training.
- Increase and decrease rate of change limits (ramping) for the output that are set by the operator or program. Provides a configurable limit for the maximum allowed rate of increase and for the maximum allowed rate of decrease.
- Tieback input (REAL) and a Hand Mode request input (BOOL); when Hand Mode is asserted, the CV is forced to follow the Tieback value.

Required Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This code helps you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

Controller Files

The module RUNG files and Add-On Instruction files are included in the following table.

Module	Add-On Instruction Import File	Rung Import File
	1734sc	
1734sc-IE2CH	I_1734scIE2CH_3_5-**00**_AOI.L5X	I_1734scIE2CH_3_5-**00**_RUNG.L5X
1734sc-IE4CH	I_1734scIE4CH_3_5-**00**_AOI.L5X	I_1734scIE4CH_3_5-**00**_RUNG.L5X
1734sc-OE2CIH	I_1734scOE2CIH_3_5-**00**_AOI.L5X	I_1734scOE2CIH_3_5-**00**_RUNG.L5X
	1756	
1756-IF8H	I_1756IF8H_3_5-**00**_AOI.L5X	I_1756IF8H_3_5-**00**_RUNG.L5X
1756-IF16H 1756-IF16IH	I_1756IF16H_3_5-**00**_AOI.L5X	I_1756IF16H_3_5-**00**_RUNG.L5X
1756-OF8H	I_1756OF8H_3_5-**00**_AOI.L5X	I_1756OF8H_3_5-**00**_RUNG.L5X
1756-OF8IH	I_1756OF8IH_3_5-**00**_AOI.L5X	I_1756OF8IH_3_5-**00**_RUNG.L5X
1756-IF8IH	I_1756IF8IH_3_5-**00**_AOI.L5X	I_1756IF8IH_3_5-**00**_RUNG.L5X
	1769sc	
1769sc-IF4IH	I_1769scIF4IH_3_5-**00**_AOI.L5X	I_1769scIF4IH_3_5-**00**_RUNG.L5X
1769sc-OF4IH	I_1769scOF4IH_3_5-**00**_AOI.L5X	I_1769scOF4IH_3_5-**00**_RUNG.L5X
	1794	
1794-IF8IH	I_1794IF8IH_3_5-**00**_AOI.L5X	I_1756IF8IH_3_5-**00**_RUNG.L5X
1794-OF8IH	I_1794OF8IH_3_5-**00**_AOI.L5X	I_1794OF8IH_3_5-**00**_RUNG.L5X
1794-IF8IHNFXT	I_1794IF8IHNFXT_3_5-**00**_AOI.L5X	I_1756IF8IHNFXT_3_5-**00**_RUNG.L5X

The P_AInHART_3_5-**00**_AOI.L5X and P_AOutHART_3_5-**00**_AOI.L5X Add-On Instructions must be imported into the controller project to be used in the controller configuration. The service release number (boldfaced) can change as service revisions are created.

Visualization Files

This Add-On Instruction has associated visualization files that provide a common user interface. These files can be downloaded from the Product Compatibility and Download Center at http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page.

IMPORTANT The visualization file dependencies require Process Library content imports to occur in a specific order as reflected in the following tables:

- Images
- Global Objects
- Standard Displays
- HMI Tags

Images are external graphic files that can be used in displays. Images must be imported to use in FactoryTalk® View software.

P_AInHART Files

When PNG files are imported, they are renamed by FactoryTalk View with a .bmp file extension, but retain a .png format.

Table 4 - P_AInHART Visualization Files: Images (.png)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
All .png files in the images folder	All .png files in the images folder	The common icons used in the global objects and standard displays for all Process Objects.

The Global Object files (.ggfx file type) in Table 5 are Process Library display elements that are created once and referenced multiple times on multiple displays in an application. When changes are made to a Global Object, all instances in the application are automatically updated.

Table 5 - P_AInHART Visualization Files: Global Objects (.ggfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) Common Faceplate Objects	(RA-BAS-ME) Common Faceplate Objects	Global objects used on process object faceplates.
(RA-BAS) P_AIn Graphics Library	(RA-BAS-ME) P_AIn Graphics Library	Analog Input global object device symbols that are used to build process graphics.
(RA-BAS) Process Alarm Objects	(RA-BAS-ME) Process Alarm Objects	Global objects used for managing alarms on process object faceplates.
(RA-BAS) Process Faceplate Analog Objects	(RA-BAS-ME) Process Faceplate Analog Objects	Analog global objects used on process object faceplates.
(RA-BAS) Process Help Objects	(RA-BAS-ME) Process Help Objects	Global objects that are used for all process objects help displays.
(RA-BAS) Process Mode Objects	(RA-BAS-ME) Process Mode Objects	Global objects used for managing modes on process object faceplates.

The Standard Display files (.gfx file type) in Table 6 are the Process Library displays that you see at runtime.

Table 6 - P_AInHART Visualization Files: Standard Displays (.gfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) Common-AnalogEdit	N/A	Faceplate used for analog input data entry. The FactoryTalk View ME faceplates use the native analog input data entry so no file is required.
(RA-BAS) P_AInHART-Faceplate	(RA-BAS-ME) P_AInHART-Faceplate	The faceplate that is used for the object.

Table 6 - P_AInHART Visualization Files: Standard Displays (.gfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) P_AInHART-Quick	(RA-BAS-ME) P_AInHART-Quick	The Quick display that is used for the object.
(RA-BAS) P_Alarm-Faceplate	(RA-BAS-ME) P_Alarm-Faceplate	The faceplate that is used for managing alarms for the object.
(RA-BAS) P_Alarm-Help	(RA-BAS-ME) P_Alarm-Help	Alarm Help information that is accessed from the P_Alarm faceplate.
(RA-BAS) P_Gate-Faceplate	(RA-BAS-ME) P_Gate-Faceplate	The gate faceplate display used for the object.
(RA-BAS) P_Mode-Config	(RA-BAS-ME) P_Mode-Config	The Configuration Display used to configure the P_Mode object.
(RA-BAS) P_Mode-Help	(RA-BAS-ME) P_Mode-Help	Mode Help information that is accessed from the Help faceplate.
(RA-BAS) Process AnalogIn Family-Help	(RA-BAS-ME) Process AnalogIn Family-Help	The Help display for Analog input objects

HMI Tags are created in a FactoryTalk View ME application to support tab switching on Process Library faceplates. The HMI tags can be imported via the comma-separated values file (.csv file type) in Table 7.

Table 7 - P_AInHART Visualization Files: HMI Tags (.csv)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
N/A	FTVME_PlantPAxLib_Tags_3_5_**xx**.csv where **xx** = the service release number.	These tags must be imported into the FactoryTalk View ME project to support switching tabs on any Process Object faceplate.

P_AOutHART Files

When PNG files are imported, they are renamed by FactoryTalk View with a .bmp file extension, but retain a .png format.

Table 8 - P_AOutHART Visualization Files: Images (.png)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
All .png files in the images folder	All .png files in the images folder	These images are the common icons used in the global objects and standard displays for all Process Objects.

The Global Object files (.ggfx file type) in Table 9 are Process Library display elements that are created once and referenced multiple times on multiple displays in an application. When changes are made to a Global Object, all instances in the application are automatically updated.

Table 9 - P_AOutHART Visualization Files: Global Objects (.ggfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) Common Faceplate Objects	(RA-BAS-ME) Common Faceplate Objects	Global objects used on process object faceplates.
(RA-BAS) Process Alarm Objects	(RA-BAS-ME) Process Alarm Objects	Global objects used for managing alarms on process object faceplates.
(RA-BAS) Process Diagnostic Objects	(RA-BAS-ME) Process Diagnostic Objects	Diagnostic global objects used on process object faceplates.
(RA-BAS) Process Faceplate Analog Objects	(RA-BAS-ME) Process Faceplate Analog Objects	Analog global objects used on process object faceplates.
(RA-BAS) Process Graphics Library	(RA-BAS-ME) Process Graphics Library	Process global object device symbols used to build process graphics

Table 9 - P_AOutHART Visualization Files: Global Objects (.ggfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) Process Help Objects	(RA-BAS-ME) Process Help Objects	Global objects that are used for all process objects help displays.
(RA-BAS) Process Interlock Objects	(RA-BAS-ME) Process Interlock Objects	Global objects used for managing interlocks and permissives on process object faceplates.
(RA-BAS) Process Mode Objects	(RA-BAS-ME) Process Mode Objects	Global objects used for managing modes on process object faceplates.

The Standard Display files (.gfx file type) in Table 10 are the Process Library displays that you see at runtime.

Table 10 - P_AOutHART Visualization Files: Standard Displays (.gfx)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
(RA-BAS) Common-AnalogEdit	N/A	Faceplate used for analog input data entry. The FactoryTalk View ME faceplates use the native analog input data entry so no file is required.
(RA-BAS) P_Alarm-Faceplate	(RA-BAS-ME) P_Alarm-Faceplate	The faceplate that is used for managing alarms for the object.
(RA-BAS) P_Alarm-Help	(RA-BAS-ME) P_Alarm-Help	Alarm Help information that is accessed from the P_Alarm faceplate.
(RA-BAS) P_AOut-Faceplate	(RA-BAS-ME) P_AOut-Faceplate	The faceplate that is used for the object
(RA-BAS) P_AOut-Quick	(RA-BAS-ME) P_AOut-Quick	The Quick display that is used for the object
(RA-BAS) P_Mode-Config	(RA-BAS-ME) P_Mode-Config	The Configuration Display used to configure the P_Mode object.
(RA-BAS) P_Mode-Help	(RA-BAS-ME) P_Mode-Help	Mode Help information that is accessed from the Help faceplate.
(RA-BAS) Process Analog Family-Help	(RA-BAS-ME) Process Analog Family-Help	The Help display for Analog objects
(RA-BAS) P_Intlk-Faceplate	(RA-BAS-ME) P_Intlk-Faceplate	**Optional** The interlock faceplate used for the object. Use this file if your Discrete Output has an associated P_Intlk object and you enable navigation to its faceplate from the Discrete Output faceplate.
(RA-BAS) Process Interlock Family-Help	(RA-BAS-ME) Process Interlock Family-Help	**Optional** Interlock/permissives help display that is used for the object. Use this file if you use the P_Intlk or P_Perm faceplate.

HMI tags are created in a FactoryTalk View ME application to support tab switching on Process Library faceplates. The HMI tags can be imported via the comma-separated values file (.csv file type) in Table 11.

Table 11 - P_AOutHART Visualization Files: HMI Tags (.csv)

FactoryTalk View SE Software	FactoryTalk View ME Software	Description
N/A	FTVME_PlantPAxLib_Tags_3_5_**xx**.csv where **xx** = the service release number.	These tags must be imported into the FactoryTalk View ME project to support switching tabs on any Process Object faceplate.

Notes:

Build Your Application

Introduction

This chapter covers the integration of the various HART input and output modules with the Rockwell Automation® Library of Process Objects.

We use the 1756-IF8H and 1756-OF8IH as examples in this chapter. The procedures for all modules are the same, but the set of tags that are created can vary by I/O family.

The following table lists the topics in this chapter.

Input Module Integration

You must have a project with a controller already configured. Make sure that the project path is set to the correct controller. For the purposes of this document, we refer to this project path as the target application.

Add Input Module

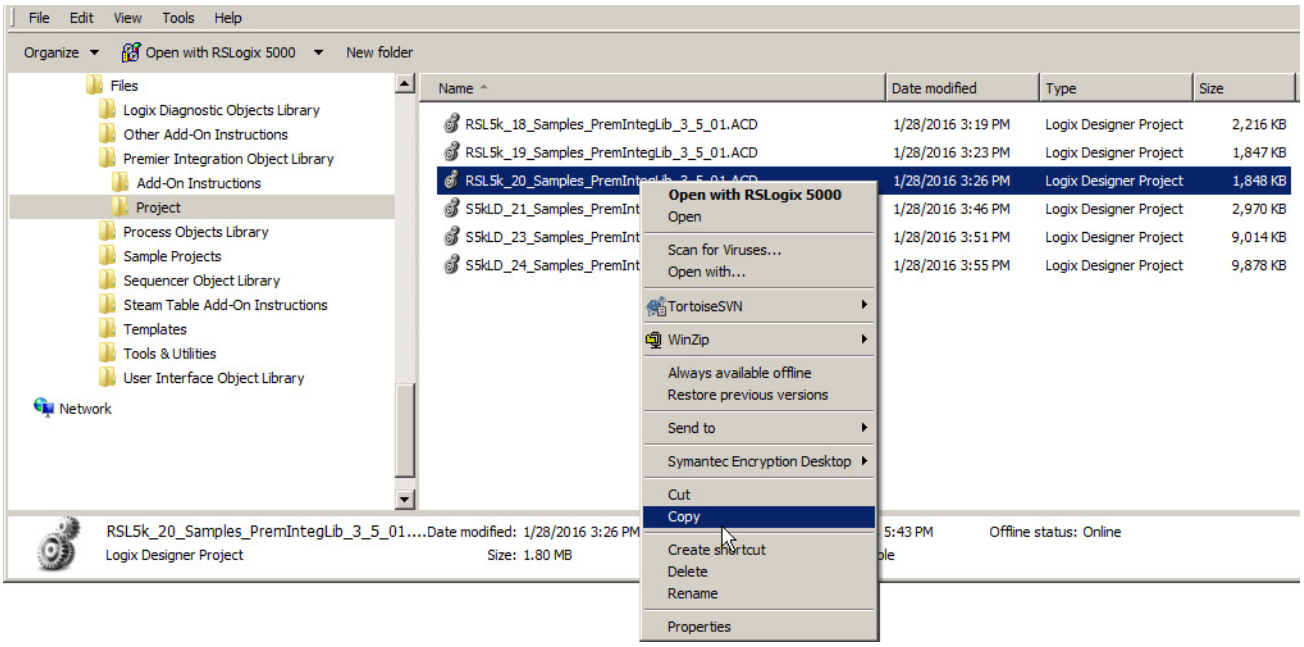
The desired HART I/O module must be added into the project I/O configuration.

TIP We recommend that you copy the module from the sample projects included in the library. By copying the module, several module options are configured for you.

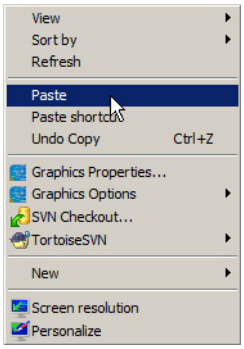
Follow these steps to add an input module to your project:

1. Open Project in the Files>Premier Integration Samples>Project folder.

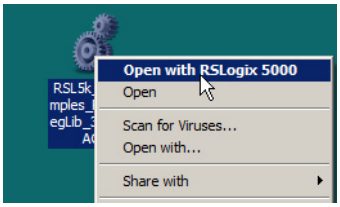
2. Select a sample .ACD file, right-click, and choose copy.



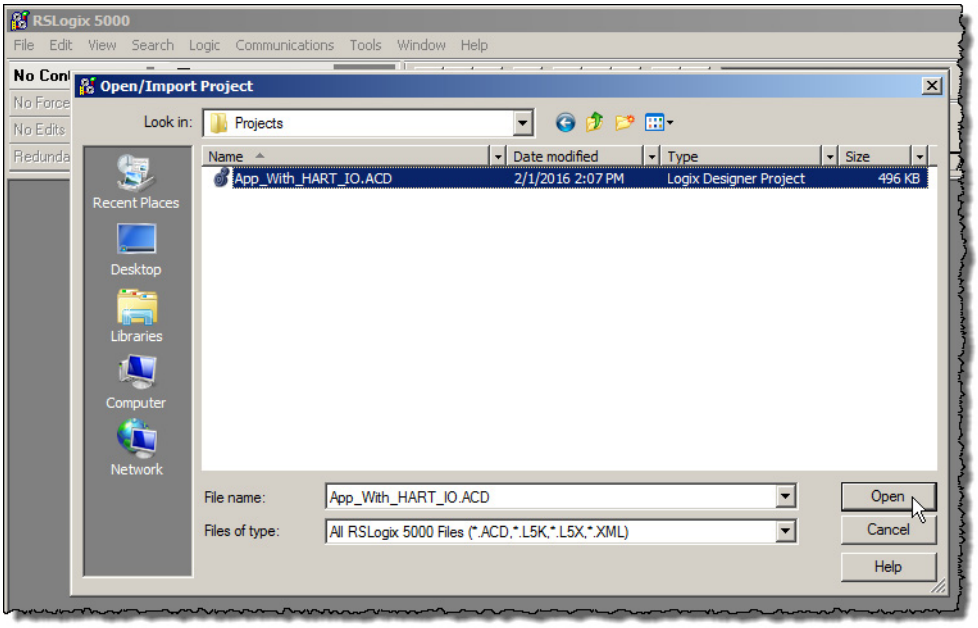
3. On your desktop, right-click and select Paste to place the ACD file on your desktop.



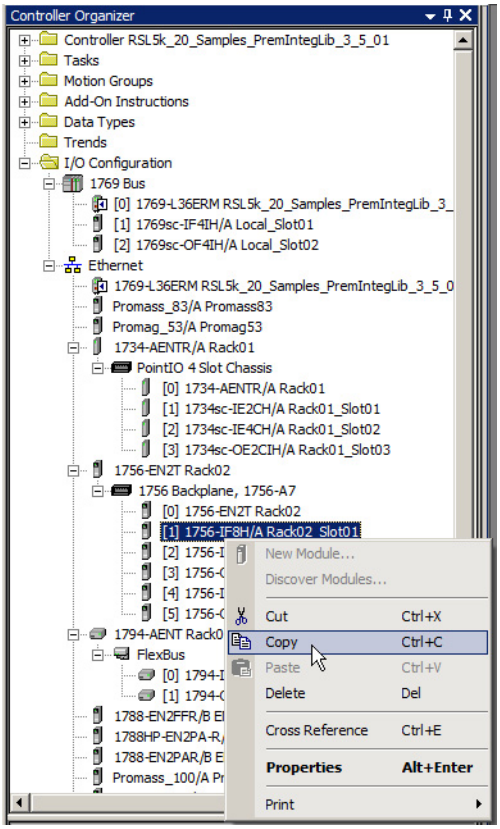
4. Double-click the sample ACD icon or right-click the icon and select Open with RSLogix 5000®.



5. In RSLogix 5000 software (version 20 or earlier) or Studio 5000 Logix Designer® application (version 21 or later), open your target application (App_With_HART_IO.ACD in our example).

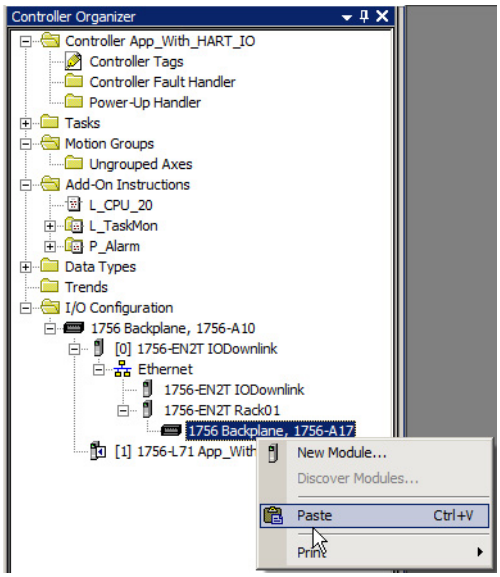


6. In the Controller Organizer of the Samples application, right-click the module type you want to copy and choose Copy.



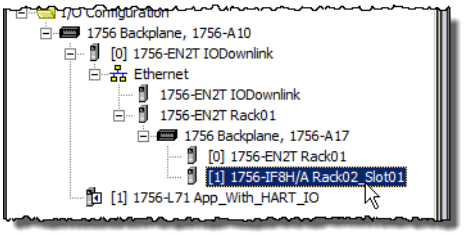
7. In your target application, right-click the 1756 backplane in the Controller Organizer and choose paste.

   For other I/O families, paste the module you copied into the appropriate backplane.



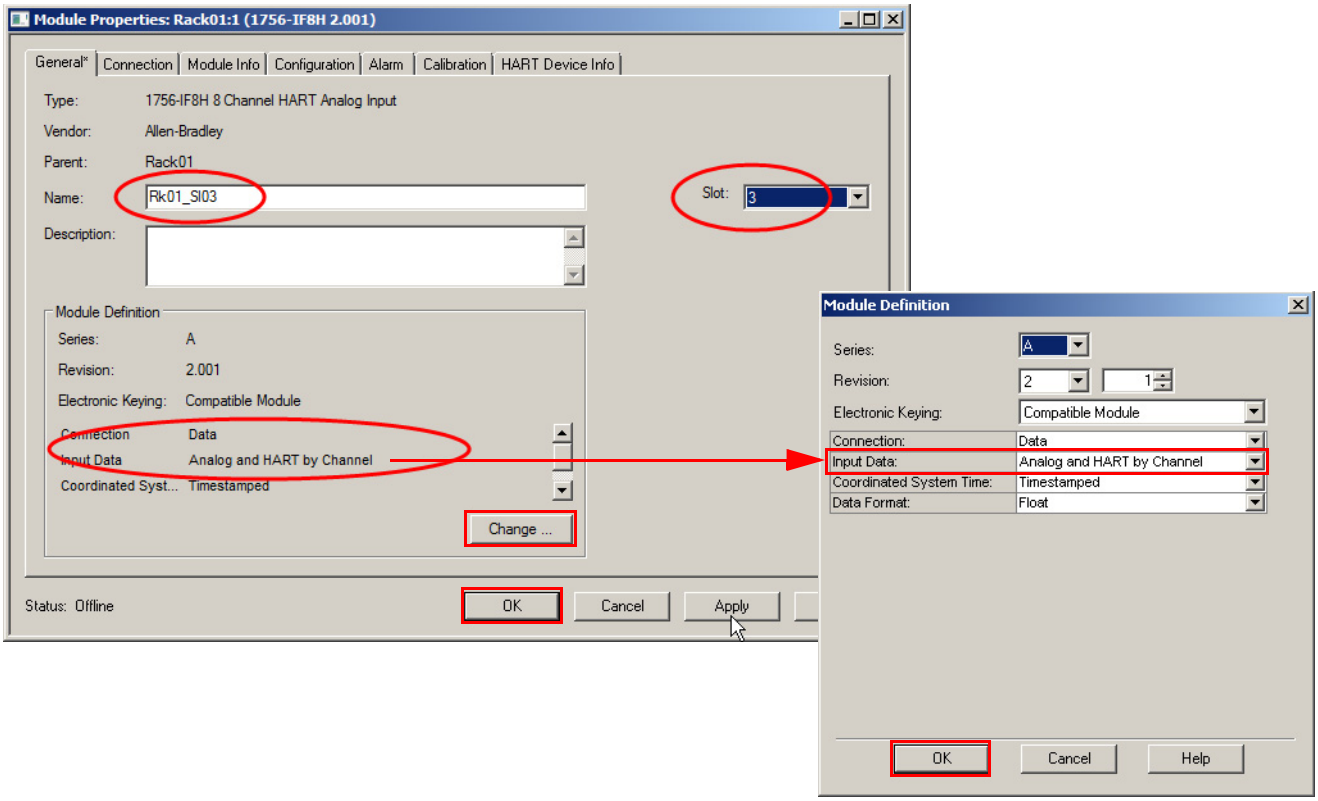
   The selected module now appears in the project at the slot location from the sample project.

8. Double-click the module.



   The Module Properties window appears.

9. Change the module name in accordance with the naming convention of your project (See Table 12 on page 27 for the convention used in this example.)

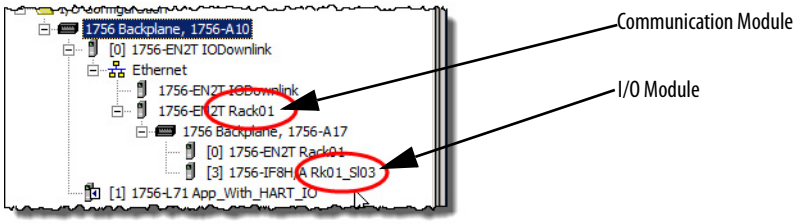


10. Set the Slot to match the actual location of the module.

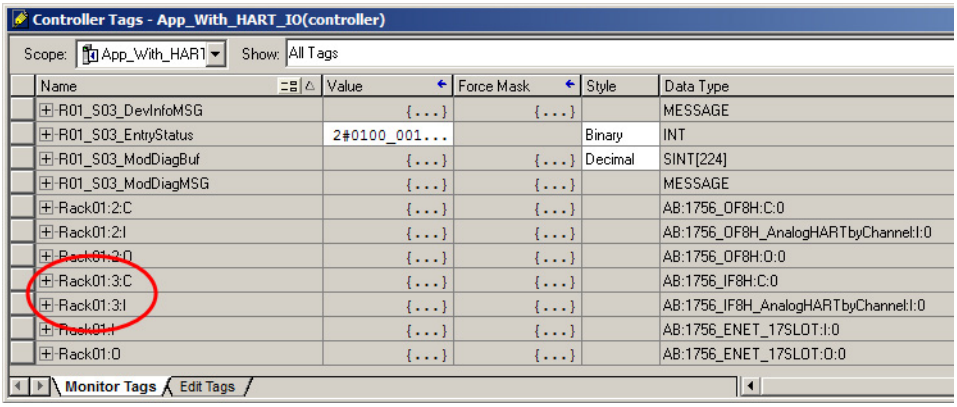
IMPORTANT For Bulletin 1794 FLEX™ I/O HART modules only, the module Add-On Instruction has a Cfg_Slot configuration parameter. This parameter must be set to the HART module 'slot' number on the FLEX Bus for Device Information messages to execute correctly.

11. Click Change, set the Input Data to 'Analog and HART by Channel', and click OK.

12. In the Controller Organizer, note the names of the Communication and I/O modules for future use.



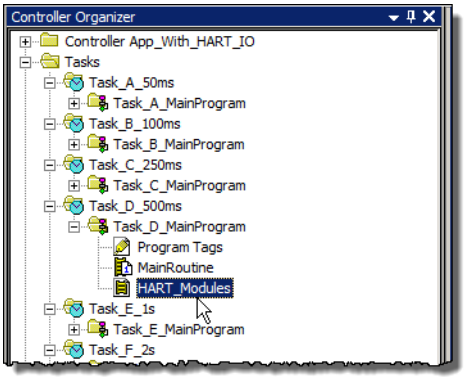
13. Open the controller tags and note the input and configuration tags for this module.



Import Rungs

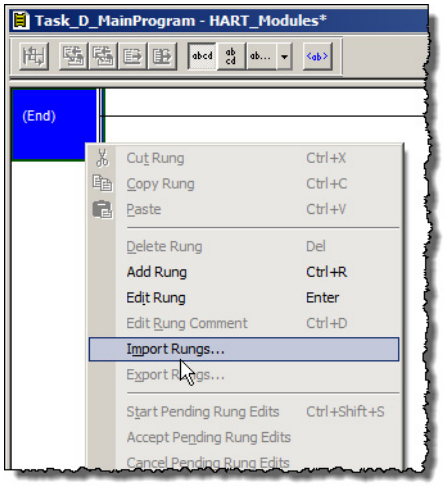
The easiest way to add the logic to support your HART I/O module is to use the provided rung import to add the logic to a Ladder Diagram routine. Use the rung import procedure to create the required tags, Add-On Instructions, Data Types, and MSG (message instruction) configurations.

1. In the target Controller Organizer, double-click a Ladder Diagram routine (HART_Modules in our example).



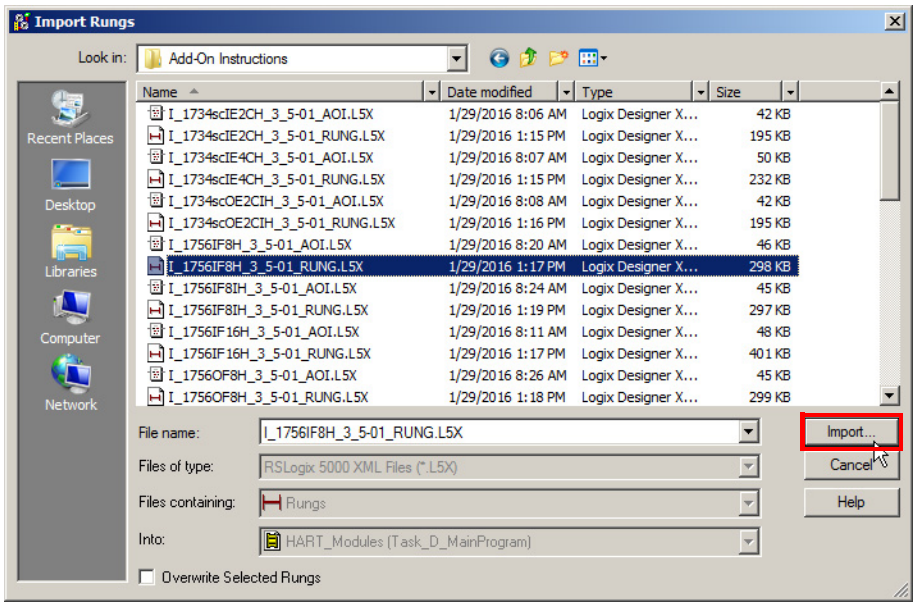
The Ladder Diagram appears.

2. Scroll to the end of the ladder diagram, right-click in the left margin, and choose Import Rungs.



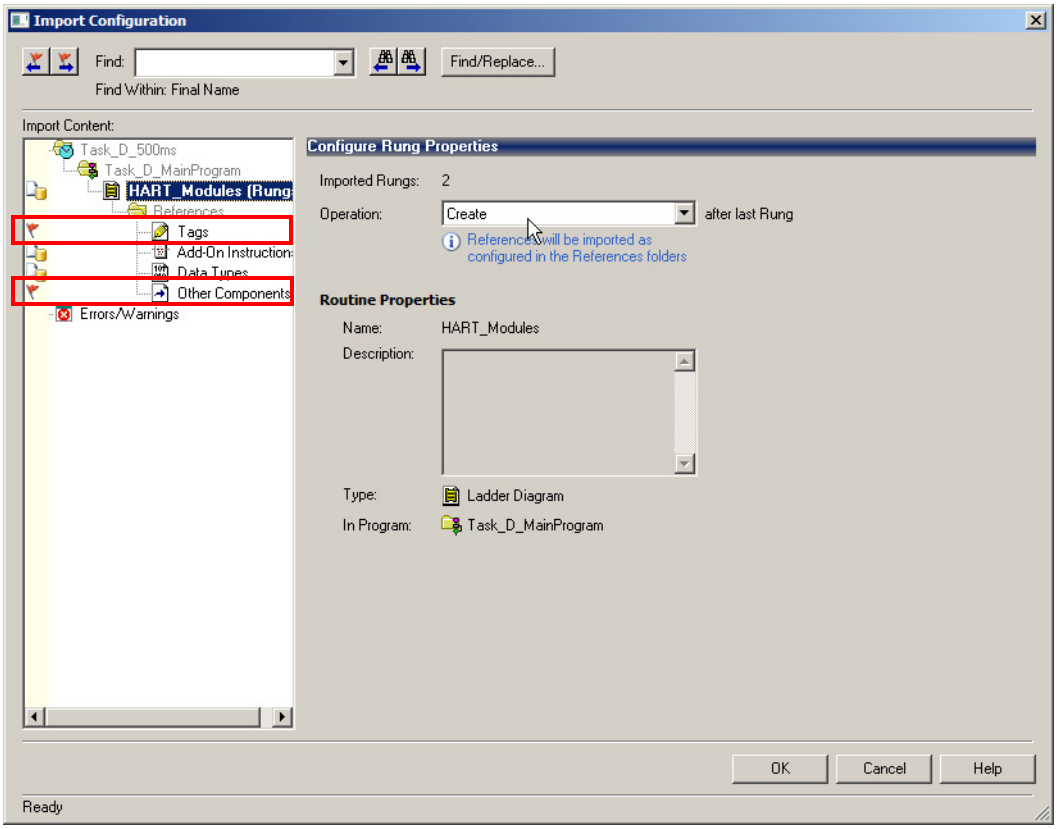
The Import Rungs dialog box appears.

3. In the Import Rungs dialog box, navigate to the Rung import file that matches the given module, select it, and click Import.
   - Make sure that you select the RUNG import file, not the Add-On Instruction (AOI) import file.
   - The HART module import files are in the library download:



The Import Configuration dialog box appears.

You must address any red flagged items in the Import Content.



Configure Tag References

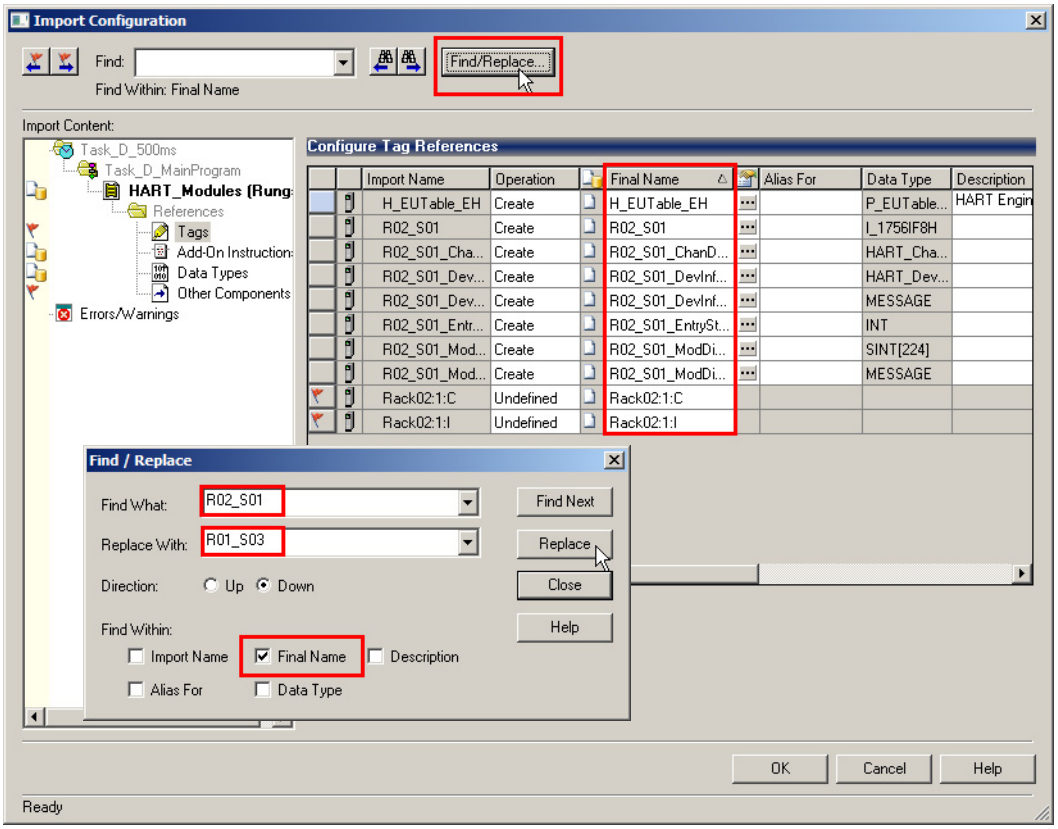
The tags used on this rung need to be renamed with new names for this instance.

The following table describes how to name the HART modules and components.

Table 12 - Tag Naming Conventions Used in This Example

Name of	How to Name	Default in RUNG Import Used in Example	Final Name in Example
HART module	Enter in Module Properties Dialog when you create the module	Rk02_SI01	Rk01_SI03
Chassis	Enter in Module Properties Dialog when you create the communication module	Rack02	Rack01
Configuration tag for module	Automatically named by using chassis and slot number	Rack02:1:C	Rack01:3:C
Input tag for module	Automatically named by using chassis and slot number	Rack02:1:I	Rack01:3:I
Output tag for module (output modules only)	Automatically named by using chassis and slot number	(Rack02:1:O)	(Rack01:3:O)
Module AOI backing tag	Enter this name in the Configure Tag References panel in the Rung Import Configuration. You can use any valid tag name. We recommend the remaining tag names use this name as a base. Use the Find / Replace dialog box to apply this name base to all remaining tags.	R02_S01	R01_S03
Channel Data Array tag	Use AOI backing tag plus '_ChanData'	R02_S01_ChanData	R01_S03_ChanData
Device Information MSG tag	Use AOI backing tag plus '_DevInfoMSG'	R02_S01_DevInfoMSG	R01_S03_DevInfoMSG
Data buffer tag used with Device Information MSG	Use AOI backing tag plus '_DevInfoBuf'	R02_S01_DevInfoBuf	R01_S03_DevInfoBuf
INT tag used with GSV for module connection status	Use AOI backing tag plus '_EntryStatus'	R02_S01_EntryStatus	R01_S03_EntryStatus
Module Diagnostic MSG tag	Use AOI backing tag plus '_ModDiagMSG'	R02_S01_ModDiagMSG	R01_S03_ModDiagMSG
Data buffer tag used with Module Diagnostic MSG	Use AOI backing tag plus '_ModDiagBuf'	R02_S01_ModDiagBuf	R01_S03_ModDiagBuf

1. In the Import Content panel, click Tags and the Configure Tag References panel appears.
2. Click Find/Replace.

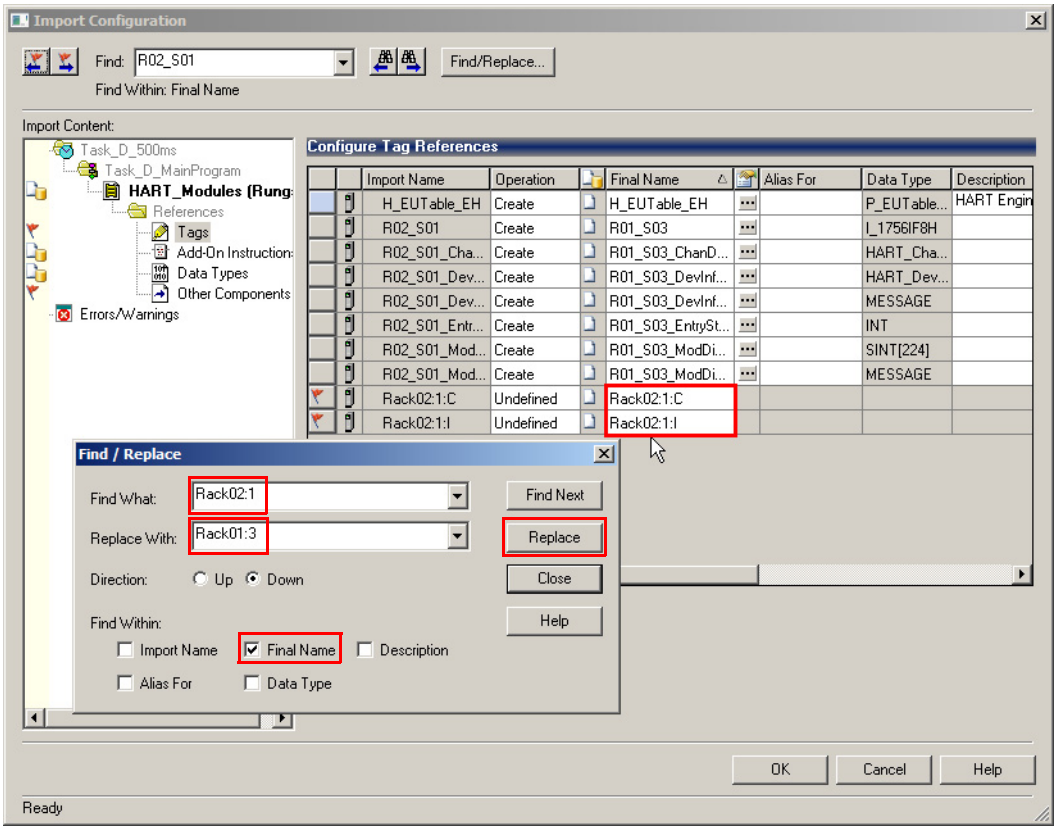


The Find/Replace dialog box appears.

3. In Find What, type the name of the tag you want to replace (R02_S01 in our example).
4. In Replace With, type the replacement name for the tag (R01_S03 in our example). The replacement name is the tag name base for this module.
5. Click Final Name as the search area.
6. Click Replace.

All tag names that contain your 'Find What name' are replaced.

7. Click Find/Replace.



The Find/Replace dialog box appears.

TIP In the next steps, use Find/Replace, not the pull-down menu.

Using Find/Replace automatically configures the message communication paths. The pull-down menu does not.

8. In Find What, type the name of the tag you want to replace (Rack02:1 in our example).
9. In Replace With, type the replacement name for the tag (Rack01:3 in our example). The replacement name is the tag name base for the module you pasted previously.
10. Click Final Name as the search area.
11. Click Replace.

    All tag names that contain your 'Find What name' are replaced.

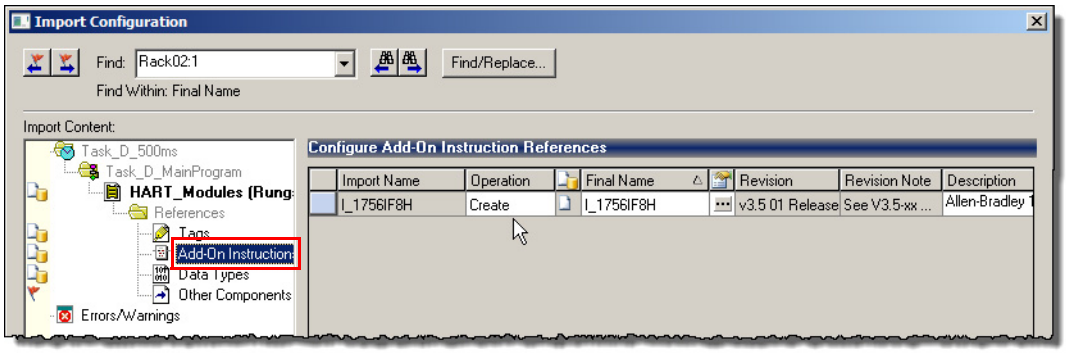
Additional Reference Configurations

The rest of the references (Add-On Instructions, Data Types, and Other Components) must be created or configured for the input module being used.

The Data Types (UDTs) used on the rungs need to be created if they don't exist. If the correct Data Types are already in place in the application (correct name and definition for each), there is no need to reimport. The same Data Type is used for ALL instances.

The Add-On Instructions used on the rungs need to be created if they don't exist. If the correct Add-On Instructions are already in place in the application (correct name and definition for each), there is no need to reimport. The same Add-On Instruction definition (with the same name) works for ALL instances.

1. In the Import Content panel, click Add-On Instructions.



The Configure Add-On Instruction References panel appears.

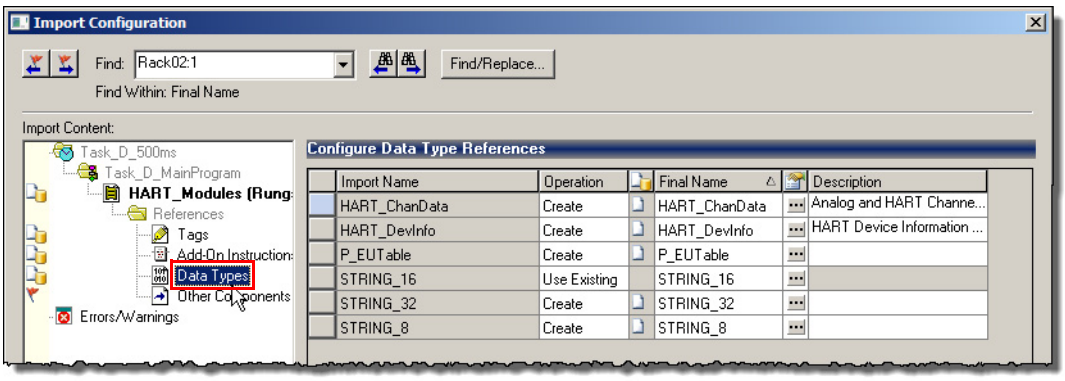
2. In the Operation column, select the appropriate option.

IMPORTANT The following conditions apply when selecting Operation:

- If the instruction or data type being imported does not exist (not previously imported), the Operation is 'Create'. That instruction or data type is imported and added to the user application.
- If the instruction or data type being imported is named the same as one that exists in the application and is the same (was already imported). The Operation is 'Use Existing'. That instruction or data type is not to be reimported -- it is already there and correct.
- If the instruction or data type being imported is named the same as one that exists in the application and is different, the Operation is 'Overwrite'. If you have any doubt, check uses of that instruction or data type and verify that you actually want to overwrite the old definition. The version being imported is required for correct operation of these HART Add-On Instructions.

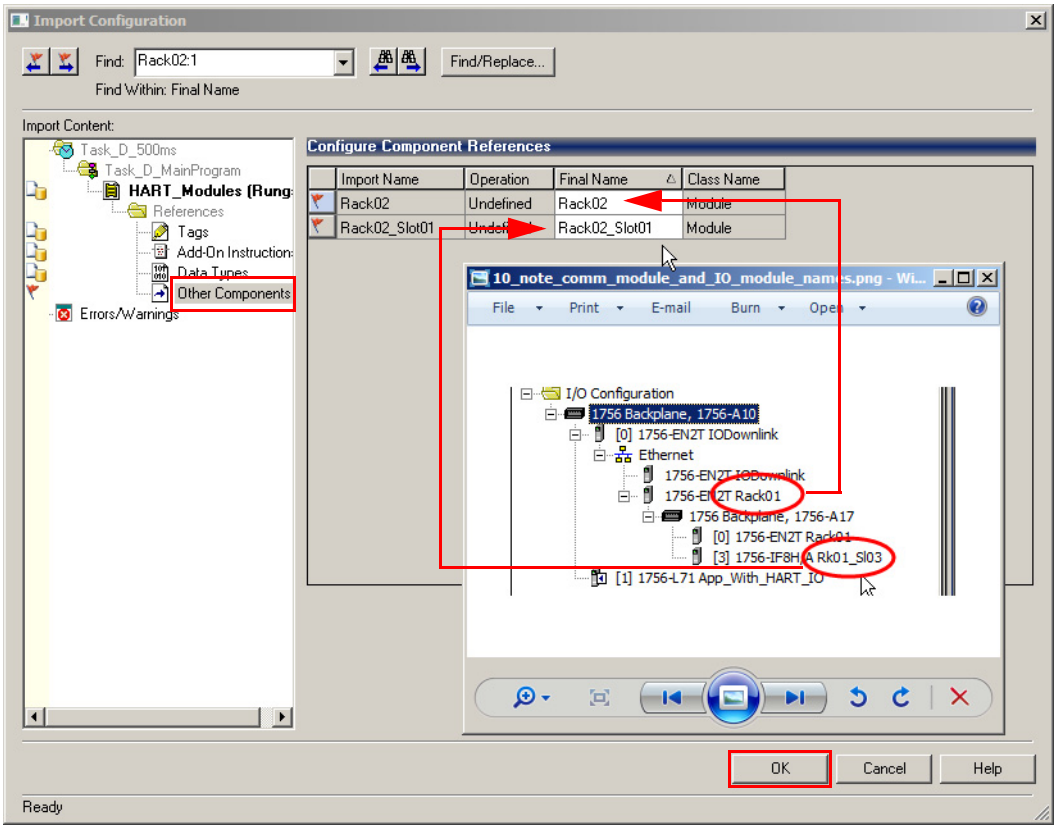
3. Make any other necessary changes.

4. Click Data Types.



The Configure Data Type References panel appears.

5. Make any necessary changes.
6. Click Other Components.



The Configure Component References panel appears.

TIP For local I/O, use the name of the HART I/O module (Rk01_SL03 in our example) in both of the following steps.

7. Click the Final Name for the Communication Module and type the name that you noted earlier in step 12 on page 23.

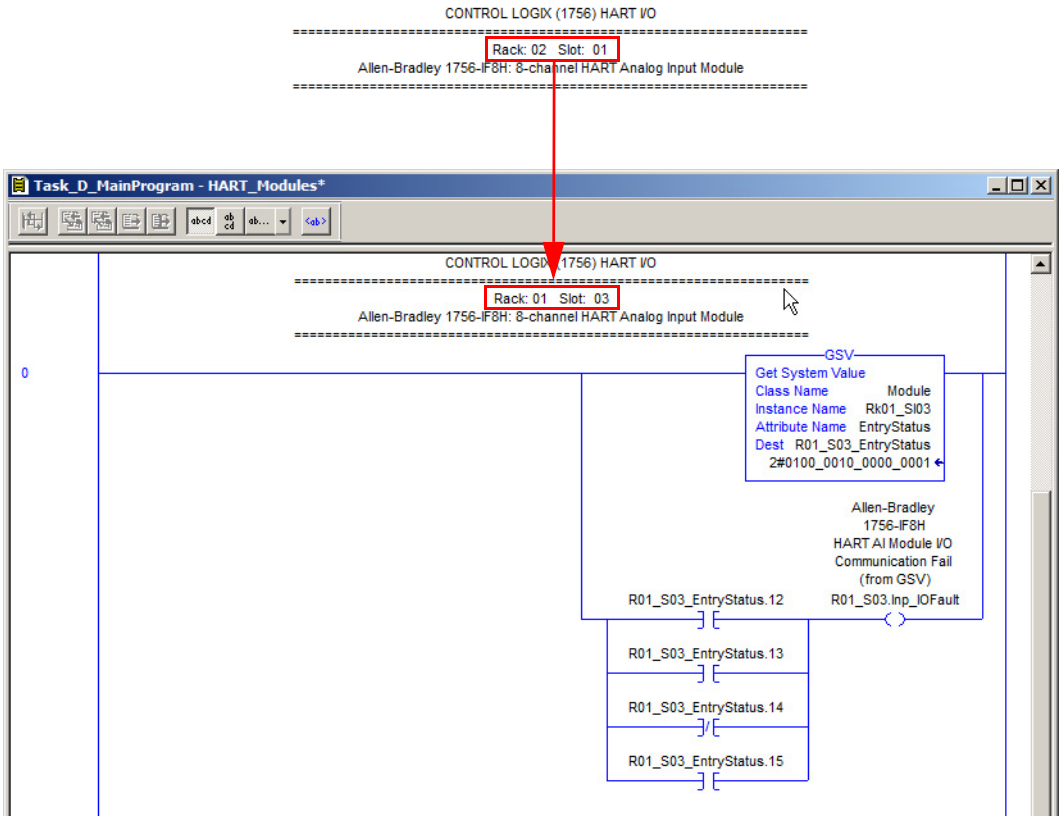
8. Click the Final Name for the I/O Module and type the name.

   Use the name that you noted earlier in step 12 on page 23, or use the pull-down list to select the name.

9. Make any other necessary changes.
10. On the Import Configuration dialog box, click OK.

    Two rungs of logic are added to your logic.

11. Return to the ladder diagram window.
12. Double-click the rung comment and make any necessary changes.
13. Press Enter when you are finished.



See Module Messaging Reference on page 141 for information on MSG configurations on the modules.

Add P_AIn_HART Add-On Instruction

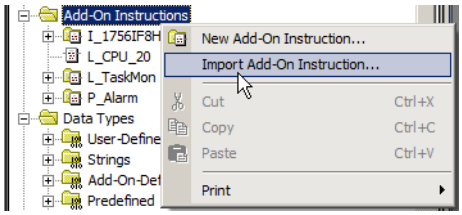
TIP You need only to import the P_AInHART Add-On Instruction once for the project.

The P_AInHART Add-On Instruction receives an analog measurement value from an input module and receives digital signals from the device for a given channel.

IMPORTANT An instance of the P_AInHART instruction is used for each channel (device) on the input module.

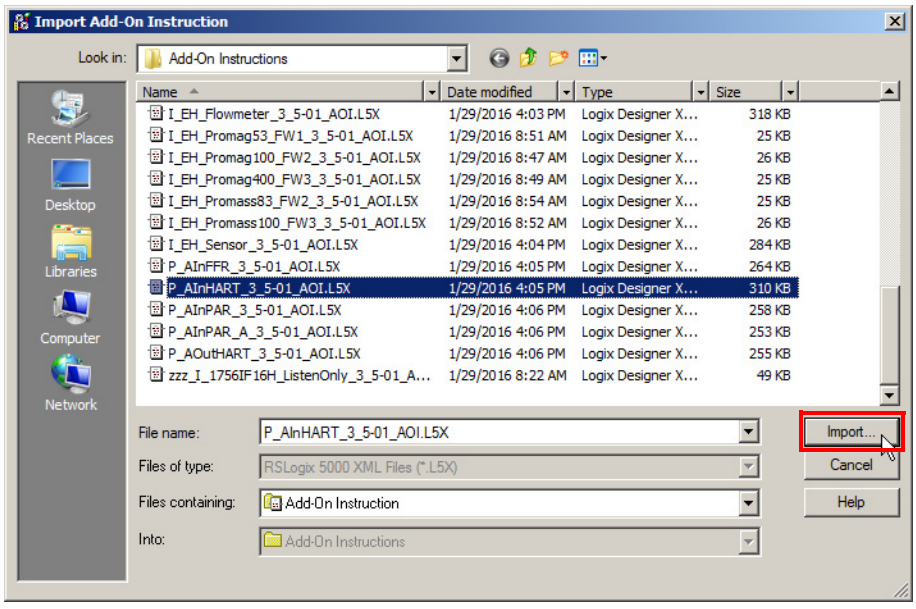
Perform the following steps:

1. In the target Controller Organizer, right-click Add-On Instructions and choose 'Import Add-On Instruction'.



   The Import Add-On Instruction dialog box appears.

2. Select the P_AInHART Add-On Instruction and click Import.

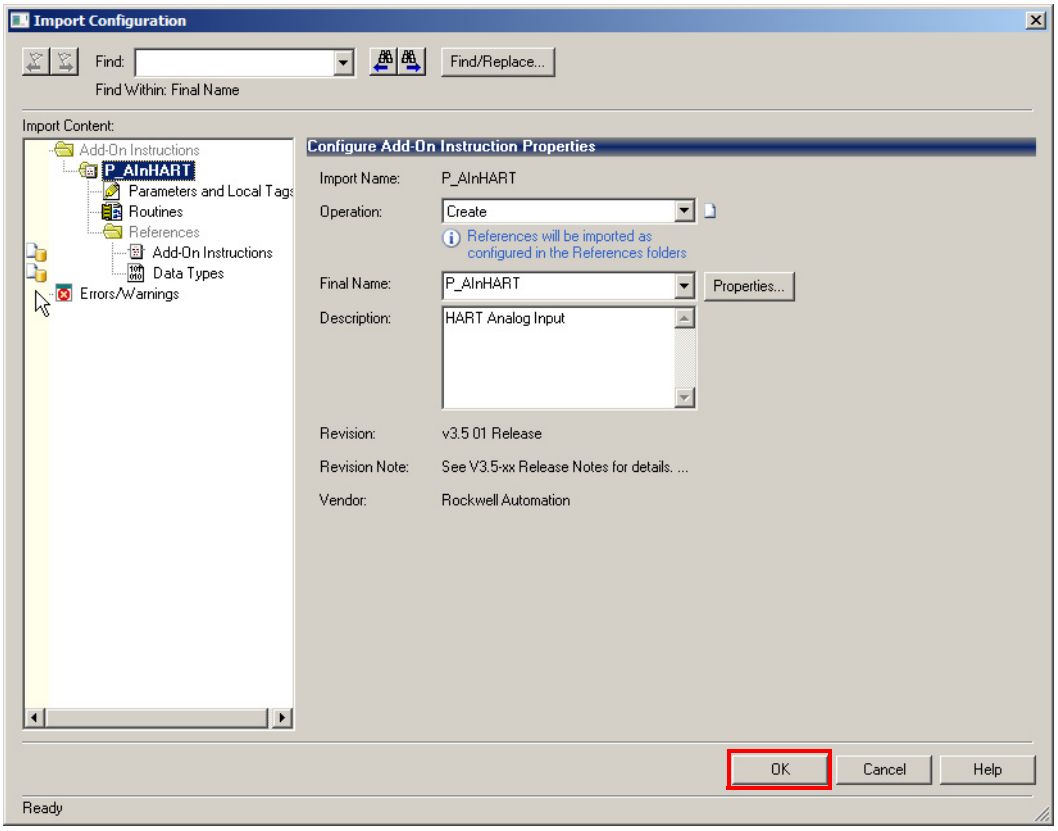


   The Import Configuration dialog box appears.

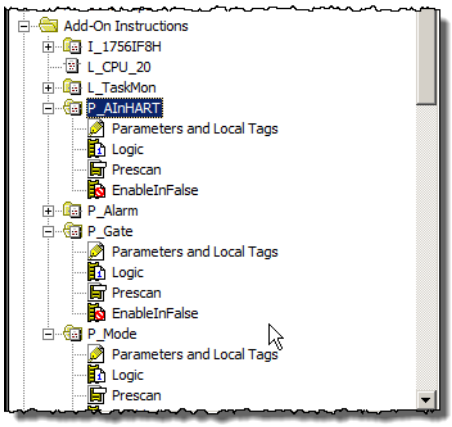
3. If there are any red flags in the Import Content area, they must be addressed.

   See Configure Tag References on page 27 for an example of clearing red flags.

4. When there are no red flags, click OK.



TIP Besides P_AInHART, P_Gate and P_Mode have also been imported.

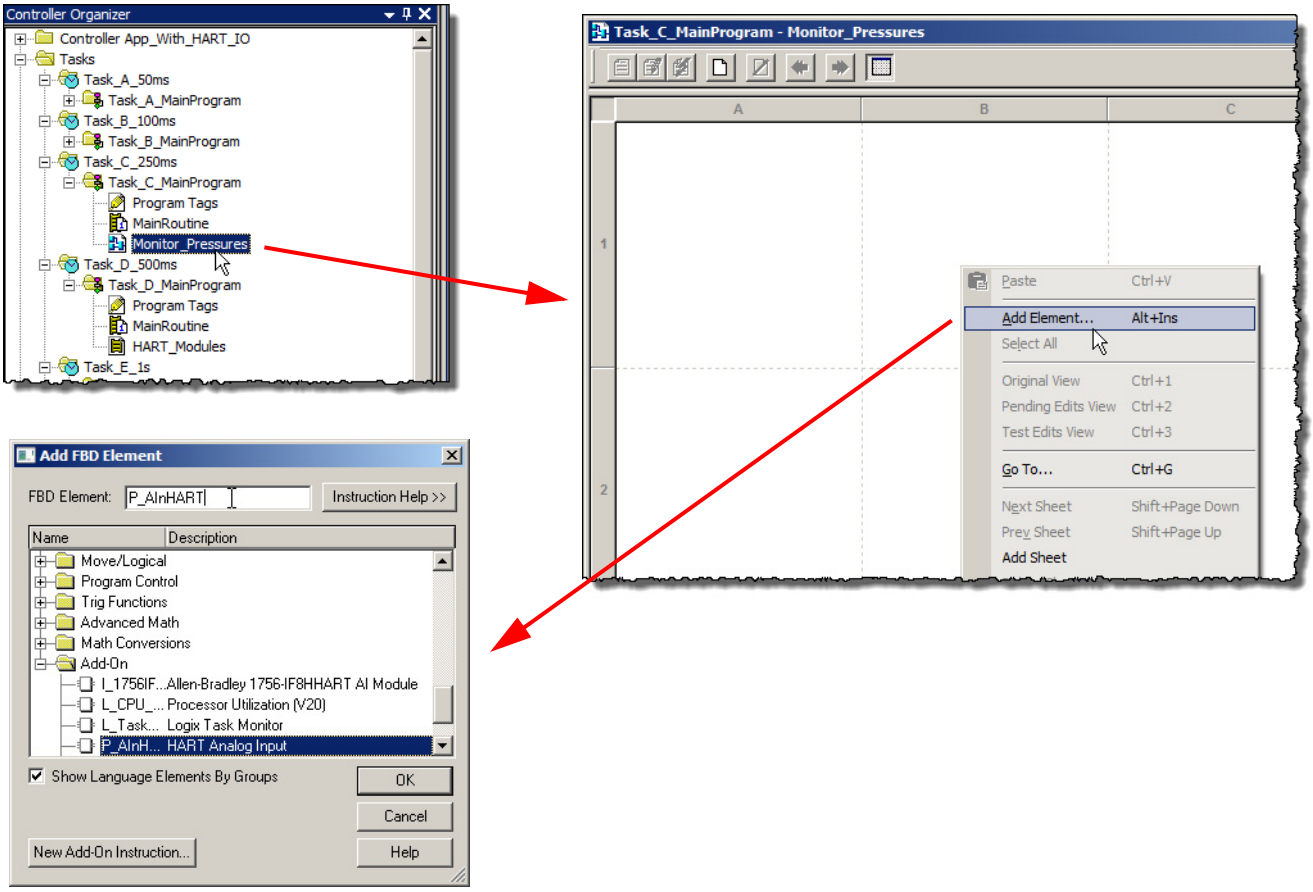


TIP You need only to import the P_AInHART Add-On Instruction (steps 1 through 4) once for the project. The remaining steps apply to each channel (instance).

5. In the Controller Organizer, double-click the routine in your process application (Monitor_Pressures in our example) where you want the P_AInHART instance for this channel.

For this example, we are using a function block diagram routine. The P_AInHART instruction also can be used in Ladder Diagram or Structured Text routines.

The routine workspace opens.



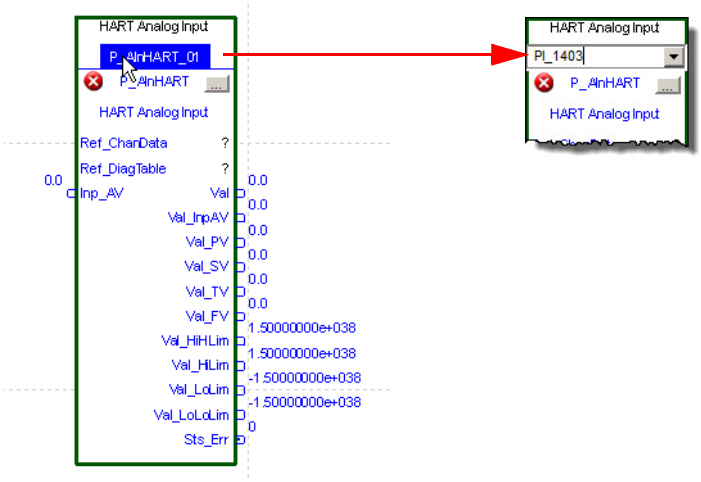
6. In the workspace, right-click and choose Add Element.

   The Add FBD Element dialog box appears.

7. Under the Add-On folder, select the HART Analog Input Add-On Instruction and click OK.

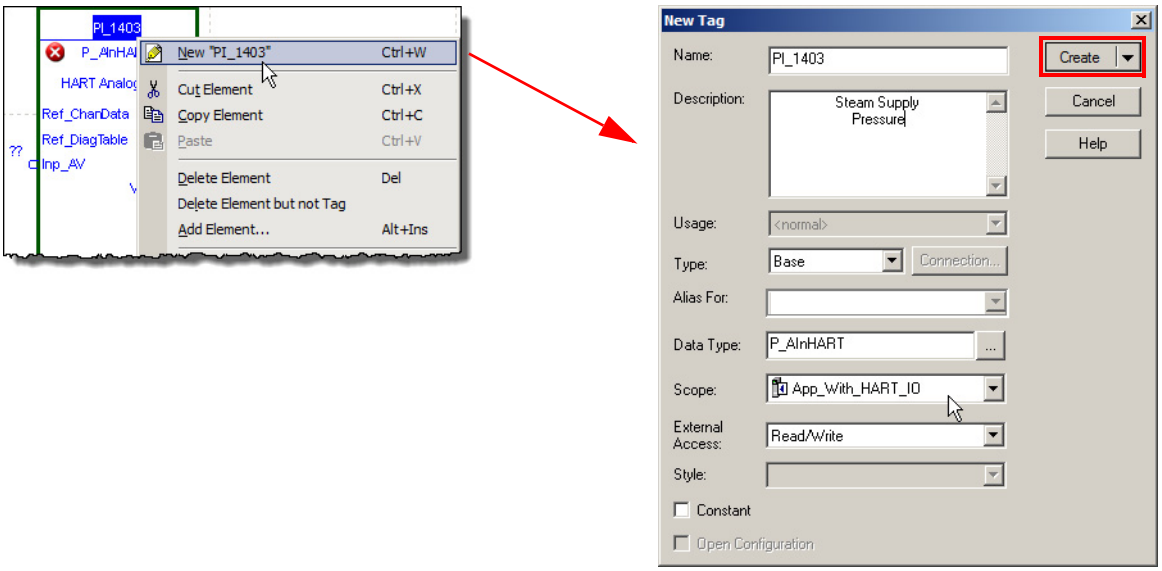
   The HART Analog Input element is added.

8. Double-click the tag name, type a new tag name (PI_1403 in our example), and press Enter.



9. Right-click the new tag name and choose New <new tag name> (New PI_1403 in our example).

   The New Tag dialog box appears.

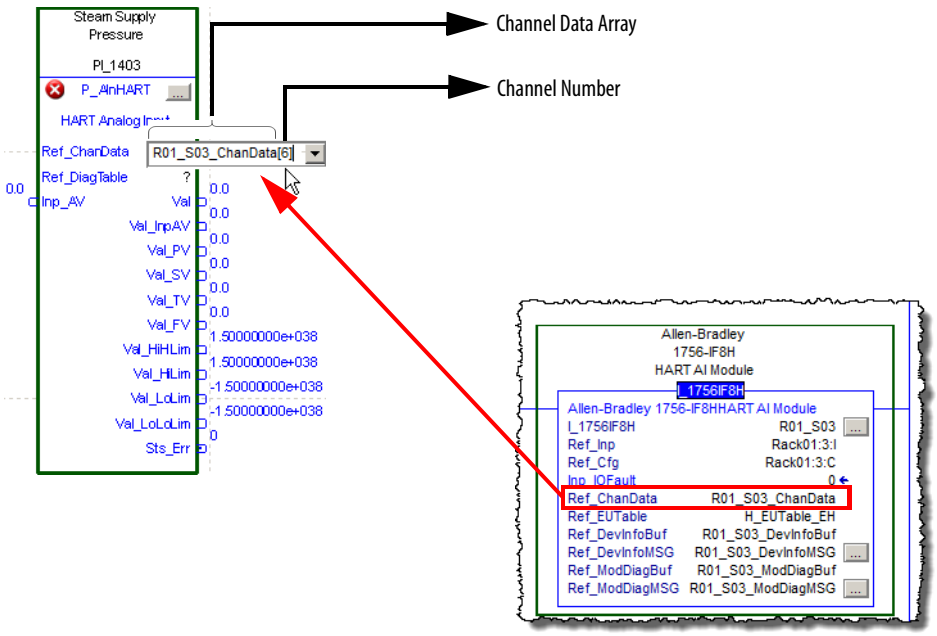


10. In the New Tag dialog box, the following fields are completed by default:
    - Name
    - Data Type
    - External Access (must be Read/Write)
11. Type an optional Description.
12. Select a Scope from the pull-down menu (controller scope in this example) and click Create.
13. On the HART Analog Input element, double-click the question mark that corresponds to Ref_ChanData.

    A pull-down menu appears.

14. Either type or select the channel data array for the module.
15. Add an array index that indicates the correct channel and press Enter.

IMPORTANT	See Ref_ChanData in the HART module instruction for the base array name.

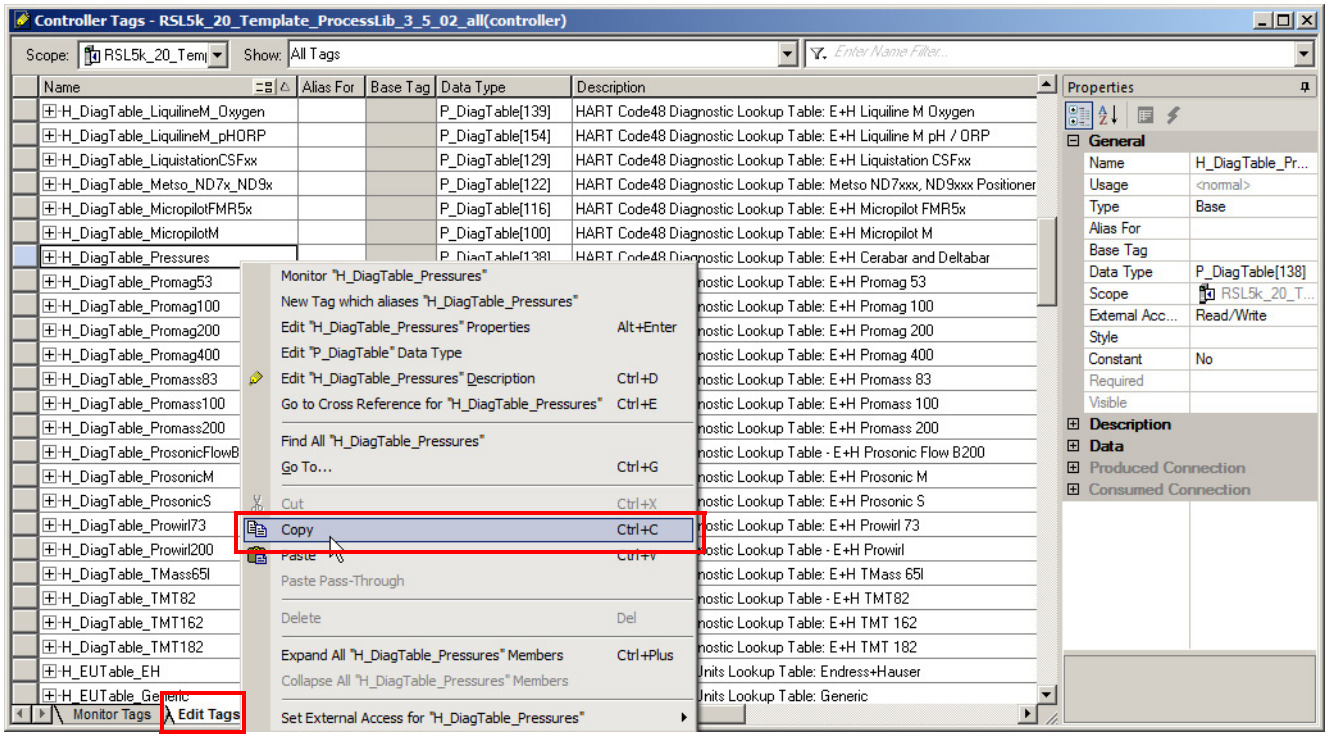


In this example, our device is wired to channel 6.

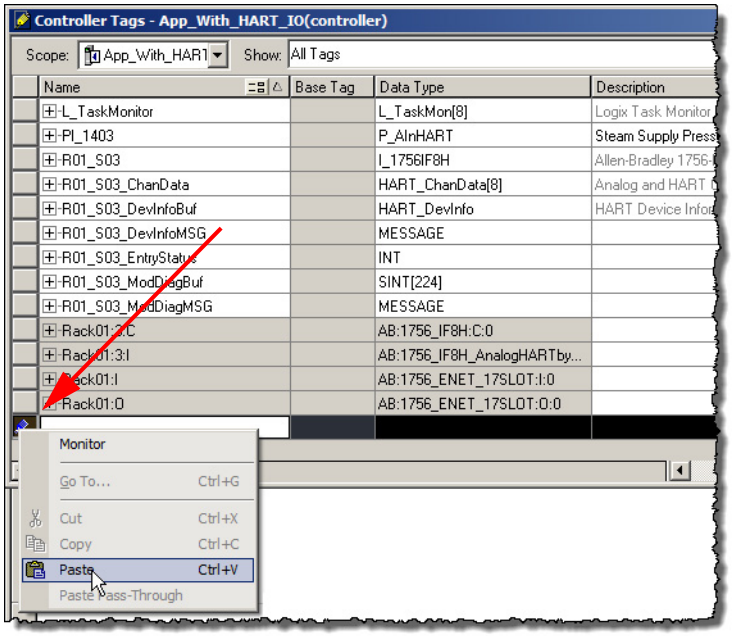
16. **In the samples application**, in the Controller Organizer, double-click Controller tags.

    The Controller Tags window appears.

17. Select the EditTags tab at the bottom of the window .
18. Right-click the tag for the diagnostic table that matches the field device you are using (E+H Cerebar and Deltabar in our example) and choose copy.

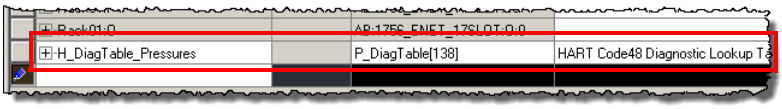


19. **In your application** (App_With_HART_IO in our example), in the Controller Organizer, open the controller tags, select the EditTags tab, and scroll to the bottom of the controller tags.



20. In the empty row, right-click the box that is left of the columns, and choose Paste.

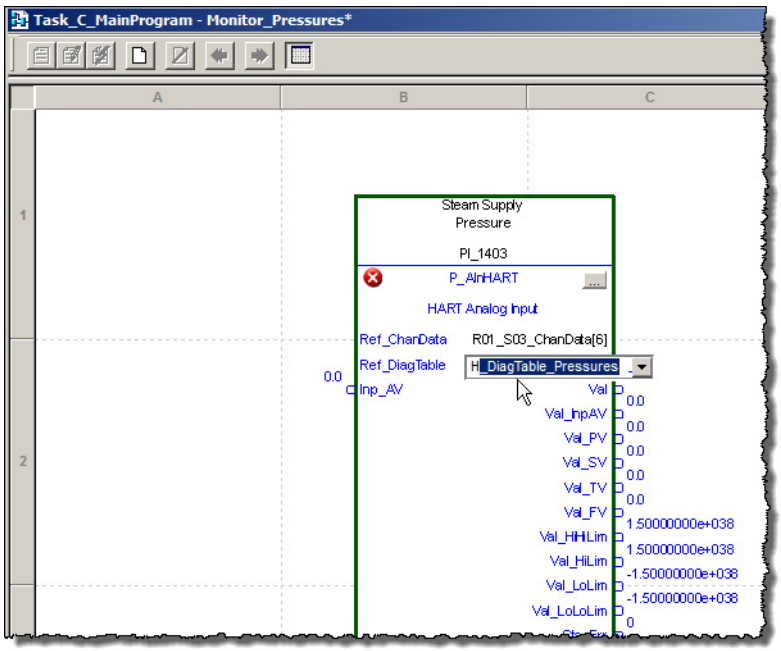
TIP Only one instance of a Diagnostic table tag is needed for all similar devices.



21. On the HART Analog Input element, double-click the question mark that corresponds to Ref_DiagTable.

A pull-down list appears.

22. Either type or select the Diagnostic table tag just copied, and press Enter.



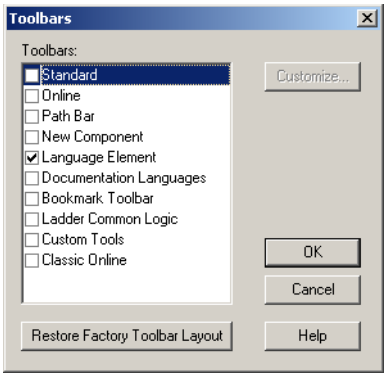
TIP If a Diagnostic table tag is not included for your device, you can use the H_DiagTable_Generic table tag, or create your own. The Online Premier Integration Configuration Tool can be useful in building your table tag.

Link Analog Signal

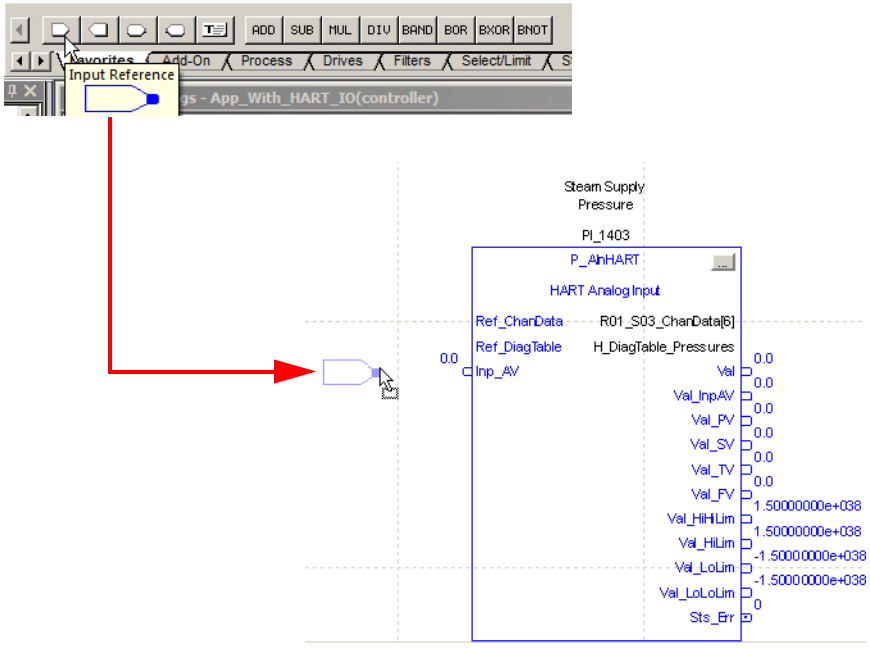
In this section, the analog channel data from the card you added to the project must be connected to the input of P_AInHART instruction.

Complete the following steps:

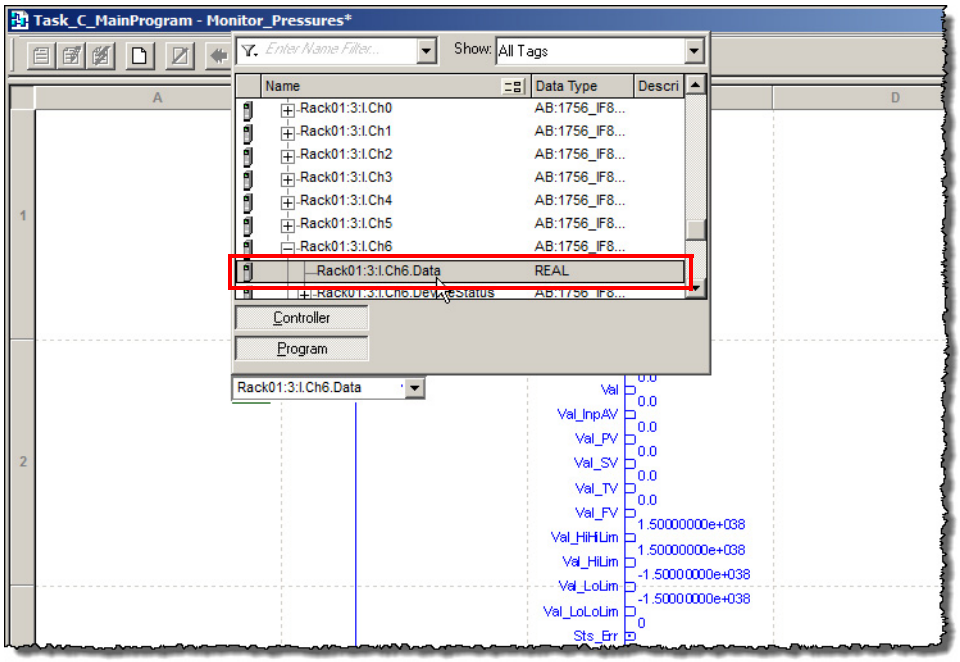
1. If the Language Element toolbar is not visible, do the following:
   a. Click View and choose Toolbars.
   b. Select Language Element and click OK.



2. In the Language Element toolbar, drag-and-drop an 'Input Reference' to Inp_AV on the workspace.

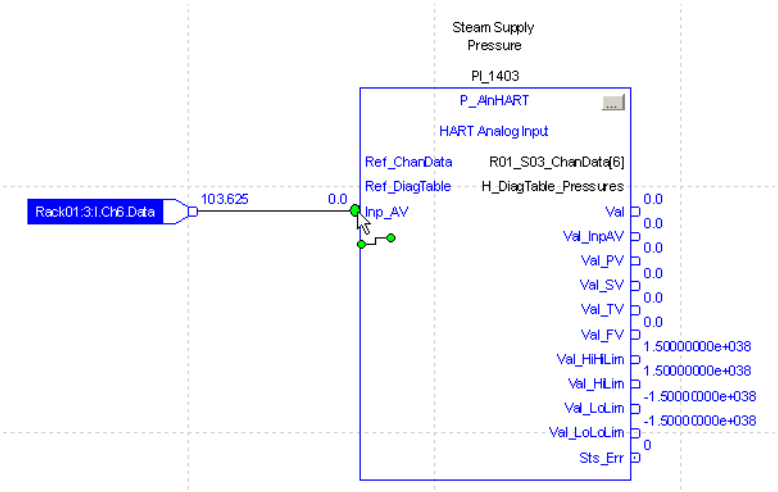


3. Double-click inside the Input Reference symbol and choose the analog input from the module.

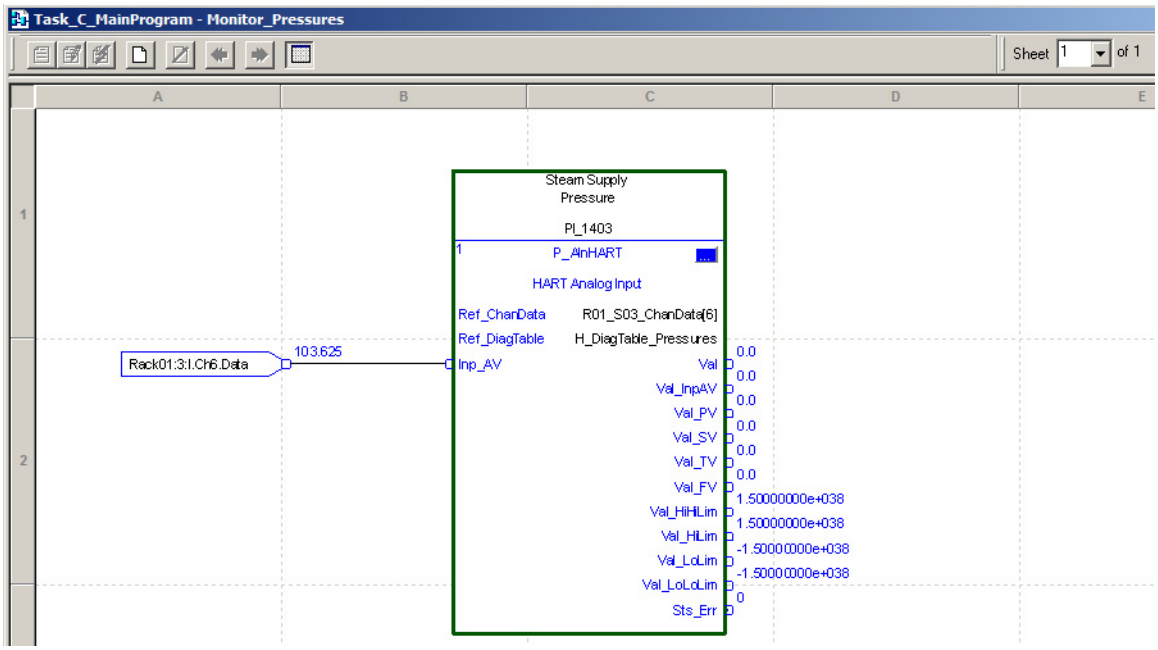


IMPORTANT The input data structure varies based on the I/O family. See the user manual for your module for the location of the analog signal input.

4. Add a wire from the Input Reference symbol to Inp_AV.



Your completed function block for a HART channel instance is similar to the following image.



Output Module Integration

You must have a project open with a controller already configured. Make sure that the project path is set to the correct controller.

Add Output Module

The desired HART I/O module must be added into the project I/O configuration.

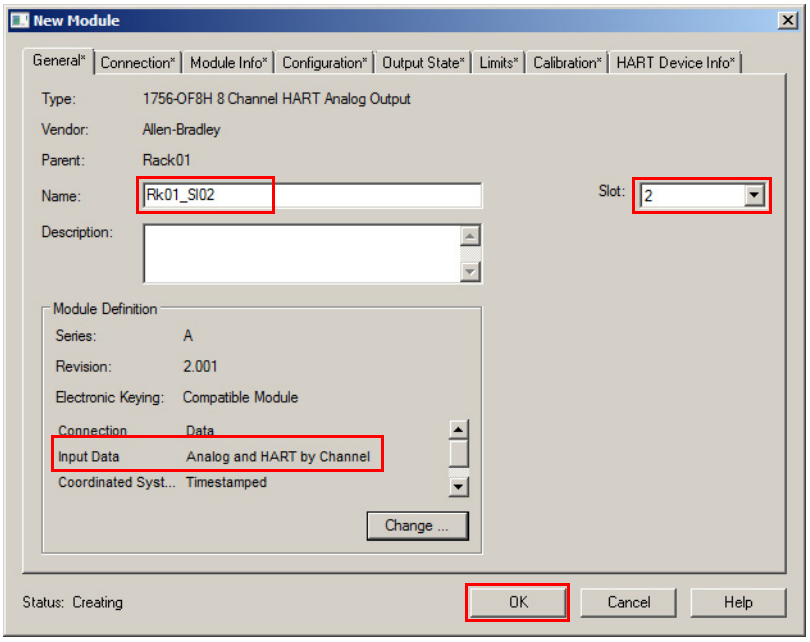
TIP We recommend that you copy the module from the sample projects included in the library. By copying the module, several module options are configured for you.

The following procedures use this method.

1. Open Project in the Files>Premier Integration Samples>Project folder.
2. Copy a sample .ACD file and paste it on your desktop.
3. Open the application, copy the sample module and paste it into your project.

   The selected module now appears in the project.

4. Change the module name in accordance with the naming convention of your project.

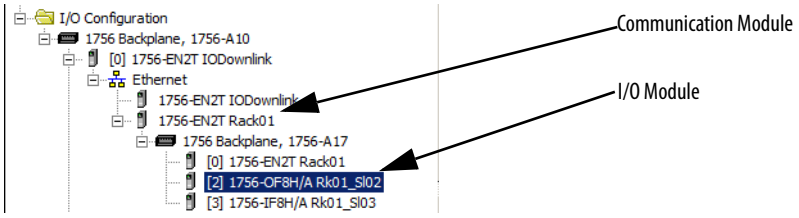


5. If necessary, change the Slot to match the desired location for the module.
6. In the Module Definition area, make sure that Input Data is 'Analog and HART by Channel'. If it is necessary to change Input Data, click Change.

   The Module Definition dialog box appears.

   a. Make sure that the Input Data row is set to 'Analog and HART by Channel'.

   b. Click OK to close the Module Definition dialog box.
7. In the Controller Organizer, note the names of the Communication and I/O modules for future use.



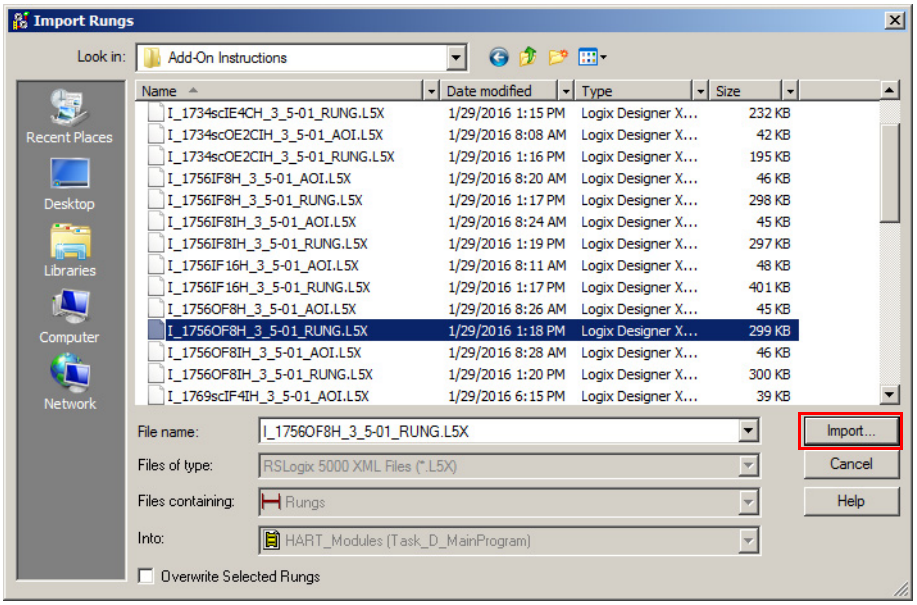
Import Rungs

The easiest way to add the logic to support your HART I/O module is to use the provided rung import to add the logic to a Ladder Diagram routine. Using the rung import procedure creates not only the logic, but also creates the required tags and MSG (message instruction) configurations.

1. At the end of the ladder diagram, right-click in the left margin, and choose Import Rungs.

   The Import Rungs dialog box appears.

2. In the Import Rungs dialog box, navigate to the Rung import file that matches the given module, select it, and click Import.



   The Import Configuration dialog box appears.

3. If there are red flagged items in the Import Content, make any fixes that are necessary.

Configure Tag References

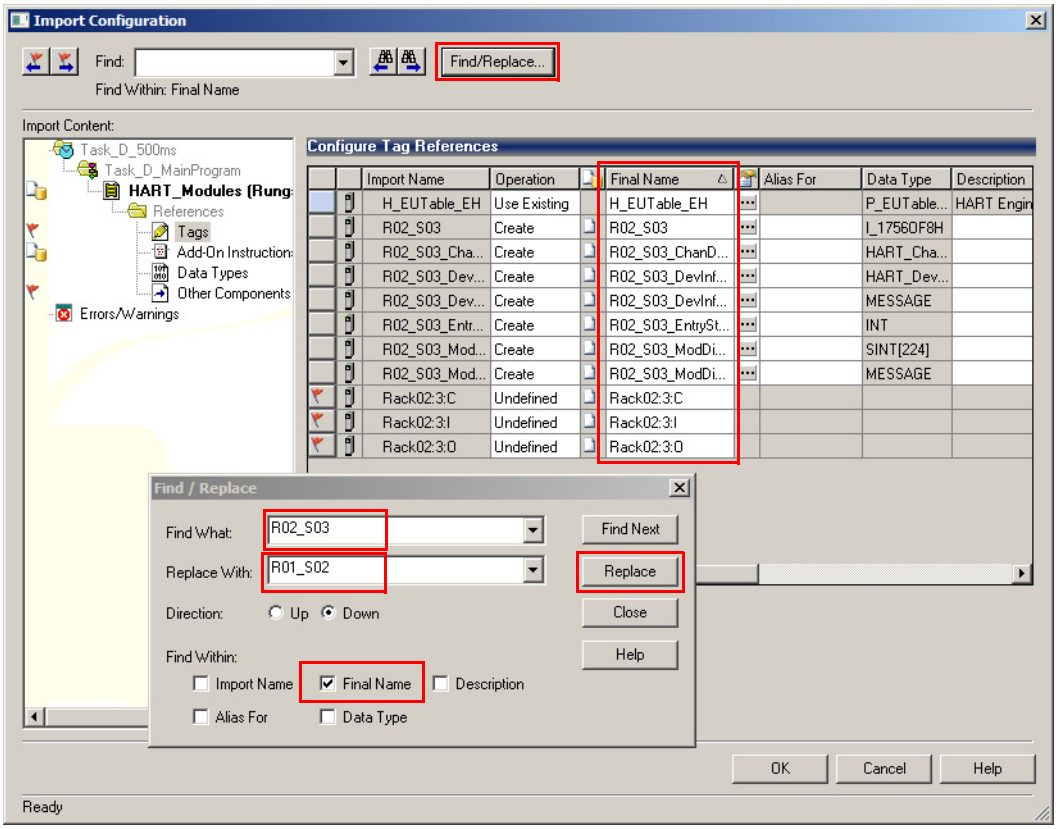
The default Final Names for the imported rungs must be changed.

1. In the Import Content panel, click Tags and the Configure Tag References panel appears.
2. Click Find/Replace.

   The Find/Replace dialog box appears.

3. In Find What, type the name of the tag you want to replace (R02_S03 in our example).
4. In Replace With, type the replacement name for the tag (R01_S02 in our example). The replacement name is the tag name base for this module.

5. Click Final Name as the search area.
6. Click Replace.



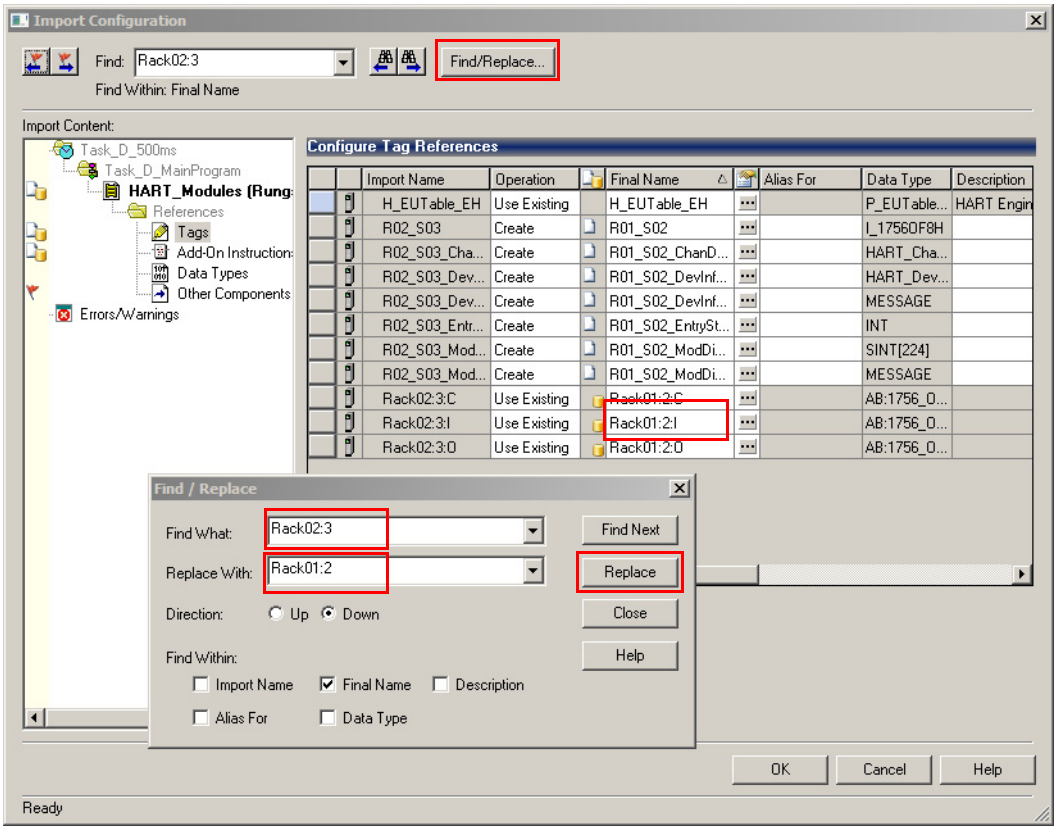
All tag names that contain your 'Find What name' are replaced.

7. Click Find/Replace.

   The Find/Replace dialog box appears.

8. In Find What, type the name of the tag you want to replace (R02_S03 in our example).
9. In Replace With, type the replacement name for the tag (R01_S02 in our example). The replacement name is the tag name base for the module you pasted previously.
10. Click Final Name as the search area.

11. Click Replace.



All tag names that contain your 'Find What name' are replaced.

Additional Reference Configurations

The rest of the references (Add-On Instructions, Data Types, and Other Components) must be created or configured for the output module.

The Data Types (UDTs) used on the rungs need to be created if they don't exist. If the correct Data Types are already in place in the application (correct name and definition for each), there is no need to reimport. The same Data Type is used for ALL instances.

The Add-On Instructions used on the rungs need to be created if they don't exist. If the correct Add-On Instructions are already in place in the application (correct name and definition for each), there is no need to reimport. The same Add-On Instruction definition (with the same name) works for
ALL instances.

1. In the Import Content panel, click Add-On Instructions.

   The Configure Add-On Instruction References panel appears.

2. In the Operation column, select the appropriate option.

IMPORTANT The following conditions apply when selecting Operation:

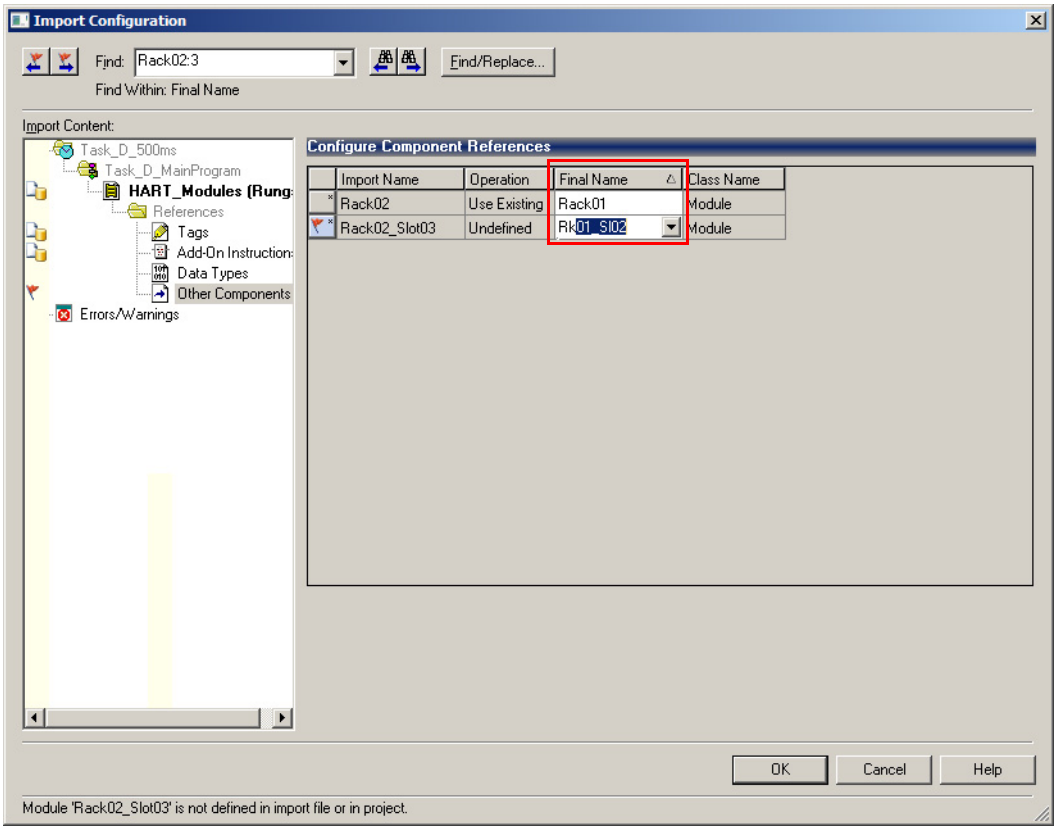
- If the instruction or data type being imported does not exist (not previously imported), the Operation is 'Create'. That instruction or data type is imported and added to the user application.
- If the instruction or data type being imported is named the same as one that exists in the application and is the same (was already imported). The Operation is 'Use Existing' and that instruction or data type is not to be reimported -- it is already there and correct.
- If the instruction or data type being imported is named the same as one that exists in the application and is different, the Operation is 'Overwrite' In most cases this is correct, for example if you are upgrading the application from an older version of the library. If you have any doubt, check uses of that instruction or data type and verify that you actually want to overwrite the old definition. The version being imported is required for correct operation of these HART Add-On Instructions.

3. Make any other necessary changes.
4. Click Data Types.

   The Configure Data Type References panel appears.
5. Make any necessary changes.
6. Click Other Components.

   The Configure Component References panel appears.
7. Click the Final Name for the Communication Module and type the name that you noted earlier in step 12 on page 23.
8. Click the Final Name for the I/O Module and type the name that you noted earlier in step 12 on page 23.

9. Make any other necessary changes.



10. On the Import Configuration dialog box, click OK.

    Two rungs of logic are added to your logic.

11. Return to the ladder diagram window.
12. Double-click the rung comment and make any necessary changes.

See Module Messaging Reference on page 141 for information on MSG configurations on the modules.

By using Find/Replace in the previous steps, the MSG configurations already have the correct path applied.

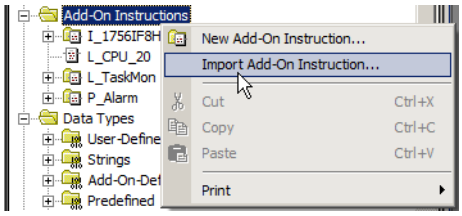
Add P_AOutHART Add-On Instruction

The P_AOutHART Add-On Instruction receives digital signals from the device and provides an analog signal to the output module for a given channel.

IMPORTANT An instance of the P_AOutHART instruction is used for each channel (device) on the output module.

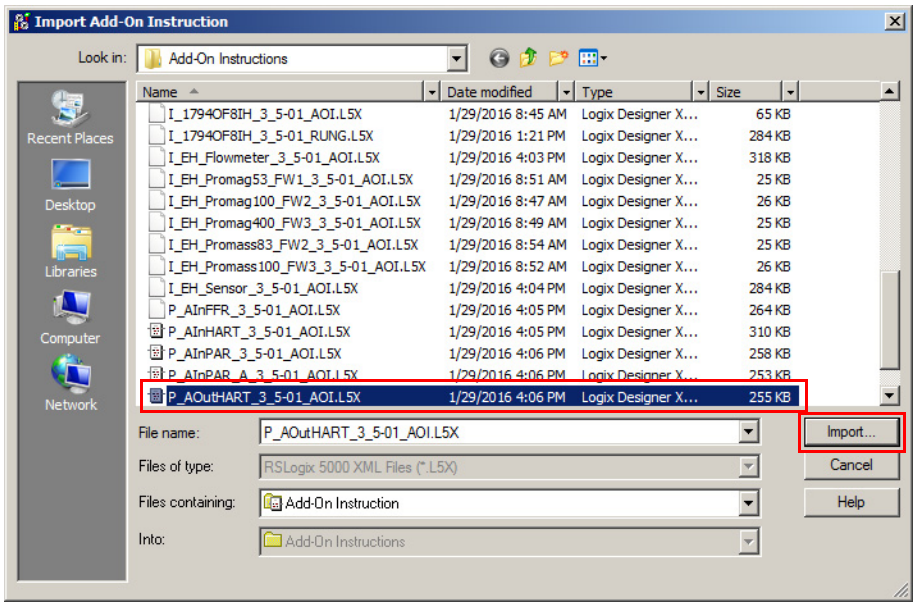
Perform the following steps:

1. In the Controller Organizer, right-click Add-On Instructions and choose 'Import Add-On Instruction'.



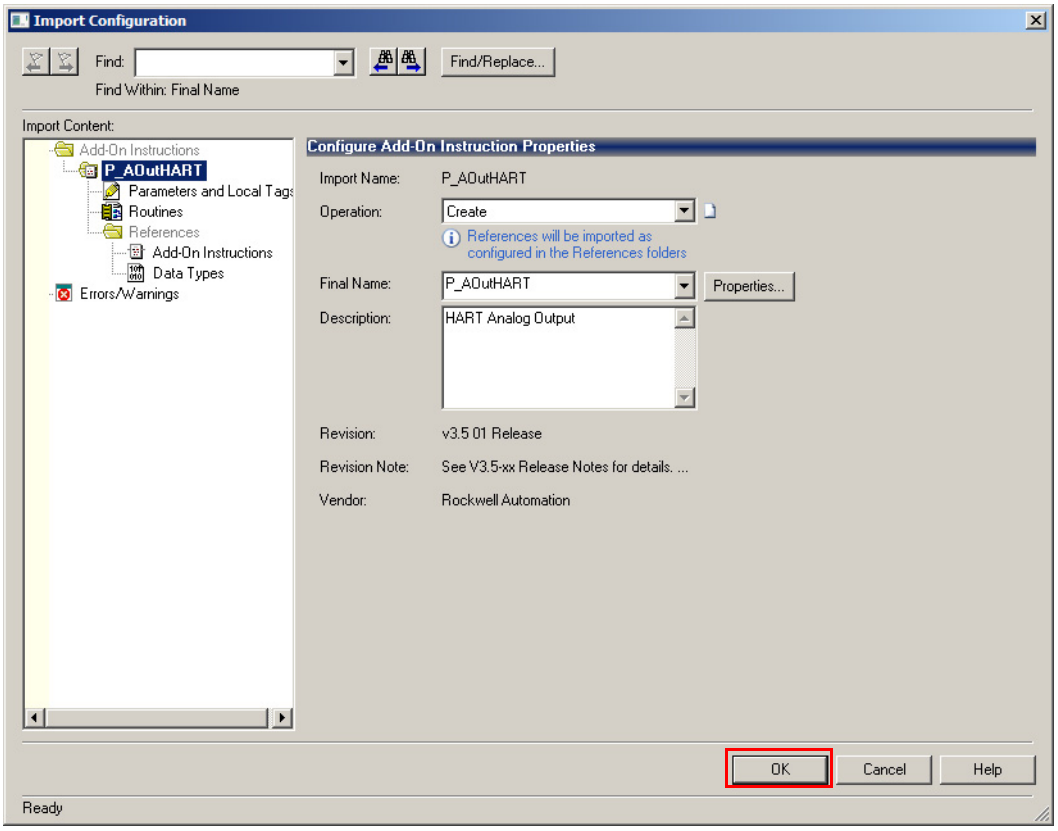
   The 'Import Add-On Instruction dialog box appears.

2. In the 'Import Add-On Instruction dialog box, select the P_AOutHART Add-On Instruction and click Import.



   The Import Configuration dialog box appears.

3. If there are any red flags, they must be addressed; otherwise, click OK.

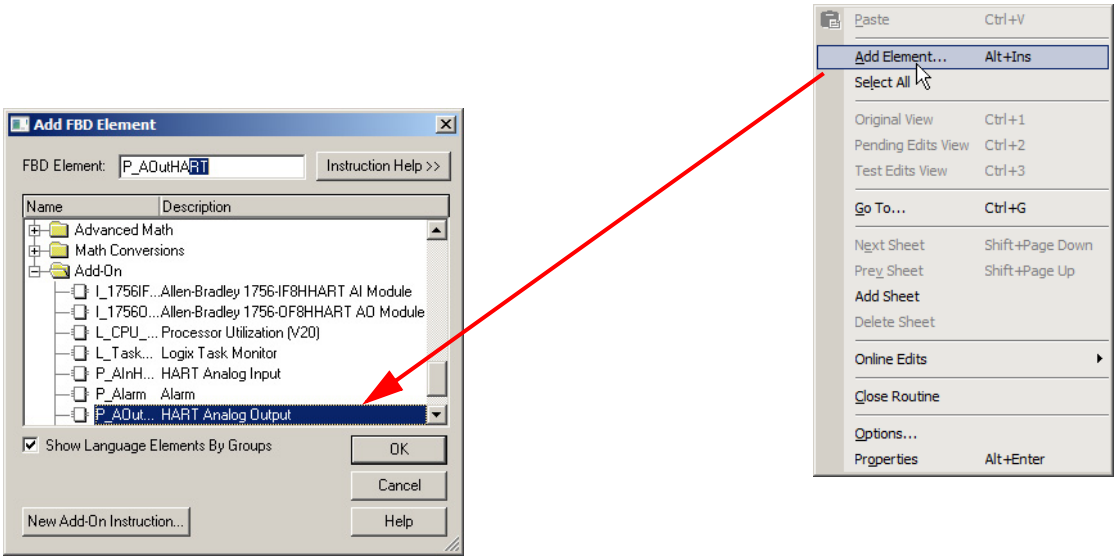


The P_AOutHART definition is imported.

TIP You need only to import the P_AOutHART Add-On Instruction (steps 1 through 3) once for the project. The remaining steps apply to each channel (instance).

4. In the Controller Organizer, double-click the routine in your process application where you want the P_AOutHART instance for this channel.

A workspace opens.



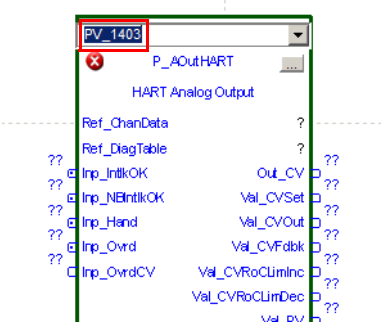
5. In the workspace, right-click and choose Add Element.

   The Add FBD Element dialog box appears.

6. Under the Add-On folder, select the HART Analog Output Add-On Instruction and click OK.

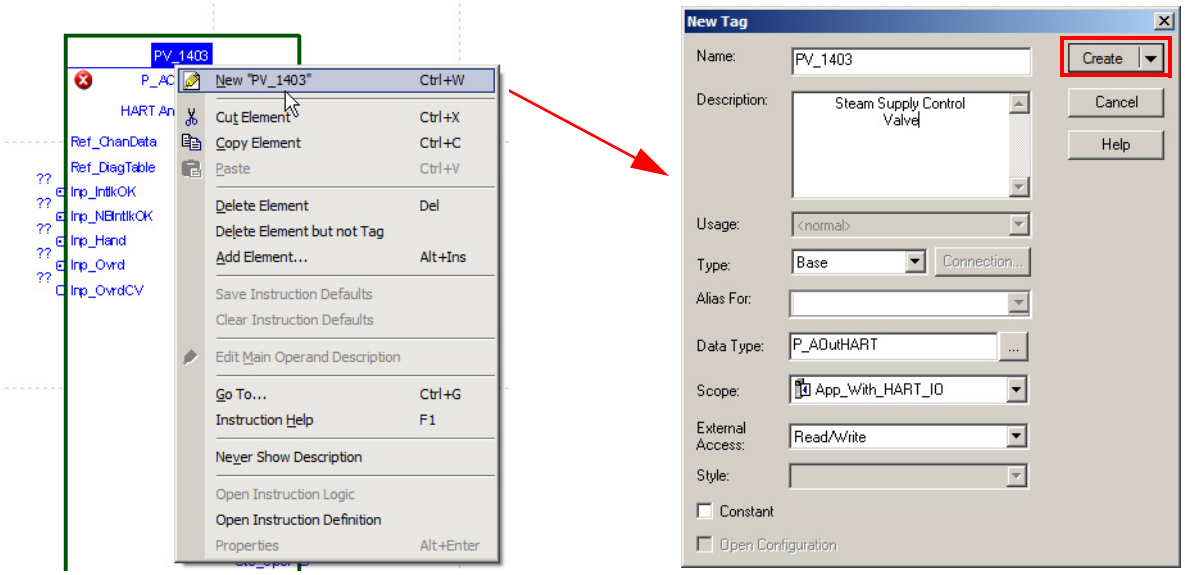
   The HART Analog Output element is added.

7. Double-click the tag name, type a new tag name (PV_1403 in our example), and press Enter.



8. Right-click the new tag name and choose New <new tag name> (New PV_1403 in our example).

The New Tag dialog box appears.

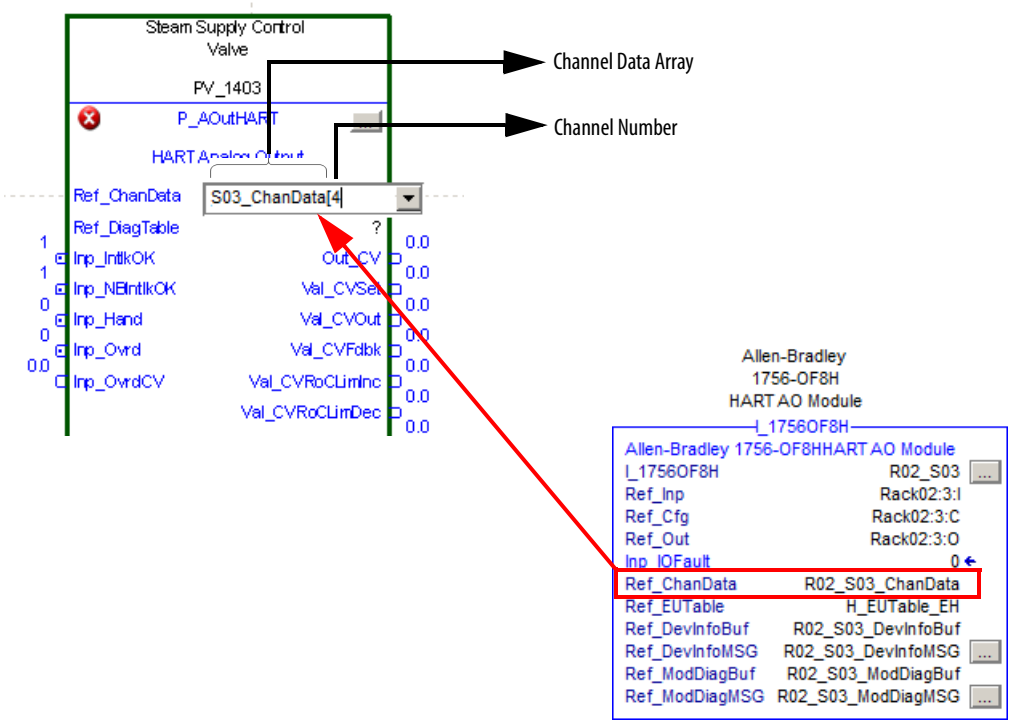


9. In the New Tag dialog box, the following fields are completed by default:
   - Name
   - Data Type
   - External Access (must be Read/Write)
10. (Optional) Type in a Description.
11. Select a Scope from the pull-down list (controller scope in our example) and click Create.
12. On the HART Analog Output element, double-click the question mark that corresponds to Ref_ChanData.

    A pull-down list appears.
13. Either type or select the channel data array for the module, then add an array index that indicates the correct channel and press Enter.

IMPORTANT	See Ref_ChanData in the HART module instruction for the base array name.

TIP	In this example, our field device is connected to channel 4 of the module.



14. **In the samples application**, in the Controller Organizer, double-click Controller tags.

    The Controller Tags window appears.

15. Select the EditTags tab.

16. Right-click the tag for the diagnostic table that matches the field device you are using and choose copy.

17. **In your application** (App_With_HART_IO in our example), in the Controller Organizer, open the controller tags, select the EditTags tab, and scroll to the bottom of the controller tags.

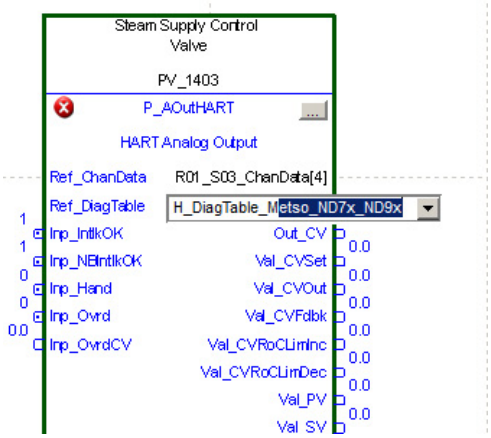
18. In the empty row, right-click the box that is left of the columns, and choose Paste.

    TIP Only one instance of a Diagnostic table tag is needed for all similar devices.

19. On the HART Analog Input element, double-click the question mark that corresponds to Ref_DiagTable.

    A pull-down list appears.

20. Either type or select the Diagnostic table tag just copied, and press Enter.



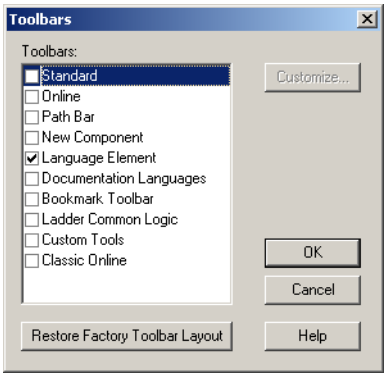
TIP If a Diagnostic table tag is not included for your device, you can use the H_DiagTable_Generic table tag, or create your own. The Online Premier Integration Configuration Tool can be useful in building your table tag.

Link Analog Signal

In this section, the analog channel data from the card you added to the project must be connected to the output of P_AOutHART instruction.

Complete the following steps:

1. If the Language Element toolbar is not visible, do the following:
   a. Click View and choose Toolbars.
   b. Select Language Element and click OK.

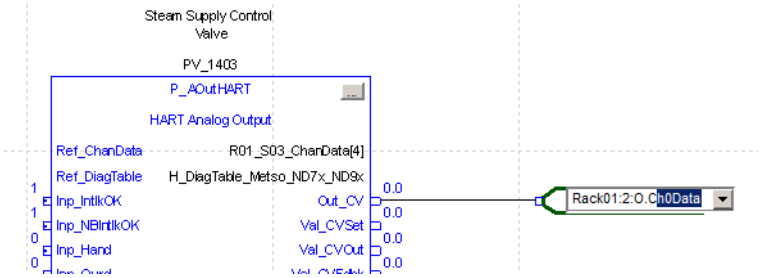


2. In the Language Element toolbar, drag-and-drop an 'output Reference' to Out_CV on the workspace.

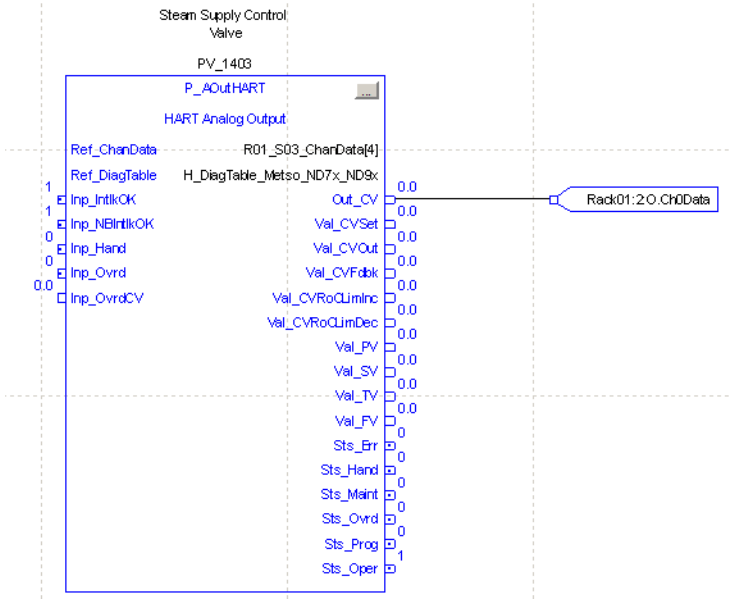
3. Double-click inside the Output Reference symbol and choose the analog output from the module.

IMPORTANT	The output data structure varies based on I/O family. See the user manual for your module for the location of the digital output signal.

4. Add a wire from the Output Reference symbol to Out_CV.



Your completed function block for a HART channel instance can look similar to the following image.

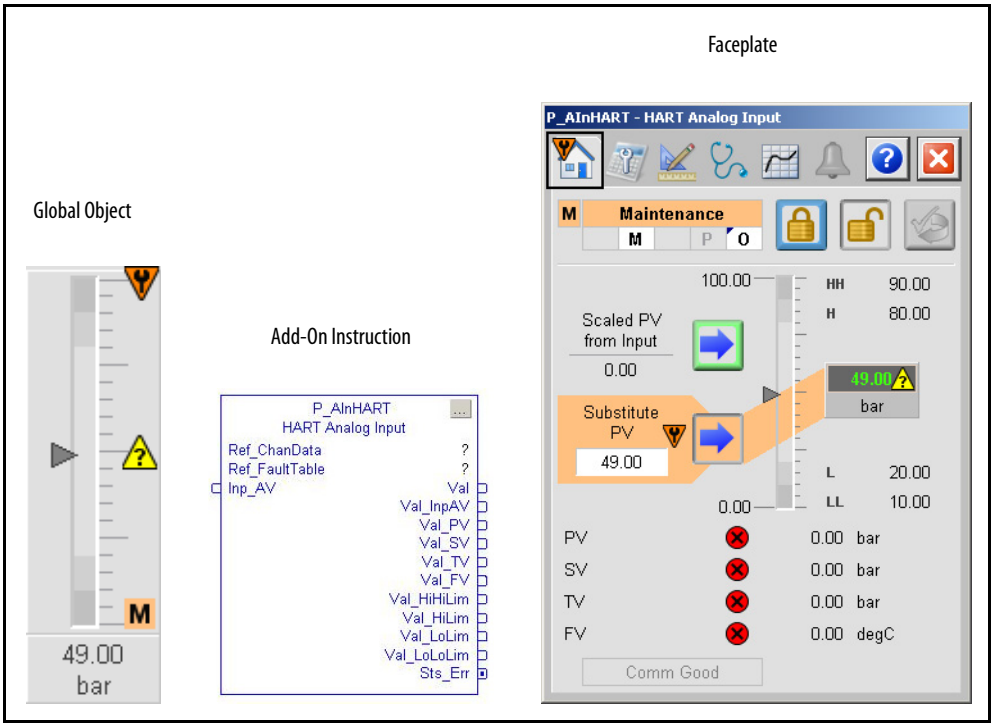


Notes:

HART Analog Input (P_AInHART)

The following table describes the topics in this chapter.

This instruction monitors one analog input from a flow, level, pressure, temperature, or other HART-connected analog sensor. Alarms are provided when the analog value exceeds user-specified thresholds (high and low). The instruction also provides capabilities for linear scaling of an analog input value from raw (input) units to engineering (output) units. Entry of a substitute Process Variable (PV), which handles an out-of-range or faulted input, is included.



Controller Code

This section describes the parameter references for this Add-On Instruction.

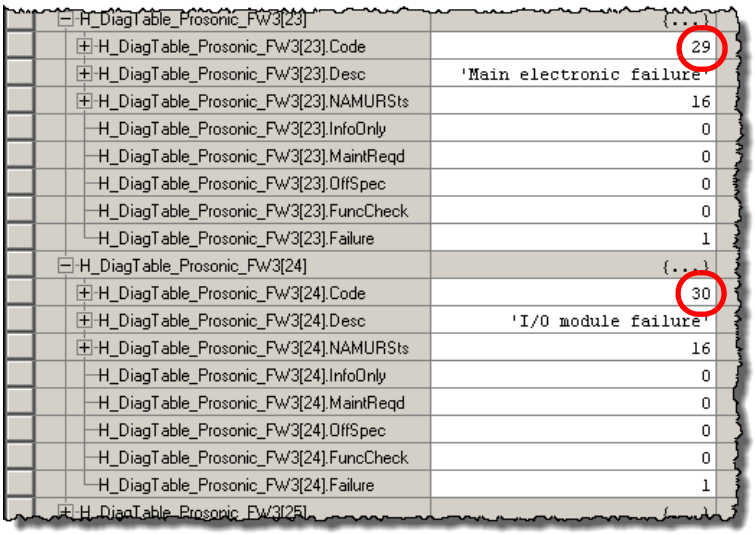
InOut parameters are used to link the Add-On Instruction to external tags that contain necessary data for the instruction to operate. These external tags must be of the data type shown.

Table 13 - P_AInHART InOut Parameters

InOut Parameters	Data Type	Description
Ref_ChanData	HART_ChanData	Channel Data from HART AI Channel
Ref_DiagTable	P_DiagTable[1]	Lookup table for Diagnostic Code to text

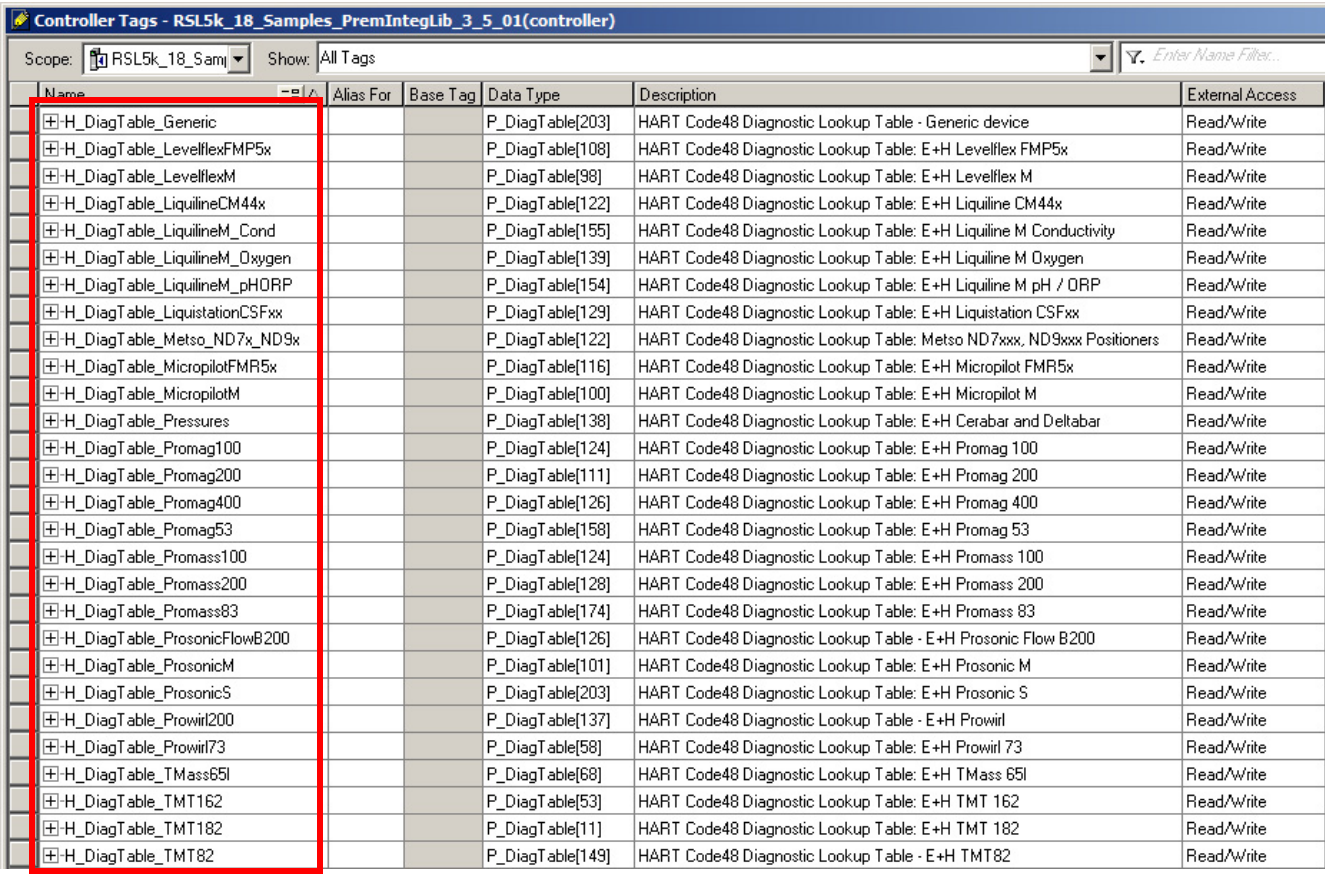
The diagnostic lookup table (Ref_DiagTable) is a tag that contains a list (array) of entries with diagnostic codes, the corresponding description, and a 'NAMUR status'.

The following image shows diagnostic codes 29 and 30 from the E+H Prosonic lookup table.



The code corresponds to a bit offset in the HART Code48 response from the device. Byte 0 bit 0 of the Code48 response is code '0'. Byte 0 bit 1 is code '1'. Byte 10 bit 0 is code '80' (8 bits per byte). The highest code number is 199, which is byte 24 bit 7.

There are several Diagnostic Lookup tables that are provided in the Premier Integration Samples ACD file. A 'generic' HART diagnostic table and several tables for Endress+Hauser HART instruments.



Controller Tags - RSL5k_18_Samples_PremIntegLib_3_5_01(controller)

Scope: RSL5k_18_Sam Show: All Tags Enter Name Filter...

Name	Alias For	Base Tag	Data Type	Description	External Access
H_DiagTable_Generic			P_DiagTable[203]	HART Code48 Diagnostic Lookup Table - Generic device	Read/Write
H_DiagTable_LevelflexFMP5x			P_DiagTable[108]	HART Code48 Diagnostic Lookup Table: E+H Levelflex FMP5x	Read/Write
H_DiagTable_LevelflexM			P_DiagTable[98]	HART Code48 Diagnostic Lookup Table: E+H Levelflex M	Read/Write
H_DiagTable_LiquilineCM44x			P_DiagTable[122]	HART Code48 Diagnostic Lookup Table: E+H Liquiline CM44x	Read/Write
H_DiagTable_LiquilineM_Cond			P_DiagTable[155]	HART Code48 Diagnostic Lookup Table: E+H Liquiline M Conductivity	Read/Write
H_DiagTable_LiquilineM_Oxygen			P_DiagTable[139]	HART Code48 Diagnostic Lookup Table: E+H Liquiline M Oxygen	Read/Write
H_DiagTable_LiquilineM_pHORP			P_DiagTable[154]	HART Code48 Diagnostic Lookup Table: E+H Liquiline M pH / ORP	Read/Write
H_DiagTable_LiquistationCSFxx			P_DiagTable[129]	HART Code48 Diagnostic Lookup Table: E+H Liquistation CSFxx	Read/Write
H_DiagTable_Metso_ND7x_ND9x			P_DiagTable[122]	HART Code48 Diagnostic Lookup Table: Metso ND7xxx, ND9xxx Positioners	Read/Write
H_DiagTable_MicropilotFMR5x			P_DiagTable[116]	HART Code48 Diagnostic Lookup Table: E+H Micropilot FMR5x	Read/Write
H_DiagTable_MicropilotM			P_DiagTable[100]	HART Code48 Diagnostic Lookup Table: E+H Micropilot M	Read/Write
H_DiagTable_Pressures			P_DiagTable[138]	HART Code48 Diagnostic Lookup Table: E+H Cerabar and Deltabar	Read/Write
H_DiagTable_Promag100			P_DiagTable[124]	HART Code48 Diagnostic Lookup Table: E+H Promag 100	Read/Write
H_DiagTable_Promag200			P_DiagTable[111]	HART Code48 Diagnostic Lookup Table: E+H Promag 200	Read/Write
H_DiagTable_Promag400			P_DiagTable[126]	HART Code48 Diagnostic Lookup Table: E+H Promag 400	Read/Write
H_DiagTable_Promag53			P_DiagTable[158]	HART Code48 Diagnostic Lookup Table: E+H Promag 53	Read/Write
H_DiagTable_Promass100			P_DiagTable[124]	HART Code48 Diagnostic Lookup Table: E+H Promass 100	Read/Write
H_DiagTable_Promass200			P_DiagTable[128]	HART Code48 Diagnostic Lookup Table: E+H Promass 200	Read/Write
H_DiagTable_Promass83			P_DiagTable[174]	HART Code48 Diagnostic Lookup Table: E+H Promass 83	Read/Write
H_DiagTable_ProsonicFlowB200			P_DiagTable[126]	HART Code48 Diagnostic Lookup Table - E+H Prosonic Flow B200	Read/Write
H_DiagTable_ProsonicM			P_DiagTable[101]	HART Code48 Diagnostic Lookup Table: E+H Prosonic M	Read/Write
H_DiagTable_ProsonicS			P_DiagTable[203]	HART Code48 Diagnostic Lookup Table: E+H Prosonic S	Read/Write
H_DiagTable_Prowirl200			P_DiagTable[137]	HART Code48 Diagnostic Lookup Table - E+H Prowirl	Read/Write
H_DiagTable_Prowirl73			P_DiagTable[58]	HART Code48 Diagnostic Lookup Table: E+H Prowirl 73	Read/Write
H_DiagTable_TMass65I			P_DiagTable[68]	HART Code48 Diagnostic Lookup Table: E+H TMass 65I	Read/Write
H_DiagTable_TMT162			P_DiagTable[53]	HART Code48 Diagnostic Lookup Table: E+H TMT 162	Read/Write
H_DiagTable_TMT182			P_DiagTable[11]	HART Code48 Diagnostic Lookup Table: E+H TMT 182	Read/Write
H_DiagTable_TMT82			P_DiagTable[149]	HART Code48 Diagnostic Lookup Table - E+H TMT82	Read/Write

Input Structure for HART Analog Input

Input parameters include the following:

- Input data elements (Inp_) are typically used to connect field inputs from I/O modules or signals from other objects.
- Configuration data elements (Cfg_) are used to set configurable capabilities and features of the instruction.
- Commands (PCmd_, OCmd_, MCmd_) are used by program logic, operators, and maintenance personnel to request instruction actions.
- Settings (PSet_, OSet_, MSet_) are used by program logic, operators, and maintenance personnel to establish runtime setpoints, thresholds, and so forth. A Setting (without a leading P, O, or M) establishes runtime settings regardless of role or mode.

Table 14 - P_AInHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
EnableIn	BOOL		1	Enable Input - System Defined Parameter
Inp_AV	REAL		0.0	Direct analog PV from Input Assembly
Inp_IOFault	BOOL		0	1 = I/O connection faulted 0 = OK (option, use with produced/consumed tags, and so forth)
Inp_Sim	BOOL		0	1 = Use simulated analog PV (Set_SimPV) 0 = Use analog Input (Inp_PV)
Inp_HiHiGate	BOOL	HiHiGate.Inp_Gate	1	These parameters are the gate inputs used for status detection. When set to 1, the corresponding analog input threshold monitoring is enabled. When enabled, the threshold detection on-delay and off-delay timers are applied after the gate delay timer. When set to 0, detection is disabled and the corresponding status output is forced off. If the status is used as an alarm, this input provides a method for suppression-by-design alarm management.
Inp_HiGate		HiGate.Inp_Gate		
Inp_LoGate		LoGate.Inp_Gate		
Inp_LoLoGate		LoLoGate.Inp_Gate		
Inp_FailGate		FailGate.Inp_Gate		
Inp_Reset	BOOL		0	Input parameter that is used to programmatically reset alarms. When set to 1, all alarms that require a reset are reset.
Cfg_NoSubstPV	BOOL		0	This parameter provides the ability to disable the maintenance substitution feature. • When this parameter is 0, the Substitute analog PV function is allowed. • When this parameter is 1, the Substitute analog PV Maintenance function is disallowed.
Cfg_SetTrack	BOOL		1	This parameter is used to configure bumpless behavior of setting parameters when switching modes: • When this parameter is 1: – In Program mode, the operator settings track the program settings – In Operator mode, the program settings track the operator settings – The simulation inputs match the output values (transitions are bumpless) • When this parameter is 0, the operator settings and program settings are not modified by this instruction. In this case, when the mode is changed, the effective value of the setting can change depending on the program-set and operator-set values.
Cfg_HasHART	BOOL		1	1 = HART instrument 0 = non-HART (4…20 mA only) instrument
Cfg_HasPV	BOOL		1	1 = Digital variable is configured and displayed: • PV (primary variable) • SV (secondary variable) • TV (third variable) • FV (fourth variable)
Cfg_HasSV				
Cfg_HasTV				
Cfg_HasFV				

Table 14 - P_AInHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_UseHARTText	BOOL		0	1 = Use HART text for Description, Label, Tag, engineering units 0 = Manually entered
Cfg_UseHARTScaling	BOOL		0	1 = Use HART scaling for raw, engineering units ranges 0 = Manually entered ranges
Cfg_AutoUpdDevInfo	BOOL		1	1 = automatically update device information 0 = no auto update
Cfg_ManUpdDevInfo	BOOL		0	1 = allow manual device information update request 0 = disallow
Cfg_PCmdClear	BOOL	Mode.Cfg_PCmdClear	0	1 = Clear Program commands on receipt 0 = Use Level-based (maintained) program commands
Cfg_ProgDefault	BOOL	Mode.Cfg_ProgDefault	0	This parameter defines the Default mode. When this parameter is 1, the mode defaults to Program if no mode is being requested. When this parameter is 0, the mode defaults to Operator if no mode is being requested. **IMPORTANT:** Changing this parameter online can cause unintended mode changes.
Cfg_HasHiHiAlm	BOOL	HiHi.Cfg_Exists		These parameters determine whether the corresponding alarm exists and is checked or if the alarm does not exist and is not used. When these parameters are 1, the corresponding alarm exists.
Cfg_HasHiAlm		Hi.Cfg_Exists		
Cfg_HasLoAlm		Lo.Cfg_Exists		
Cfg_HasLoLoAlm		LoLo.Cfg_Exists		
Cfg_HasFailAlm		Fail.Cfg_Exists		
Cfg_HiHiResetReqd	BOOL	HiHi.Cfg_ResetReqd	0	These parameters determine whether a reset is required to clear the alarm status. When these parameters are 1, the alarm is latched ON when the alarm occurs. After the alarm condition returns to normal, a reset is required to clear the alarm status. For example, OCmd_Reset, Inp_Reset, or Hi.OCmd_Reset is required to clear Alm_Hi alarm after the alarm is set and the value returns to normal. When these parameters are 0, no reset is required and the alarm status is cleared when the alarm condition returns to normal. **IMPORTANT:** If the reset clears the alarm, it also acknowledges the alarm.
Cfg_HiResetReqd		Hi.Cfg_ResetReqd		
Cfg_LoResetReqd		Lo.Cfg_ResetReqd		
Cfg_LoLoResetReqd		LoLo.Cfg_ResetReqd		
Cfg_FailResetReqd		Fail.Cfg_ResetReqd		
Cfg_HiHiAckReqd	BOOL	HiHi.Cfg_AckReqd		These parameters determine whether an acknowledgement is required for an alarm. When these parameters are 1, the acknowledge (ack) bit is cleared when the alarm occurs. An acknowledge command (for example, PCmd_FailAck or Fail.OCmd_Ack) is required to acknowledge the alarm. When set to 0, the Acknowledge bit is set when an alarm occurs indicating an acknowledged alarm and no acknowledge command is required.
Cfg_HiAckReqd		Hi.Cfg_AckReqd		
Cfg_LoAckReqd		Lo.Cfg_AckReqd		
Cfg_LoLoAckReqd		LoLo.Cfg_AckReqd		
Cfg_FailAckReqd		Fail.Cfg_AckReqd		
Cfg_HiHiSeverity	INT	HiHi.Cfg_Severity	750	These parameters determine the severity of each alarm. The severity drives the color and symbol that are used to indicate alarm status on the faceplate and global object. The following are valid values: 1…250 = Low 251…500 = Medium 501…750 = High 751…1000 = Urgent **IMPORTANT:** For FactoryTalk® View Site Edition (SE) software, version 7.0, these severity parameters drive only the indication on the global object and faceplate. The Alarms and Events definition of severity drives the color and symbol that is used on the alarm banner and alarm summary and the value returned by FactoryTalk Alarms and Events display commands.
Cfg_HiSeverity		Hi.Cfg_Severity	500	
Cfg_LoSeverity		Lo.Cfg_Severity	500	
Cfg_LoLoSeverity		LoLo.Cfg_Severity	750	
Cfg_FailSeverity		Fail.Cfg_Severity	1000	
Cfg_InpRawMin	REAL		0.0	Input (unscaled) minimum for Scaling
Cfg_InpRawMax	REAL		100.0	Input (unscaled) maximum for Scaling
Cfg_PVEUMin	REAL		0.0	Analog PV (Output) minimum for Scaling to engineering units
Cfg_PVEUMax	REAL		100.0	Analog PV (Output) maximum for Scaling to engineering units

Table 14 - P_AInHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_FiltTC	REAL		0.0	Analog PV Filter Time Constant (s), 0.0 = unfiltered
Cfg_HiHiDB	REAL		1.0	These parameters set the deadband (hysterisis) that is applied to each alarm limit. This is used to help prevent a noisy signal from generating spurious alarms. **EXAMPLE:** If the High Alarm is enabled (Cfg_HasHiAlm = 1), the High Alarm Limit (Val_HiLim) is 90 and the High Alarm Deadband (Cfg_HiDB) is 5, the high alarm is generated when the output (Val) rises above 90 and is cleared once the output (Val) falls below 85 (90 minus 5).
Cfg_HiDB			1.0	
Cfg_LoDB			1.0	
Cfg_LoLoDB			1.0	
Cfg_FailDB			0.41666666	
Cfg_HiHiOnDly	DINT	HiHiGate.Cfg_OnDly	0	These parameters determine the minimum time (in seconds) the PV must remain beyond the status threshold for the status to be set. On-delay times are used to avoid unnecessary alarms when an output (Val) briefly overshoots its threshold (for example, Val_HiHiLim).
Cfg_HiOnDly		HiGate.Cfg_OnDly		
Cfg_LoOnDly		LoGate.Cfg_OnDly		
Cfg_LoLoOnDly		LoLoGate.Cfg_OnDly		
Cfg_FailOnDly		FailGate.Cfg_OnDly		
Cfg_HiHiOffDly	DINT	HiHiGate.Cfg_OffDly	0	These parameters determine the amount of time (in seconds) the output must stay within each status threshold to clear the status. Off-delay times are used to reduce chattering alarms. **EXAMPLE:** If Cfg_HiOffDly is 5 seconds, the output (Val) must be below the status limit (Val_HiHiLim) minus deadband (Cfg_HiHiDB) for 5 seconds before the status is returned to normal.
Cfg_HiOffDly		HiGate.Cfg_OffDly		
Cfg_LoOffDly		LoGate.Cfg_OffDly		
Cfg_LoLoOffDly		LoLoGate.Cfg_OffDly		
Cfg_FailOffDly		FailGate.Cfg_OffDly		
Cfg_HiHiGateDly	DINT	HiHiGate.Cfg_GateDly	0	These parameters determine the amount of time (in seconds) the gate input must be turned on for threshold detection to be enabled. On-delays and off-delays are applied after the gate delay is complete.
Cfg_HiGateDly		HiGate.Cfg_GateDly		
Cfg_LoGateDly		LoGate.Cfg_GateDly		
Cfg_LoLoGateDly		LoLoGate.Cfg_GateDly		
Cfg_FailGateDly		FailGate.Cfg_GateDly		
Cfg_FailHiLim	REAL		103.958336	Out-of-Range (fail) High Limit (engineering units)
Cfg_FailLoLim	REAL		-2.0833333	Out-of-Range (fail) Low Limit (engineering units)
PSet_Owner	DINT		0	Program Owner Request ID (nonzero) or Release (zero)
PSet_HiHiLim	REAL		1.5E+38	Program-Entered High-High or High status threshold (engineering units)
PSet_HiLim				
PSet_LoLim	REAL		-1.5E+38	Program-Entered Low or Low-Low status threshold (engineering units)
PSet_LoLoLim				
MSet_SubstPV	REAL		0.0	Maintenance-Entered Substitute Analog PV (engineering units)
OSet_HiHiLim	REAL		1.5E+38	Operator-Entered High-High or High status threshold (engineering units)
OSet_HiLim				
OSet_LoLim	REAL		-1.5E+38	Operator-Entered Low or Low-Low status threshold (engineering units)
OSet_LoLoLim				
Set_SimPV	REAL		0.0	Analog PV used in Simulation (Inp_Sim = 1) (engineering units)
Set_SimHARTPV	REAL		0.0	PV, SV, TV, or FV used in Simulation (Inp_Sim = 1) (primary, secondary, third, or fourth value in engineering units)
Set_SimHARTSV				
Set_SimHARTTV				
Set_SimHARTFV				

Table 14 - P_AInHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
PCmd_ClearCapt	BOOL		0	• Set PCmd_ClearCapt to 1 to clear the captured minimum/maximum PV excursion values • The parameter is reset Automatically
PCmd_Acq	BOOL	Mode.PCmd_Acq	0	When Cfg_PCmdClear is 1: • Set PCmd_Acq to 1 to Acquire • Set PCmd_Rel to 1 to Release • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_Acq to 1 to Acquire • Set PCmd_Acq to 0 to Release • PCmd_Rel is not used • These parameters do not reset automatically
PCmd_Rel		Mode.PCmd_Rel		
PCmd_Lock	BOOL	Mode.PCmd_Lock	0	When Cfg_PCmdClear is 1: • Set PCmd_Lock to 1 to Lock • Set PCmd_Unlock to 1 to Unlock • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_Lock to 1 to Lock • Set PCmd_Lock to 0 to Unlock • PCmd_Unlock is not used • These parameters do not reset automatically
PCmd_Unlock		Mode.PCmd_Unlock		
PCmd_Reset	BOOL		0	• Set PCmd_Reset to 1 to reset all alarms requiring reset • This parameter is always reset automatically
PCmd_HiHiAck	BOOL	HiHi.PCmd_Ack	0	• Set PCmd_<Alarm>Ack to 1 to Acknowledge alarm • The parameter is reset automatically
PCmd_HiAck		Hi.PCmd_Ack		
PCmd_LoAck		Lo.PCmd_Ack		
PCmd_LoLoAck		LoLo.PCmd_Ack		
PCmd_FailAck		Fail.PCmd_Ack		
PCmd_HiHiSuppress	BOOL	HiHi.PCmd_Suppress	0	When Cfg_PCmdClear is 1: • Set PCmd_<Alarm>Suppress to 1 to suppress alarm • Set PCmd_<Alarm>Unsuppress to 1 to unsuppress alarm • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_<Alarm>Suppress to 1 to suppress alarm • Set PCmd_<Alarm>Suppress to 0 to unsuppress alarm • PCmd_<Alarm>Unsuppress is not used • These Parameters do not reset automatically
PCmd_HiSuppress		Hi.PCmd_Suppress		
PCmd_LoSuppress		Lo.PCmd_Suppress		
PCmd_LoLoSuppress		LoLo.PCmd_Suppress		
PCmd_FailSuppress		Fail.PCmd_Suppress		
PCmd_HiHiUnsuppress	BOOL	HiHi.PCmd_Unsuppress	0	
PCmd_HiUnsuppress		Hi.PCmd_Unsuppress		
PCmd_LoUnsuppress		Lo.PCmd_Unsuppress		
PCmd_LoLoUnsuppress		LoLo.PCmd_Unsuppress		
PCmd_FailUnsuppress		Fail.PCmd_Unsuppress		
PCmd_HiHiUnshelve	BOOL	HiHi.PCmd_Unshelve	0	• Set PCmd_<Alarm>Unshelve to 1 to Unshelve alarm • The parameter is reset automatically
PCmd_HiUnshelve		Hi.PCmd_Unshelve		
PCmd_LoUnshelve		Lo.PCmd_Unshelve		
PCmd_LoLoUnshelve		LoLo.PCmd_Unshelve		
PCmd_FailUnshelve		Fail.PCmd_Unshelve		
MCmd_UpdDevInfo	BOOL		0	Maintenance command to request update of device info
MCmd_SubstPV	BOOL		0	Maintenance command to use Substitute Analog PV (override input)
MCmd_InpPV	BOOL		0	Maintenance command to use Input Analog PV (normal)
OCmd_ClearCapt	BOOL		0	Operator command to clear the captured minimum/maximum analog PV excursion values

Table 14 - P_AInHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
MCmd_Acq	BOOL	Mode.MCmd_Acq	0	Maintenance command to Acquire Ownership (Operator/Program/Overload to Maintenance)
MCmd_Rel	BOOL	Mode.MCmd_Rel	0	Maintenance command to Release Ownership (Maintenance to Operator/Program/ Overload)
OCmd_AcqLock	BOOL	Mode.OCmd_AcqLock	0	Operator command to Acquire (Program to Operator)/Lock Ownership
OCmd_Unlock	BOOL	Mode.OCmd_UnlockRel	0	Operator command to Unlock/Release (Operator to Program) Ownership
OCmd_Reset	BOOL		0	Operator command to Reset all alarms requiring Reset
OCmd_ResetAckAll	BOOL		0	Operator command to Reset and Acknowledge all alarms

Output Structure for HART Analog Input

Output parameters include the following:

- Value data elements (Val_) are numeric outputs of the instruction for use by the HMI. Values also can be used by other application logic or software packages.
- Source and Quality data elements (SrcQ_) are outputs of the instruction used by the HMI to indicate PV source and quality.
- Status data elements (Sts_) are bit outputs of the instruction for use by the HMI. Status bits also can be used by other application logic.
- Error data elements (Err_) are outputs of the instruction that indicate a particular configuration error. If any Err_ bit is set, then the Sts_Err configuration error summary status is set and the Invalid Configuration indicator is displayed on the HMI.
- Alarm data elements (Alm_) are outputs of the instruction that indicate a particular alarm has occurred.
- Acknowledge data elements (Ack_) are outputs of the instruction that indicate the corresponding alarm has been acknowledged.
- Ready data elements (Rdy_) are bit outputs of the instruction used by the HMI to enable or disable Command buttons and Setting entry fields.

Table 15 - P_AInHART Output Parameters

Parameter	Data Type	Alias For	Description
EnableOut	BOOL		Enable Output - System Defined Parameter
Val	REAL		Analog Value (after Substitute PV, if used)
Val_InpAV	REAL		Analog Input Value (actual, before Substitute PV selection)
Val_PVMinCapt	REAL		Captured Analog PV Minimum excursion or Maximum excursion since last cleared
Val_PVMaxCapt			
Val_PVEUMin	REAL		Minimum and maximum of analog scaled range = Min (Cfg_PVEUMin, Cfg_PVEUMax) or MAX (Cfg_PVEUMin, Cfg_PVEUMax)
Val_PVEUMax			

Table 15 - P_AInHART Output Parameters

Parameter	Data Type	Alias For	Description
Val_PV	REAL		Digital (HART) variable value: • Primary Variable (PV) • Secondary Variable (SV) • Third Variable (TV) • Fourth Variable (FV)
Val_SV			
Val_TV			
Val_FV			
Val_DiagCode1	DINT		HART Diagnostic Code 1, 2, or 3: 0…199 -1 = No diagnostic
Val_DiagCode2			
Val_DiagCode3			
Val_NAMURSts1	DINT		NAMUR NE107 Status for HART Diagnostic Code: 0 = OK 1 = Information 2 = Maintenance required 4 = Off specification (uncertain) 8 = Function check (substitution) 16 = Failure
Val_NAMURSts2			
Val_NAMURSts3			
SrcQ_IO	SINT		I/O signal source and quality.
SrcQ			Final analog PV source and quality. GOOD 0 = I/O live and confirmed good quality 1 = I/O live and assumed good quality 2 = No feedback configured, assumed good quality TEST 8 = Device simulated 9 = Device loopback simulation 10 = Manually entered value UNCERTAIN 16 = Live input, off-specification 17 = Value substituted at device/bus 18 = Value substituted by maintenance (Has and not Use) 19 = Shed, using last good value 20 = Shed, using replacement value BAD 32 = Signal failure (out-of-range, NaN, invalid combination) 33 = I/O channel fault 34 = I/O module fault 35 = Bad I/O configuration (for example, scaling parameters)
SrcQ_PV	SINT		Source and Quality of the following: • HART PV value • HART SV value • HART TV value • HART FV value
SrcQ_SV			
SrcQ_TV			
SrcQ_FV			
Val_Fdbk	SINT		Device Feedback: 0 = PV Good 1 = PV Uncertain 2 = PV Bad 3 = PV Subst. or Sim.
Val_Sts	SINT		Device Confirmed Status: 0 = PV Good 5 = PV Uncertain 6 = PV Bad 7 = Substitute PV 33 = Disabled

Table 15 - P_AInHART Output Parameters

Parameter	Data Type	Alias For	Description
Val_Fault	SINT		Device Fault Status: 0 = none 20 = Lo 21 = Hi 24 = LoLo 25 = HiHi 32 = Fail 34 = CfgErr
Val_Mode	SINT	Mode.Val	Mode enumeration: 0 = No mode 1 = H 2 = Maintenance 3 = ! 4 = Program (locked) 5 = Operator (locked) 6 = Program (unlocked, Operator is default) 7 = Operator (unlocked, Program is default) 8 = Program (unlocked, Program is default) 9 = Operator (unlocked, Operator is default)
Val_Owner	DINT		Current Object Owner ID (0 = not owned)
Val_Notify	SINT		Current alarm level and acknowledgement (enumeration): 0 = No alarm 1 = Alarm cleared: a reset or acknowledge is required 2 = Low (acknowledged) 3 = Low (unacknowledged) 4 = Medium (acknowledged) 5 = Medium (unacknowledged) 6 = High (acknowledged) 7 = High (unacknowledged) 8 = Urgent (acknowledged) 9 = Urgent (unacknowledged)
Val_HiHiLim	REAL		Current High-High status threshold
Val_HiLim	REAL		Current High status threshold
Val_LoLim	REAL		Current Low status threshold
Val_LoLoLim	REAL		Current Low-Low status threshold
Sts_SubstPV	BOOL		1 = Using Substitute analog PV (input being overridden)
Sts_InpPV	BOOL		1 = Using input analog PV (normal)
Sts_PVBad	BOOL		1 = Analog PV bad quality or out of range
Sts_PVUncertain	BOOL		1 = Analog PV Value is uncertain (quality)
Sts_MaintByp	BOOL		1 = A Maintenance Bypass is active, display icon
Sts_AlmInh	BOOL		1 = An Alarm is inhibited, disabled, or suppressed, display icon
Sts_Err	BOOL		1 = Error in configuration (see detail Err_ bits for reason), display icon
Err_Raw	BOOL		1 = Error in configuration: • Raw Input Scaling minimum = maximum • Scaled engineering units minimum = maximum • On Delay, Off Delay, Gate Delay Time Invalid (use 0…2,147,483 seconds) • PV filter parameters (RateTime, TC) • Status Deadband is < 0.0 • Alarm Minimum On Time, Shelf Time, Severity
Err_EU			
Err_Timer			
Err_Filt			
Err_DB			
Err_Alarm			

Table 15 - P_AInHART Output Parameters

Parameter	Data Type	Alias For	Description
Sts_Maint	BOOL	Mode.Sts_Maint	1 = Mode is Maintenance (supersedes Overload, Program, Operator)
Sts_Prog	BOOL	Mode.Sts_Prog	1 = Mode is Program
Sts_Oper	BOOL	Mode.Sts_Oper	1 = Mode is Operator
Sts_ProgOperLock	BOOL	Mode.Sts_ProgOperLock	1 = Program or Operator has requested Mode Lock
Sts_NoMode	BOOL	Mode.Sts_NoMode	1 = Mode is No Mode (no owner, disabled or not scanned)
Sts_MAcqRcvd	BOOL	Mode.Sts_MAcqRcvd	1 = Maintenance Acquire command received this scan
Sts_HiHiCmp	BOOL	HiHiGate.Inp	PV High-High, High, Low, Low-Low, or Fail comparison result 1 = High-High, High, Low, Low-Low, or Fail
Sts_HiCmp		HiGate.Inp	
Sts_LoCmp		LoGate.Inp	
Sts_LoLoCmp		LoLoGate.Inp	
Sts_FailCmp		FailGate.Inp	
Sts_HiHiGate	BOOL	HiHiGate.Sts_Gate	PV High-High, High, Low, Low-Low, or Fail gate delay status 1 = Done.
Sts_HiGate		HiGate.Sts_Gate	
Sts_LoGate		LoGate.Sts_Gate	
Sts_LoLoGate		LoLoGate.Sts_Gate	
Sts_FailGate		FailGate.Sts_Gate	
Sts_HiHi	BOOL	HiHi.Inp	1 = Analog Input is above High-High or High limit
Sts_Hi		Hi.Inp	
Sts_Lo		Lo.Inp	1 = Analog Input is below Low or Low-Low limit
Sts_LoLo		LoLo.Inp	
Sts_Fail		Fail.Inp	1 = Analog Input is Out of Range or analog PV Bad
Alm_HiHi	BOOL	HiHi.Alm	1 = Analog Input is in High-High, High, Low, Low-Low, or Fail (analog PV bad or out of range) alarm.
Alm_Hi		Hi.Alm	
Alm_Lo		Lo.Alm	
Alm_LoLo		LoLo.Alm	
Alm_Fail		Fail.Alm	
Ack_HiHi	BOOL	HiHi.Ack	1 = High-High, High, Low, Low-Low, or Analog Input failure alarm has been acknowledged.
Ack_Hi		Hi.Ack	
Ack_Lo		Lo.Ack	
Ack_LoLo		LoLo.Ack	
Ack_Fail		Fail.Ack	
Sts_HiHiDisabled	BOOL	HiHi.Disabled	1 = High-High, High, Low, Low-Low, or Fail alarm is disabled (by Maintenance).
Sts_HiDisabled		Hi.Disabled	
Sts_LoDisabled		Lo.Disabled	
Sts_LoLoDisabled		LoLo.Disabled	
Sts_FailDisabled		Fail.Disabled	

Table 15 - P_AInHART Output Parameters

Parameter	Data Type	Alias For	Description
Sts_HiHiShelved	BOOL	HiHi.Shelved	1 = High-High, High, Low, Low-Low, or Fail alarm is shelved (by Operator).
Sts_HiShelved		Hi.Shelved	
Sts_LoShelved		Lo.Shelved	
Sts_LoLoShelved		LoLo.Shelved	
Sts_FailShelved		Fail.Shelved	
Sts_HiHiSuppressed	BOOL	HiHi.Suppressed	1 = High-High, High, Low, Low-Low, or Fail alarm is suppressed (by Program).
Sts_HiSuppressed		Hi.Suppressed	
Sts_LoSuppressed		Lo.Suppressed	
Sts_LoLoSuppressed		LoLo.Suppressed	
Sts_FailSuppressed		Fail.Suppressed	
Rdy_UpdDevInfo	BOOL		1 = Ready for: • MCmd_UpdDevInfo • MCmd_SubstPV • MCmd_InpPV.
Rdy_SubstPV			
Rdy_InpPV			
Rdy_Reset	BOOL		1 = At least one Alarm requires Reset
Rdy_ResetAckAll	BOOL		1 = At least one Alarm requires Reset or Acknowledgement
Rdy_OSet	BOOL		1 = Ready to receive OSets (enables data entry fields)
P_AInHART	BOOL		Unique Parameter Name for auto - discovery

Local Configuration Tags for HART Analog Input

Configuration parameters that are array, string, or structure data types cannot be configured as parameters for Add-On Instructions. Configuration parameters of these types appear as local tags to the Add-On Instruction. Local tags can be configured through the HMI faceplates or in Studio 5000 Logix Designer® application by opening the instruction logic of the Add-On Instruction instance and then opening the Data Monitor on a local tag. These parameters cannot be modified by using controller logic or Logix Designer application export/import functionality.

Table 16 - P_AInHART Local Configuration Tags

Tag Name	Data Type	Default	Description
Cfg_Desc	STRING_40	'Analog Input (HART)'	Description for display on HMI. This string is shown in the title bar of the faceplate.
Cfg_EU	STRING_8	'%'	Analog PV Engineering units for display on HMI (from lookup table).
Cfg_FVEU	STRING_8	''	Engineering units for HART fourth variable display on HMI.
Cfg_FVLabel	STRING_16	''	Label for HART fourth variable for display on HMI.
Cfg_Label	STRING_20	'Analog Input (HART)'	Label for graphic symbol displayed on HMI. This string appears on the graphic symbol.
Cfg_PVEU	STRING_8	''	Engineering units for HART primary variable display on HMI.
Cfg_PVLabel	STRING_16	''	Label for HART primary variable for display on HMI.
Cfg_SVEU	STRING_8	''	Engineering units for HART secondary variable display on HMI.
Cfg_SVLabel	STRING_16	''	Label for HART secondary variable for display on HMI.
Cfg_Tag	STRING_20	'P_AInHART'	Tag name for display on HMI. This string is shown in the title bar of the faceplate.
Cfg_TVEU	STRING_8	''	Engineering units for HART third variable display on HMI
Cfg_TVLabel	STRING_16	''	Label for HART third variable for display on HMI.

Operations

This section describes the primary operations for Add-On Instructions.

Modes

This instruction uses the following standard modes, which are implemented by using an embedded P_Mode Add-On Instruction.

Table 17 - Modes

Mode	Description
Operator	The Operator owns control of the device. Operator commands (OCmd_) and Operator settings (OSet_) from the HMI are accepted.
Program	Program logic owns control of the device. Program commands (PCmd_) and Program settings (PSet_) are accepted.
Maintenance	Maintenance owns control of the device and supersedes Operator, Program, and Override control. Operator commands and settings from the HMI are accepted. Bypassable interlocks and permissives are bypassed, and device timeout checks are not processed.

The following standard modes are not used:

- Hand mode
- Override (Ovrd) mode

See Rockwell Automation® Library of Process Objects: Common Mode Block (P_Mode) Reference Manual, publication SYSLIB-RM005, for more information.

Alarms

This instruction uses the following alarms, which are implemented by using embedded P_Alarm and P_Gate Add-On Instructions.

Table 18 - Alarms

Alarm Name	P_Alarm Name	P_Gate Name	Description
Fail	Fail	FailGate	Raised when any of the following is true: • The analog PV quality is bad • The Inp_PVBad input is true • The analog PV is outside the configured failure limits • The analog PV is infinite or not a number (floating point exception) • The raw or engineering unit range configuration is invalid
High PV	Hi	HiGate	Raised when the analog PV is above the High threshold. The threshold is set by the operator or by program logic. Deadband, gating, and timing are set in configuration.
High-High PV	HiHi	HiHiGate	Raised when the analog PV is above the High-High threshold. The threshold is set by the operator or by program logic. Deadband, gating, and timing are set in configuration.

Table 18 - Alarms

Alarm Name	P_Alarm Name	P_Gate Name	Description
Low PV	Lo	LoGate	Raised when the analog PV is below the Low threshold. The threshold is set by the operator or by program logic. Deadband, gating, and timing are set in configuration.
Low-Low PV	LoLo	LoLoGate	Raised when the analog PV is below the Low-Low threshold. The threshold is set by the operator or by program logic. Deadband, gating, and timing are set in configuration.

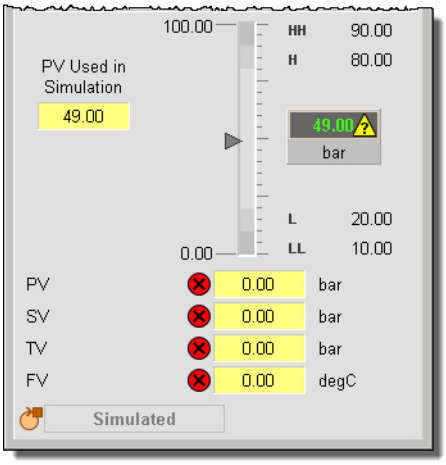
Parameters of the P_Alarm object can be accessed by using the following convention: [P_Alarm Name].[P_Alarm Parameter].

For more information, see the following Rockwell Automation Library of Process Objects publications:

- Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002
- Condition Gate Delay (P_Gate) Reference Manual, publication SYSLIB-RM041

Simulation

Simulation in P_AInHART disables the normal analog input (Inp_AV) and provides an input on the Operator faceplate for you to enter your own input value (Set_SimPV).



You can simulate digital variable inputs by using the following parameters:

- Set_SimHARTPV
- Set_SimHARTSV
- Set_SimHARTTV
- Set_SimHARTFV

You must set the Inp_Sim parameter in the controller to '1' to enable simulation. The Simulation icon is displayed at the bottom left of the Operator faceplate indicating the device is in simulation.

When you have finished in simulation, set the Inp_Sim parameter in the controller to '0' to return to normal operation.

Execution

The following table explains the handling of instruction execution conditions.

Table 19 - Execution Conditions

Condition	Description
EnableIn False (false rung)	The P_AIn Instruction shows a status of bad quality (Sts_PVBad) and an indication on the HMI. All alarms are cleared. The mode is reported as No Mode. However, calculation of the scaled Val_InpPV is executed to indicate to the operator the actual input value, even though the primary PV (Val) is not updated (holds last value).
Powerup (prescan, first scan)	Any commands received before first scan are discarded. Embedded P_Alarm and P_Mode instructions are handled in accordance with their standard power-up procedures. Refer to the Reference Manual for the P_Alarm and P_Mode Instruction for more information.
Postscan (SFC transition)	No SFC postscan logic is provided.

Refer to the Logix5000™ Controllers Add-On Instructions Programming Manual, publication 1756-PM010, for more information.

Display Elements

A display element (global object) is created once and can be referenced multiple times on multiple displays in an application. When changes are made to the original (base) object, the instantiated copies (reference objects) are automatically updated. Use of global objects, in conjunction with tag structures in the ControlLogix® system, aid consistency and save engineering time.

IMPORTANT The P_AInHART instruction uses the same Display Elements as the basic Analog Input (P_AIn) instruction.

Table 20 - P_AIn Display Elements Description

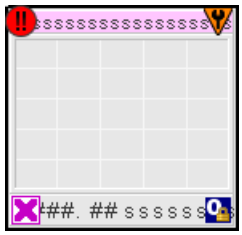
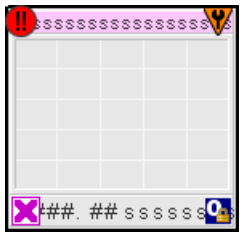
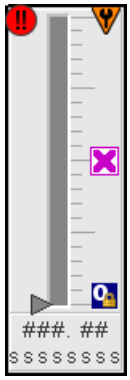
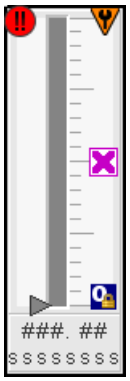
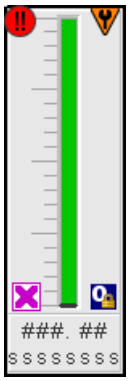
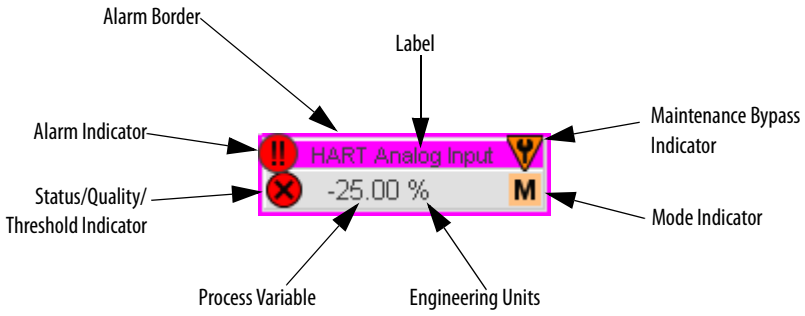
Display Element Name	Display Element	Description
GO_P_AIn		Standard analog input global object.
GO_P_AIn_Trend		Analog input with a trend of the Primary Value and limits (high-high, high, low, and low-low).
GO_P_AIn_TrendWCapture		The object is the same as GO_P_AIn_Trend except it displays a capture of the Primary Value.
GO_P_AIn_Indicator		Primary Value indicated by a moving triangle. The graphic display includes limits displayed with filled bars.

Table 20 - P_AIn Display Elements Description

Display Element Name	Display Element	Description
GO_P_AIn_IndicatorWCapture		This object is the same as the GO_P_AIn_Indicator plus a light gray minimum/maximum capture area.
GO_P_AInX		Primary Value displayed as a bar graph. The graphic display includes limits displayed as lines on the graph.

Common attributes of the P_AIn global objects include the following:

- Current value of the PV with engineering units
- Status/quality/threshold indicator
- Maintenance bypass indicator
- Engineering units
- Label
- Mode indicator
- Color changing alarm border that blinks on unacknowledged alarm
- Alarm indicator that changes color with the severity of an alarm



Status/Quality Indicators

One of these symbols appears on the graphic symbol when the described condition is true.

Table 21 - Status/Quality Indicators

Graphic Symbol	Description
	Invalid configuration.
	Data quality bad/failure.
	Data Quality degraded: uncertain, test, simulation, substitution, or out of specification.
	The input or device has been disabled.
No symbol displayed	I/O communication and quality good, configuration valid.

TIP When the Invalid Configuration indicator appears, you can find what configuration setting is invalid by following the indicators. Click the graphic symbol to open the faceplate. The Invalid Configuration indicator appears next to the appropriate tab at the top of the faceplate to guide you in finding the configuration error. Once you navigate to the tab, the misconfigured item is flagged with this indicator or appears in a magenta box.

For the HART Analog Input Instruction, the Invalid Configuration indicator appears under the following conditions:

- The Input Raw Scaling Minimum and Raw Maximum Scaling parameters are set to the same value.
- The Scaled Engineering Units Minimum and Scaled Engineering Units Maximum are set to the same value.
- PV Filter parameters (RateTime and TC) are invalid.
- A Status Deadband is set to a negative value.
- An Alarm On-delay, Off-delay, or Gate Delay time is set to a value less than zero or greater than 2,147,483 seconds.
- Alarm Severity is set to a value less than 1 or greater than 1000.
- Alarm minimum on time or shelf time is invalid.

Threshold Indicators

These indicators show that the analog PV has exceeded a threshold.

Table 22 - Threshold Indicators

Graphic Symbol	Description
	High-High threshold exceeded
	High threshold exceeded
	Low threshold exceeded
	Low-Low threshold exceeded

Mode Indicators

One of these symbols appears on the right side of the graphic symbol to indicate the mode of the object instruction.

Table 23 - Mode Indicators

Graphic Symbol	Description
Transparent	Operator mode (if the default mode is Operator and the current mode is Operator, the mode indicator is transparent).
	Operator mode (if the default mode is Program).
	Operator mode locked.
Transparent	Program mode (if the default mode is Program and the current mode is Program, the mode indicator is transparent).
	Program mode (if the default mode is Operator).
	Program mode locked.
	Maintenance mode.
	No mode.

When the object is in the default mode, the mode indicator is transparent.

TIP The images provided for the Operator and Program default modes are transparent; therefore, no mode indicators are visible if the device is in its default mode. This behavior can be changed by replacing the image files for these mode indicators with images that are not transparent.

See Rockwell Automation Library of Process Objects: Common Mode Block (P_Mode) Reference Manual, publication SYSLIB-RM005, for more information.

Alarm Indicators

One of these symbols appears on the left of the label to indicate the described alarm condition. The alarm border and label background blink if Acknowledgement of an alarm condition is required. Once the alarm is acknowledged, the alarm border and label background remain the color that corresponds to the severity of the alarm.

Table 24 - Alarm Indicators

Symbol	Border and Label Background	Description
	No change in color	Alarm Inhibit: an alarm is suppressed by the Program, disabled by Maintenance, or shelved by the Operator.
	White	Return to normal (no alarm condition), but a previous alarm has not been acknowledged.
	Blue	Low severity alarm.
	Yellow	Medium severity alarm.
	Red	High severity alarm.
	Magenta	Urgent severity alarm.
No symbol	No change in color	No alarm or alarm inhibit condition, and all alarms are acknowledged.

See Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

Maintenance Bypass Indicator

This symbol appears to the right of the label to indicate that a maintenance bypass has been activated.

Table 25 - Maintenance Bypass Indicator

Graphic Symbol	Description
	A maintenance bypass is active.
No symbol displayed	No maintenance bypass is active.

TIP When the Maintenance bypass indicator appears, you can find what condition was bypassed by following the indicators. Click the graphic symbol to open the faceplate. The Maintenance bypass indicator appears next to the appropriate tab at the top of the faceplate to guide you in finding the bypass. Once you navigate to the tab, the bypassed item is flagged with this indicator.

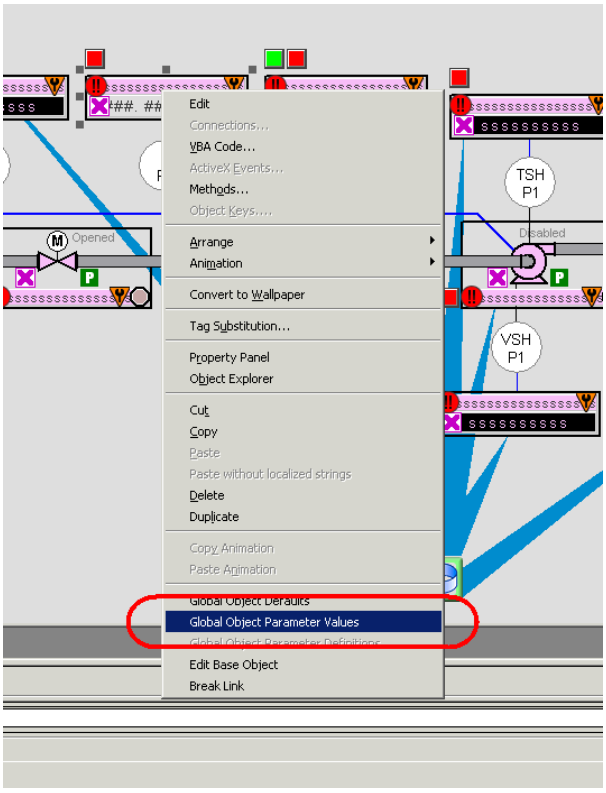
For the HART Analog Input instruction, the Maintenance Bypass indicator appears when the Substitute PV function is enabled. The 'live' PV is being superseded by a Maintenance-entered value.

Using Display Element

IMPORTANT The P_AInHART instruction uses the same display elements as the P_PAIn basic analog input.

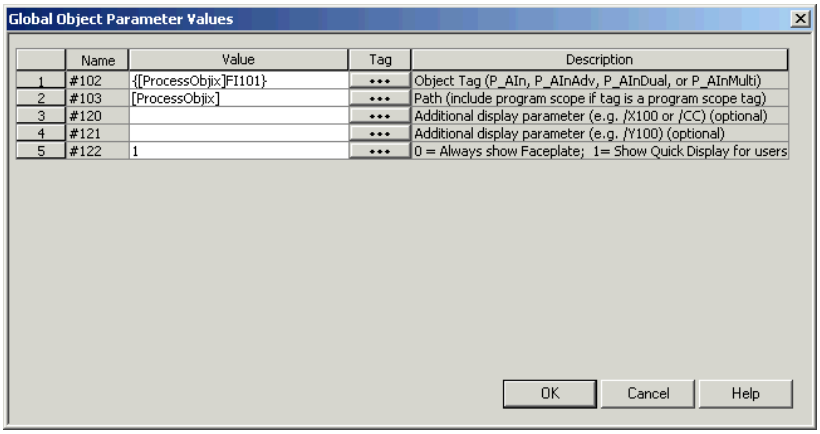
The global objects for P_AInHART can be found in the global object file (RA-BAS) P_AIn Graphics Library.ggfx. Follow these steps to use a global object.

1. Copy the global object from the global object file and paste it in the display file.



2. In the display, right-click the global object and choose Global Object Parameter Values.

The Global Object Parameter Values dialog box appears.



The global object parameters are as follows.

Table 26 - Global Object Parameters

Parameter	Required	Description
#102	Y	Object tag to point to the name of the associated object Add-On Instruction in the controller.
#103	Y	Path used for display navigation features to other objects. Include program scope if tag is a program scope tag.
#120	N	Additional parameter to pass to the display command to open the faceplate. Typically used to define position for the faceplate.
#121	N	Additional parameter to pass to the display command to open the faceplate. if defining X and Y coordinate, separate parameters so that X is defined by #120 and Y is defined by #121. This lets these same parameters to be used in subsequent display commands originating from the faceplate.
#122	Y	These are the options for the global object display: 0 = Always show faceplate 1 = Show Quick Display for users without Maintenance access (Code C) 2= Always show Quick Display

3. In the Value column, type the tag or value as specified in the Description column.

   In our example:

   #102 {[ProcessObjix]FI101}
   #103 [ProcessObjix]

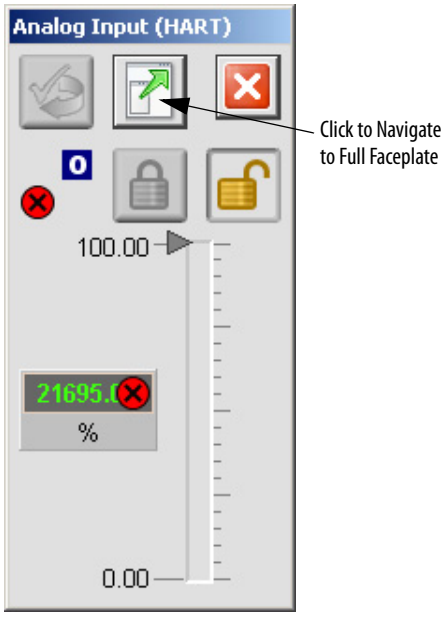
   TIP Click the ellipsis (. . .) to browse and select a tag.

   Values for items marked '(optional)' can be left blank.

4. Click OK.

Quick Display

The Quick Display screen provides means for operators to perform simple interactions with the P_AInHART instruction instance. From the Quick Display, you can navigate to the faceplate for full access for operation, maintenance, and configuration.

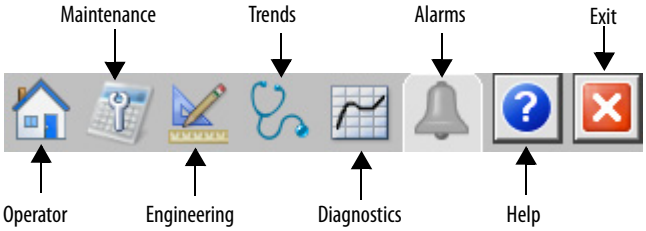


Faceplate

The P_AInHART faceplate consists of six tabs and each tab consists of one or more pages.

Each faceplate contains the value of local configuration tags Cfg_Tag and Cfg_Desc in the title bar.

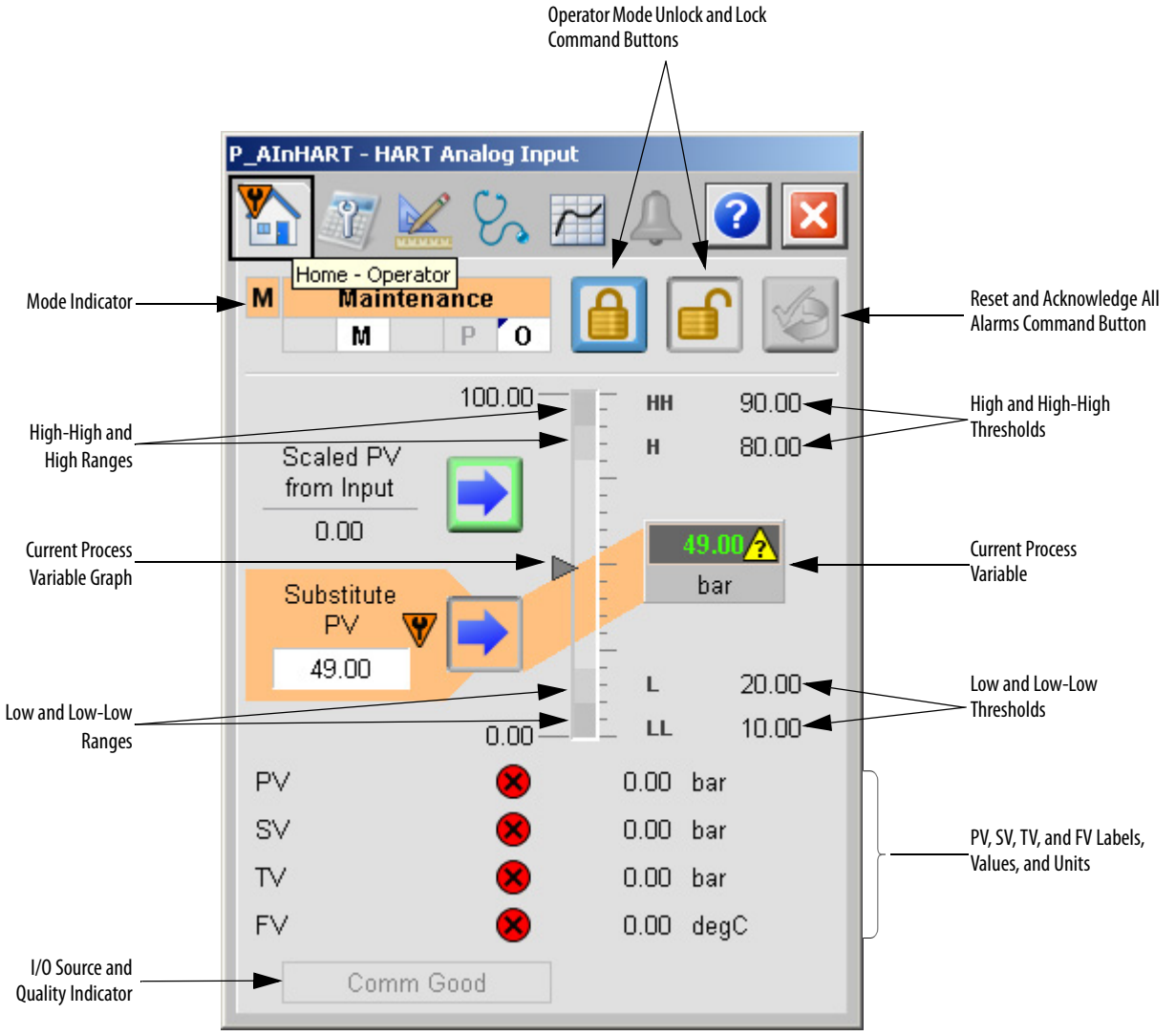
The Operator tab is displayed when the faceplate is initially opened. Click the appropriate icon at the top of the faceplate to access a specific tab.



The faceplate provides the means for operators, maintenance workers, engineers, and others to interact with the P_AInHART instruction instance, including viewing its status and values and manipulating it through its commands and settings. When a given input is restricted via FactoryTalk® View security, the required user security code letter is shown in the tables that follow.

Operator Tab

The Faceplate initially opens to the Operator ('Home') tab. From here, an operator can monitor the device status and manually operate the device when it is in Operator mode.



The Operator tab shows the following information:

- Current mode (Program, Operator, or Maintenance).
- Requested modes indicator (This appears only if the Operator or Program mode has been superseded by another mode.)
- Current Process Variable.
- Bar graph for the current Process Variable. High-High and Low-Low ranges are shown in dark gray and these ranges turn red if the threshold is exceeded. High and Low ranges are shown in medium gray, and these ranges turn yellow if the threshold is exceeded.
- Scaled High and Low Range Values (Top and Bottom labels on the bar graph). If high range or low range values are exceeded, then the appropriate icon appears next to the values to the left of the bar graph.

- High-High (HH) and Low-Low (LL) thresholds are displayed with a label background that turns red when exceeded.
- High (H) and Low (L) thresholds are displayed with a label background that turns yellow when exceeded.
- PV, SV, TV, and FV values along with a status indicator for each.
- Input Source and Quality indicator (See 'SrcQ' in the Output parameters table on page 65 for details).

The following table shows the functions included on the Operator tab.

Table 27 - Operator Tab Description

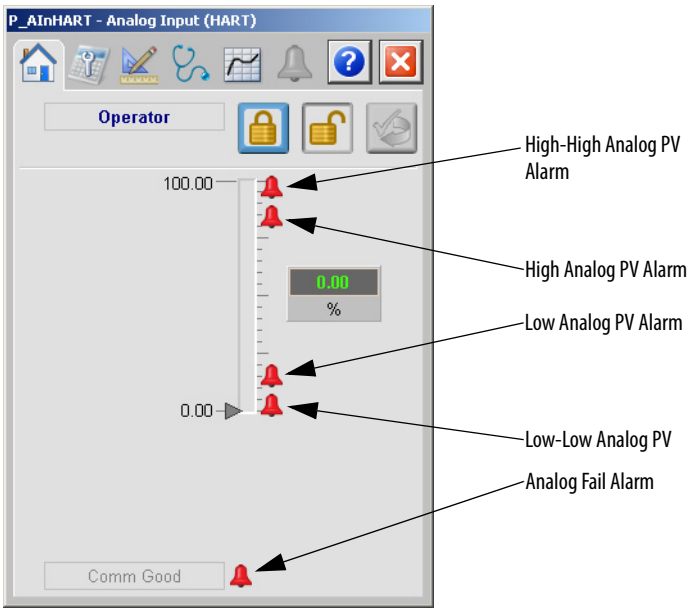
Function	Action	Security
	Click to lock in Operator mode. Function locks the mode in Operator mode, preventing the program from taking control.	Manual Device Operation (Code B)
	Click to unlock Operator mode. Function unlocks Operator mode, allowing the program to take control.	
	Click to request Program mode.	
	Click to request Operator mode.	
	Click to reset and acknowledge all alarms.	Acknowledge Alarms (Code F)
	Click to select normal input for the PV. This button is visible only in Maintenance mode, and only if Engineering has checked 'Allow selection of Substitute PV' on Engineering tab, page 2 (See Engineering Tab Page 2 on page 89).	Equipment Maintenance (Code C)
	Click to select substitute PV instead of normal input. This button is visible only in Maintenance mode, and only if Engineering has checked 'Allow selection of Substitute PV' on Engineering tab, page 2 (See Engineering Tab Page 2 on page 89).	
Substitute PV data entry	Enter the substitute PV value. This button is visible only in Maintenance mode, and only if Engineering has checked 'Allow selection of Substitute PV' on Engineering tab, page 2 (See Engineering Tab Page 2 on page 89).	
PV Used in simulation data entry (not shown on faceplate image)	Type the simulation PV value. This entry is available only when input simulation is enabled. (See Simulation on page 71 for more information.)	Normal Operation of Devices (Code A)
Simulated device PV, SV, TV, and FV	Type the values for the simulated device values. This entry is available only when input simulation is enabled. (See Simulation on page 71 for more information.)	

The following table shows the alarm status symbols used on the Operator tab.

Table 28 - Operator Tab Alarm Status

Graphic Symbol	Alarm Status
	In Alarm (Active Alarm)
	In Alarm and Acknowledged
	Out of Alarm but not Acknowledged
	Alarm Suppressed (by Program)
	Alarm Disabled (by Maintenance)
	Alarm Shelved (by Operator)

Alarm indicators appear on the Operator tab when the corresponding alarm occurs.

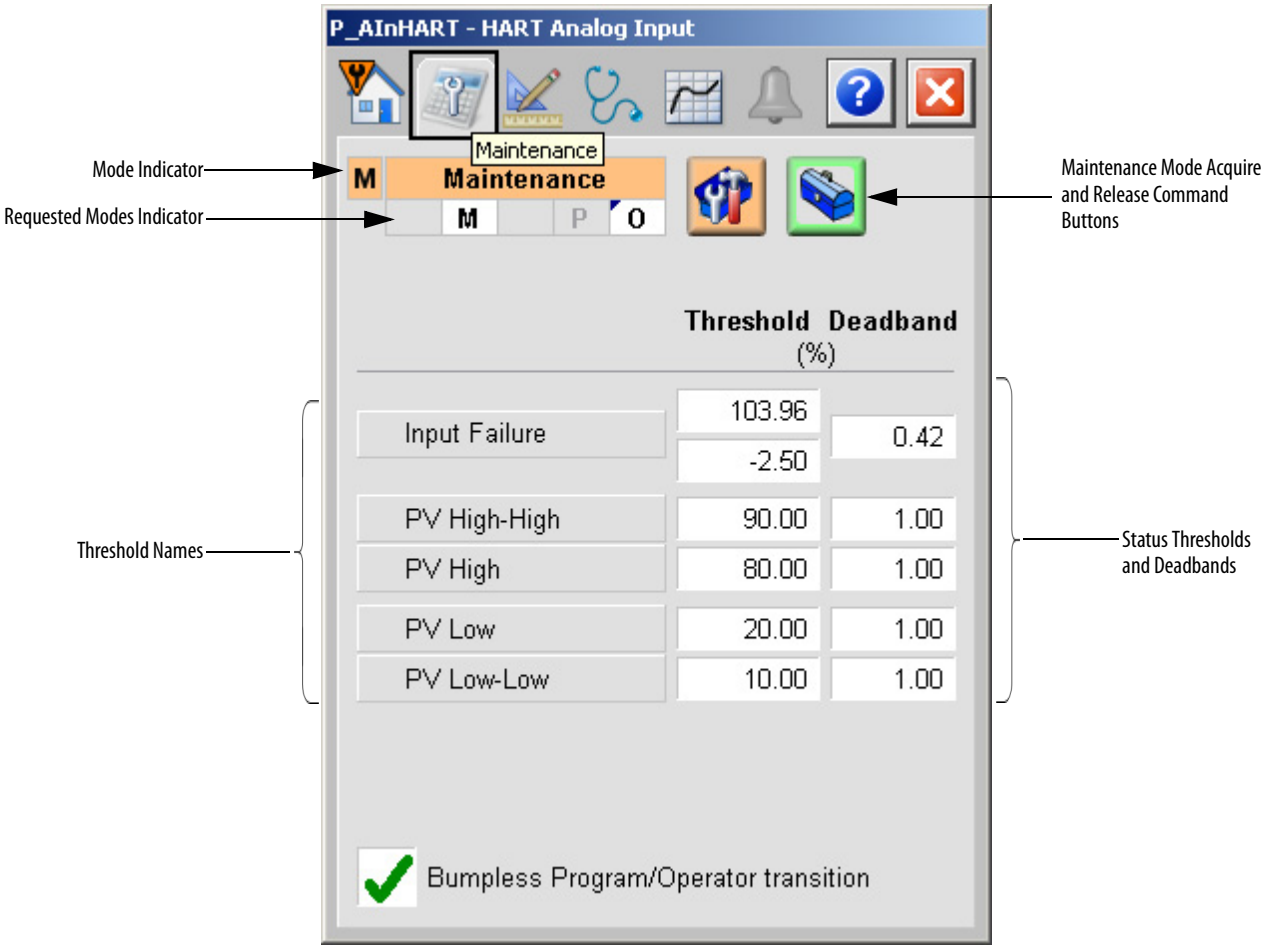


Maintenance Tab

Maintenance personnel use the information and controls on the Maintenance tab to make adjustments to device parameters. The tab also is used to troubleshoot and temporarily work around device problems, and disable the device for routine maintenance.

The Maintenance tab shows the following information:

- The current mode (Program, Operator, or Maintenance).
- Requested modes indicator highlights all of the modes that have been requested. The leftmost highlighted mode is the active mode.



IMPORTANT Click a threshold name to open the P_Gate faceplate. From the P_Gate faceplate, you can configure and perform additional operations for each alarm, including Gate Delay, Status On-delay, Status Off-delay, and Threshold Name.

The following table shows the functions on the Maintenance tab.

Table 29 - Maintenance Tab Description

Function	Action	Security	Configuration Parameters
	Click to acquire Maintenance mode.	Equipment Maintenance (Code C)	None
	Click to release Maintenance mode.		
Input Failure Threshold	Type the threshold (trip point) for analog input failure alarms.	Disable Alarms Bypass Permissives and Interlocks (Code H)	• Cfg_FailHiLim • Cfg_FailLoLim
PV High-High and High Thresholds	Type the High-High and High thresholds.		None
PV Low and Low-Low Thresholds	Type the Low and Low-Low thresholds		None
Deadband	Type the deadband (hysteresis) that applies to each alarm limit. This is used to prevent a noisy signal from generating numerous spurious alarms. Example: If the High alarm limit is 90.0 and the High alarm deadband is 5, once the signal rises above 90.0 and generates a High alarm, the signal must fall below 85.0 (90.0-5.0) for the alarm to clear.		• Cfg_HiHiDB • Cfg_HiDB • Cfg_LoDB • Cfg_LoLoDB • Cfg_FailDB
Threshold Name	Click a threshold name to open the associated P_Gate faceplate.	None	None
Bumpless Program/Operator Transition	Check so that when this parameter is the following: • On - the operator settings track the program settings when mode is Program, and program settings track the operator settings when the mode is Operator. Transition between modes is bumpless. • Off - the operator settings and program settings are not modified by this instruction and retain their values regardless of mode. When the mode is changed, the value of a limit can change, such as from the Program-set value to the Operator-set value.	Equipment Maintenance (Code C)	• Cfg_SetTrack

Refer to the Rockwell Automation Library of Process Objects: Condition Gate Delay (P_Gate) Reference Manual, publication SYSLIB-RM041, for more information.

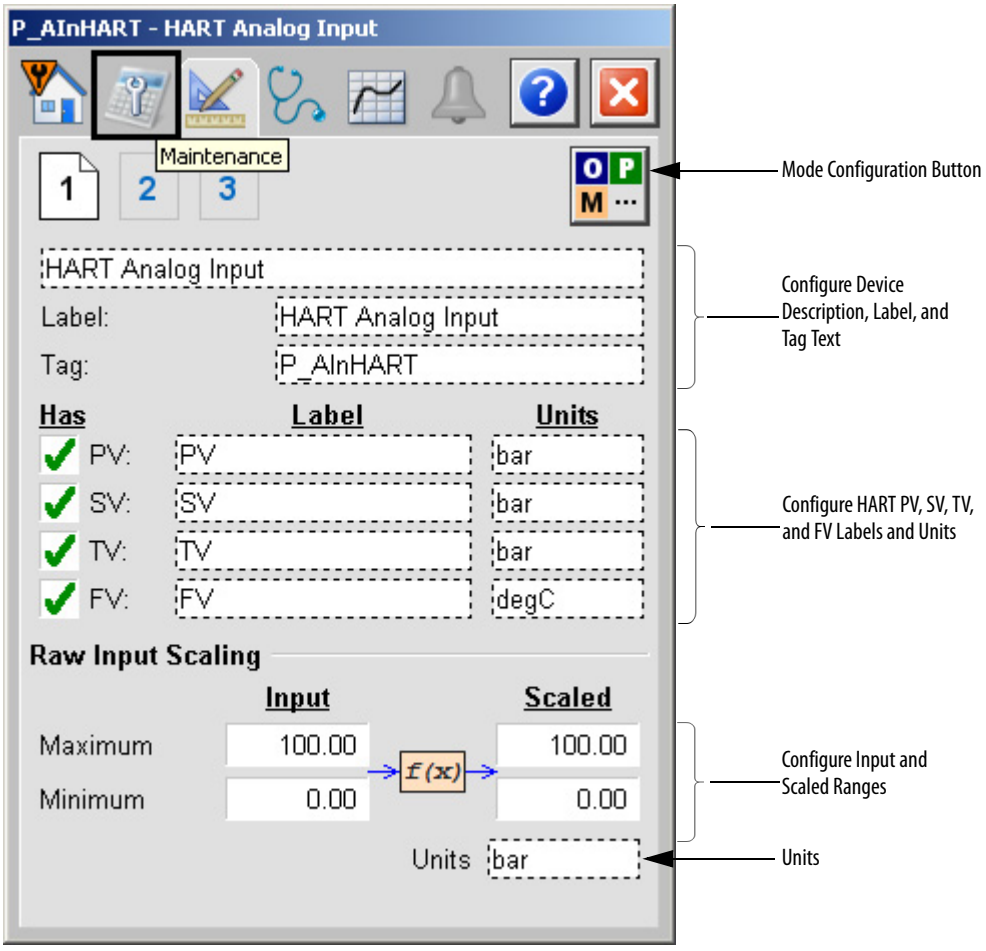
Engineering Tab

The Engineering tab provides access to device configuration parameters and ranges, options for device and I/O setup, displayed text, and faceplate-to-faceplate navigation settings, for initial system commissioning or later system changes.

The Engineering tab is divided into three pages.

Engineering Tab Page 1

On page 1 of the Engineering tab, you can configure the description, label, tag, and HART PV, SV, TV, and FV labels and units for the device.



The following table lists the functions on page 1 of the Engineering tab.

Table 30 - Engineering Tab Page 1 Description

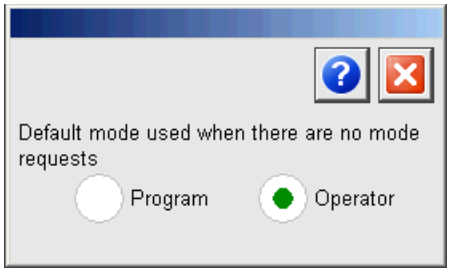
Function	Action	Security	Configuration Parameters
	Click to open the Mode Configuration display.	None	See Mode Configuration display on page 88
Description	Type the device description to show on the faceplate title bar. **IMPORTANT:** Use text configuration from HART device (on Engineering Tab Page 3 on page 91) must be clear to enable this field.	Engineering Configuration (Code E)	• Cfg_Desc
Label	Type the label to show on the graphic symbol. Type the device description to show on the faceplate title bar. **IMPORTANT:** Use text configuration from HART device (on Engineering Tab Page 3 on page 91) must be clear to enable this field.		• Cfg_Label
Tag	Type the tag name to show on the faceplate and Tooltip. **IMPORTANT:** Pausing the mouse over this field displays a tool tip with the configured Logix tag/path. Type the device description to show on the faceplate title bar. **IMPORTANT:** Use text configuration from HART device (on Engineering Tab Page 3 on page 91) must be clear to enable this field.		• Cfg_Tag
PV SV TV FV Labels	Type the labels that to show on the Operator tab.		• Cfg_PVLabel • Cfg_SVLabel • Cfg_TVLabel • Cfg_FVLabel
PV SV TV FV Units	Type the units that are used for the values. Type the device description to show on the faceplate title bar. **IMPORTANT:** Use text configuration from HART device (on Engineering Tab Page 3 on page 91) must be clear to enable this field.		• Cfg_PVEU • CFG_SVEU • Cfg_TVEU • Cfg_FVEU
Raw Input Scaling: Maximum Input Raw Input Scaling: Minimum Input	These parameters must be set to the range of the signal connected to the Inp_PV Input. The raw minimum default is 0.0 and the raw maximum default is 100.0. **Example:** If your input card provides a signal from 4.0 . . . 20.0mA, set Cfg_InpRawMin to 4.0 and Cfg_InpRawMax to 20.0. The raw minimum/maximum and engineering units minimum/maximum are used for scaling to engineering units. **IMPORTANT:** These fields are not available unless the 'Use scaling configuration parameters from HART module' option is clear. See Engineering Tab Page 2 on page 89.		• Cfg_InpRawMax • Cfg_InpRawMin

Table 30 - Engineering Tab Page 1 Description

Function	Action	Security	Configuration Parameters
Raw Input Scaling: Maximum Scaled Raw Input Scaling: Minimum Scaled (EU)	These parameters must be set to match the PV range represented by the input signal connected to Inp_PV. The PV engineering units minimum default is 0.0 and the PV engineering units maximum is 100.0. **Example:** If your input card provides a signal from 4…20 mA that represents -50…250 °C, set Cfg_PVEUMIN to -50.0 and Cfg_PVEU maximum to 250.0. The raw minimum/maximum and PV engineering units minimum/maximum are used for scaling to engineering units. **IMPORTANT:** These fields are not available unless the 'Use scaling configuration parameters from HART module' option is clear. See Engineering Tab Page 2 on page 89.	Engineering Configuration (Code E)	• Cfg_PVEUMax • Cfg_PVEUMin
Units	Type engineering units for display on the HMI. Percent (%) is the default.		• Cfg_EU

TIP The P_AInHART instruction supports reverse scaling; either the raw (Input) or engineering (Scaled) range can be reversed (maximum less than minimum).

Mode Configuration Display

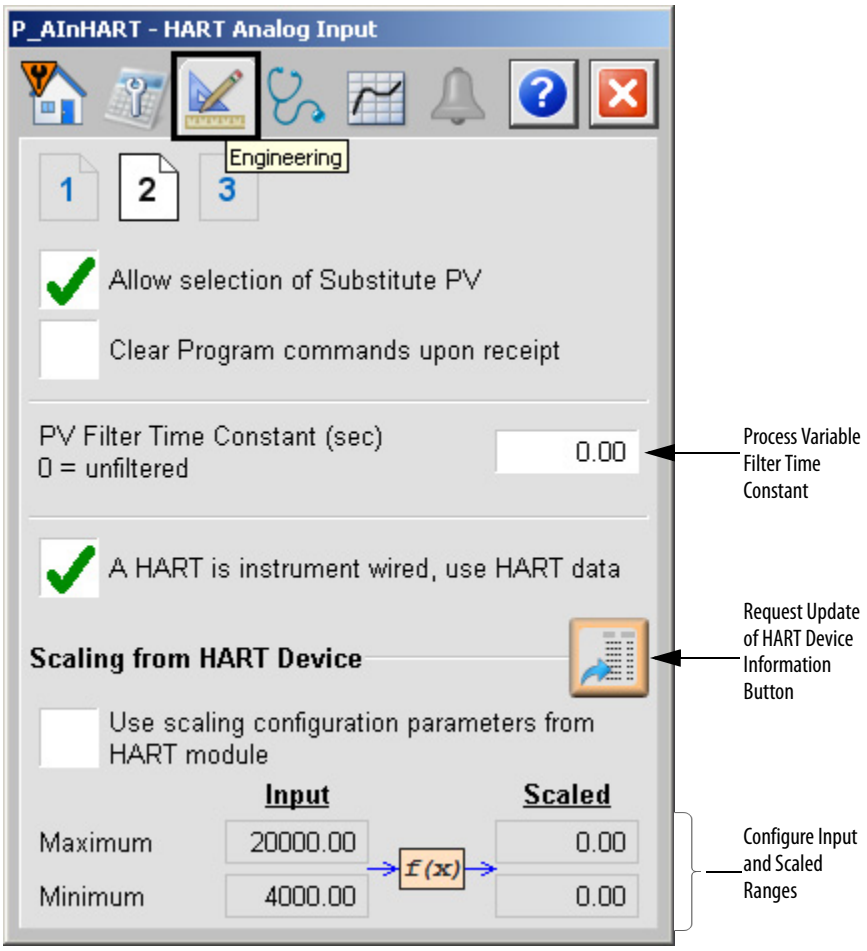


This display lets you select the default mode for the object by selecting the appropriate mode.

IMPORTANT If no mode is being requested, changing the default mode changes the mode of the instruction.

You must have FactoryTalk View security code E to select the default mode on this display.

Engineering Tab Page 2



The following table lists the functions on page 2 of the Engineering tab.

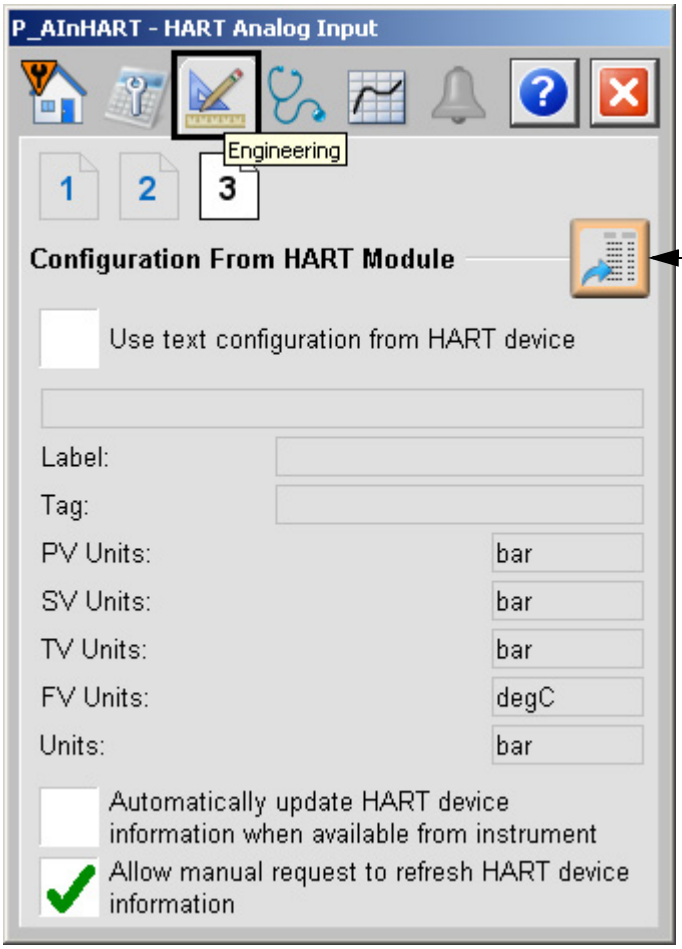
Table 31 - Engineering Tab Page 2 Description

Function	Action	Security	Configuration Parameters
	Click to get an update of HART device information.	Configuration and Tuning Maintenance (Code D)	None
Allow Selection of Substitute PV	Check to allow the Substitute analog PV Maintenance function. Clear this checkbox to disallow the Substitute PV Maintenance function (default).	Engineering Configuration (Code E)	• Cfg_NoSubstPV
Clear Program Commands on Receipt	Check to clear Program commands on receipt.		• Cfg_PCmdClear
PV Filter Time (seconds) 0 = unfiltered	Type the analog PV filter time constant. If the time constant is 0, the PV is unfiltered.		• Cfg_FiltTC

Table 31 - Engineering Tab Page 2 Description

Function	Action	Security	Configuration Parameters
A HART is instrument wired, use HART data	Check to use HART data from the connected instrument. Clear this checkbox to use local data. **IMPORTANT:** When this checkbox is checked, Engineering Tab page 3 is available.	Engineering Configuration (Code E)	• Cfg_HasHART
Use scaling configuration parameters from HART module	Checking to use HART scaling for raw and engineering units ranges. Clear this checkbox to use manually entered ranges (See Engineering Tab Page 1 on page 86).		• Cfg_UseHARTScaling
Scaling From HART Device: Maximum Input	These parameters display the maximum and minimum signal range provided by the HART analog input module.		None
Scaling From HART Device: Minimum Input			
Scaling From HART Device: Maximum Scaled	These parameters display the range (in engineering units) of the analog signal provided by the HART device.		
Scaling From HART Device: Minimum Scaled (EU)			

Engineering Tab Page 3



IMPORTANT This page is not shown unless 'A HART is instrument wired, use HART data' on Engineering page 2 is checked (See Engineering Tab Page 2 on page 89).

The following table lists the functions on page 3 of the Engineering tab.

Table 32 - Engineering Tab Page 3 Description

Function	Action	Security	Configuration Parameters
	Click to get an update of HART device information.	Configuration and Tuning Maintenance (Code D)	None
Use text configuration from HART Module	Check to use HART text for Description, label, and Tag. Uncheck to use manual input (See Engineering Tab Page 1 on page 86).	Engineering Configuration (Code E)	• Cfg_UseHARTText
Automatically update HART device information when available from instrument	Check to automatically update HART device information when available. Clear this checkbox to disable automatic updating of HART device information.		• Cfg_AutoUpdDevInfo

Table 32 - Engineering Tab Page 3 Description

Function	Action	Security	Configuration Parameters
Allow manual request to refresh HART device information	Check to allow operator to update HART device information. Clear this checkbox to prevent operator from manually updating HART device information.	Engineering Configuration (Code E)	• Cfg_ManUpdDevInfo

Diagnostics Tab

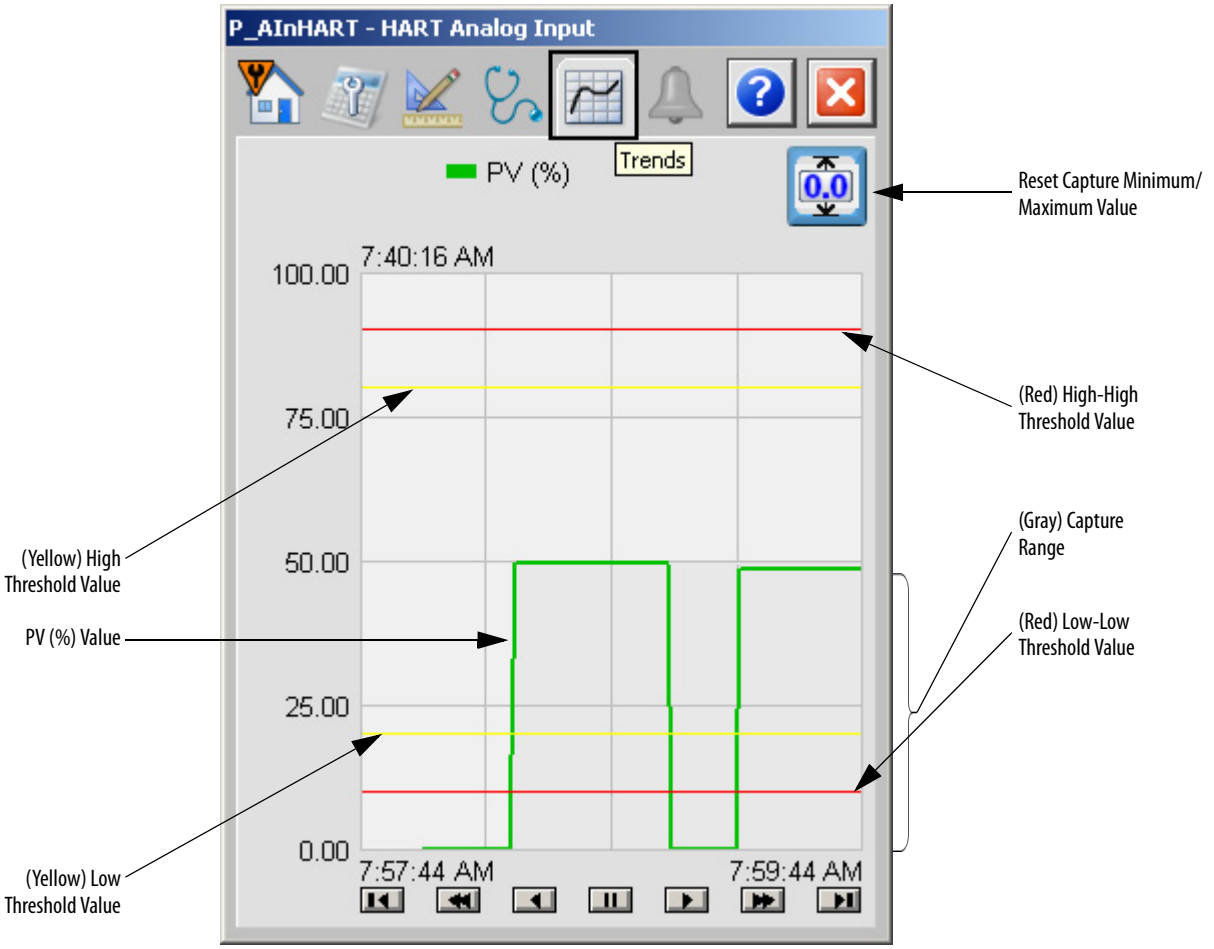
The Diagnostic tab provides indications that are helpful in diagnosing or preventing device problems, which can include device warnings and faults, warning and fault history, and predictive/preventive maintenance data.

The Diagnostics tab displays messages for up to three Code48 status bits received from the HART device.

Only the first three codes encountered are shown on the Diagnostics page. These codes differ depending on the device used.

Trends Tab

The Trends tab shows trend charts of key device data over time. These faceplate trends provide a quick view of current device performance to supplement, but not replace, dedicated historical or live trend displays.



The following table lists the functions on the Trends tab.

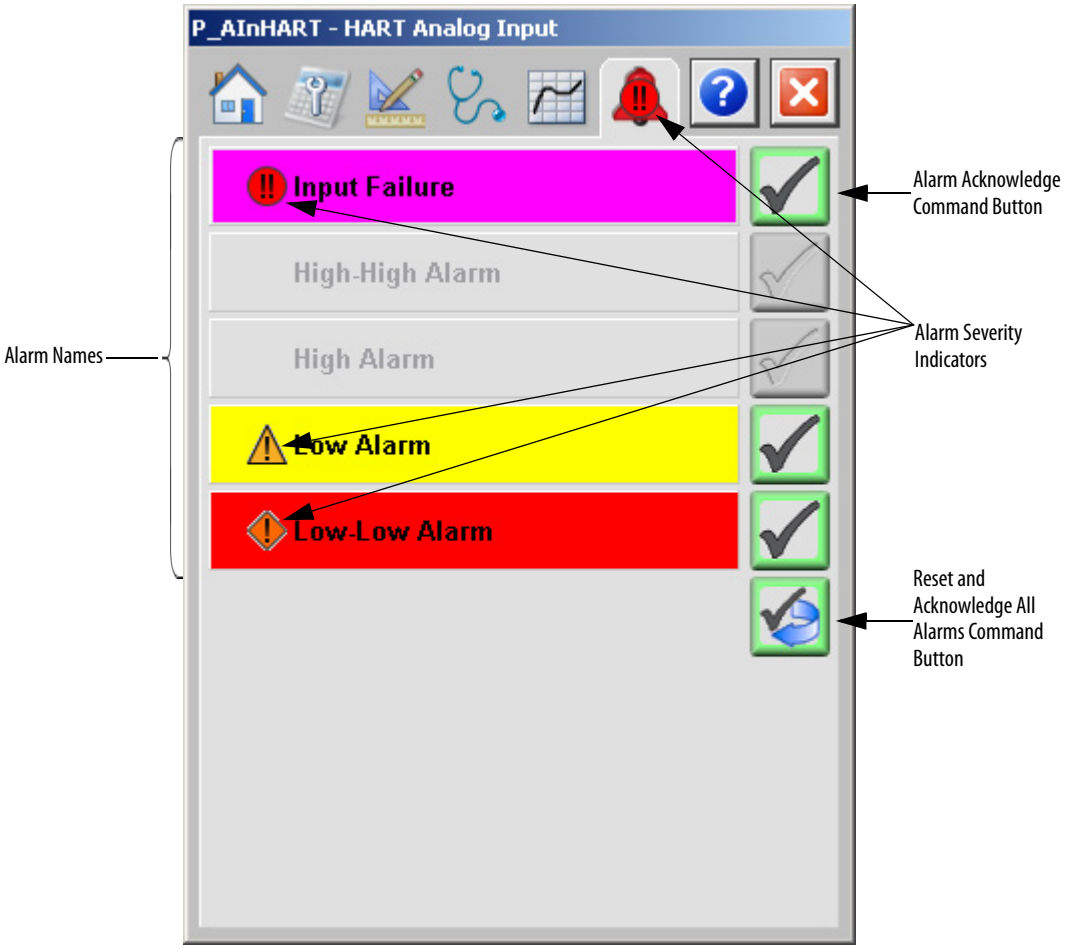
Table 33 - Trends Tab Description

Button	Action	Security Required
	Reset capture minimum/maximum values	Normal Operation of Devices (Code A)

Alarms Tab

The Alarms tab displays each configured alarm for the P_AInHART instruction. The icon on the tab for the alarms page changes color based on the current active alarms. A blinking alarm icon indicates that one or more alarms must be acknowledged or the device must be reset.

IMPORTANT	Alarms are provided for the analog value only. There are no alarms for the digital PV, SV, TV, or FV.



Click an alarm name to open the P_Alarm faceplate for that alarm. From the P_Alarm faceplate, you can configure and perform additional operations on the alarm.

If an alarm is active, the panel behind the alarm changes color to match the severity of the alarm. The color of the bell icon at the top of the faceplate shows the severity of the highest active alarm. The icon blinks if any alarm is unacknowledged or requires reset.

Table 34 - Alarm Severity Colors

Color	Definition
Magenta	Urgent
Red	High
Yellow	Medium
Blue	Low
White (bell icon)	Alarm has cleared but is unacknowledged
Background (Light Gray)	No alarm

The following table shows the functions on the Alarms tab.

Table 35 - Alarms Tab Description

Function	Action	Security
Alarm Name	Click an alarm name to open the associated P_Alarm faceplate.	None
	Click to acknowledge the alarm.	Acknowledge Alarms (Code F)
	Click to reset and acknowledge all alarms.	

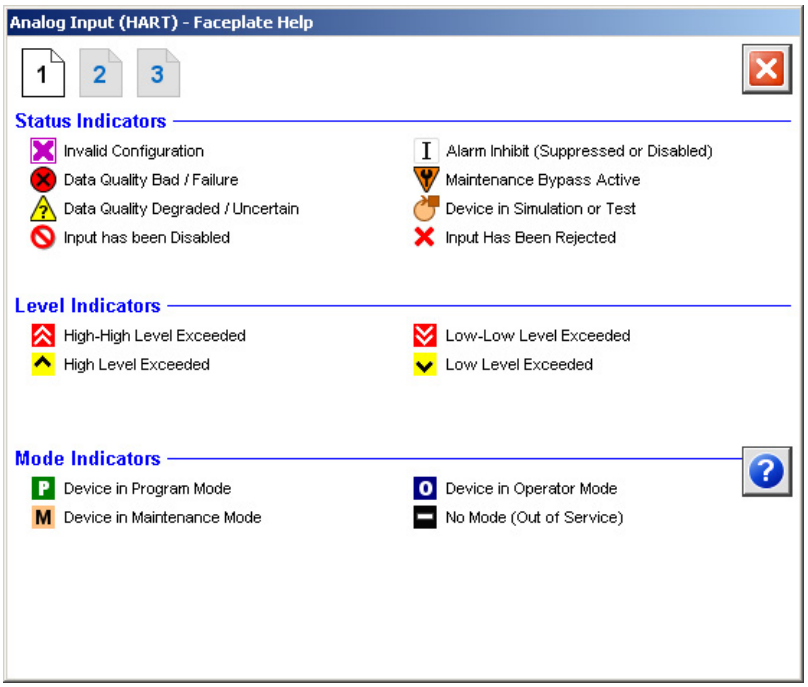
When the Reset and Acknowledge All Alarms button is enabled, the panel behind the alarm blinks, indicating the alarm requires acknowledgement or reset. The Alarm Acknowledge button is enabled if the alarm requires acknowledgment. Click the button with the check mark to acknowledge the alarm.

See Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

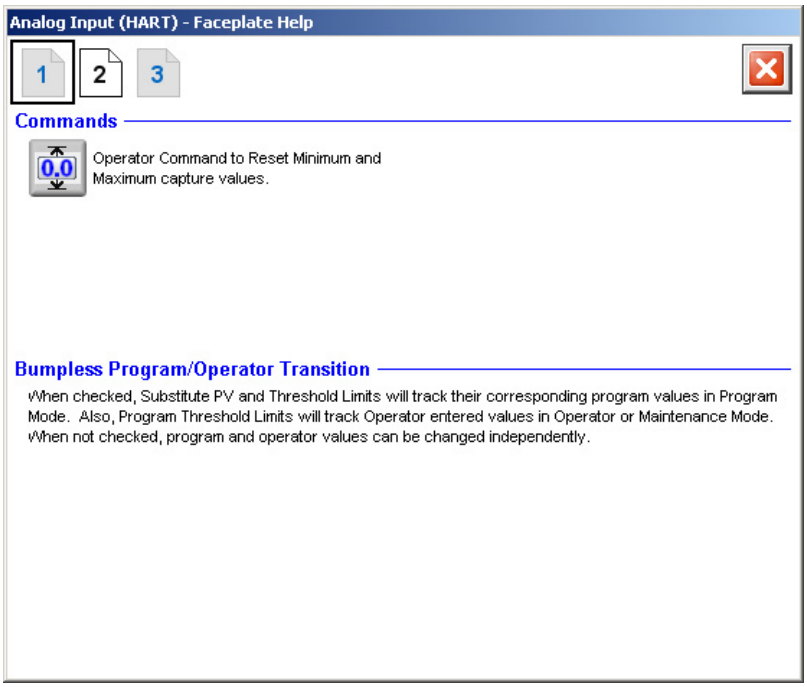
HART Analog Input Faceplate Help

The Faceplate Help is divided into three pages.

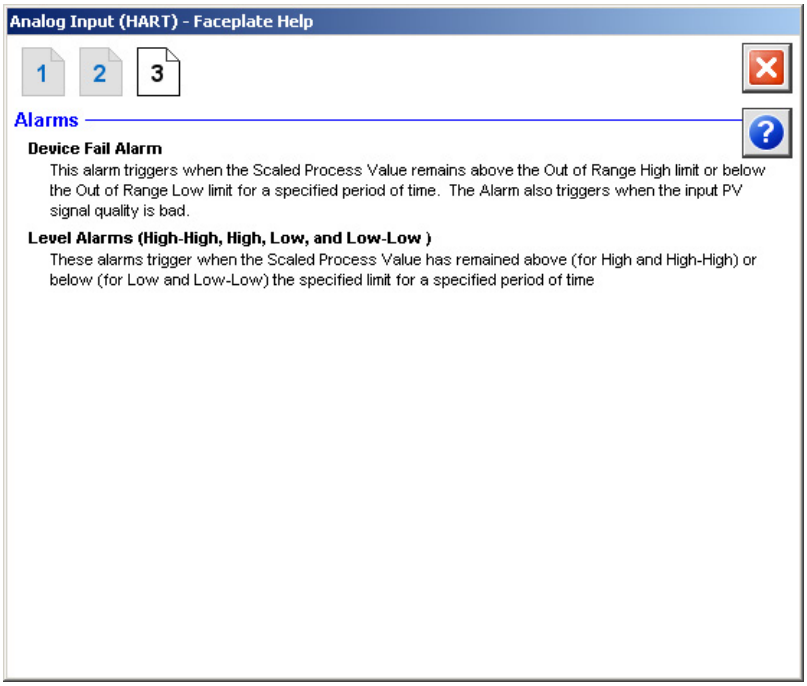
Faceplate Help Page 1



Faceplate Help Page 2



Faceplate Help Page 3



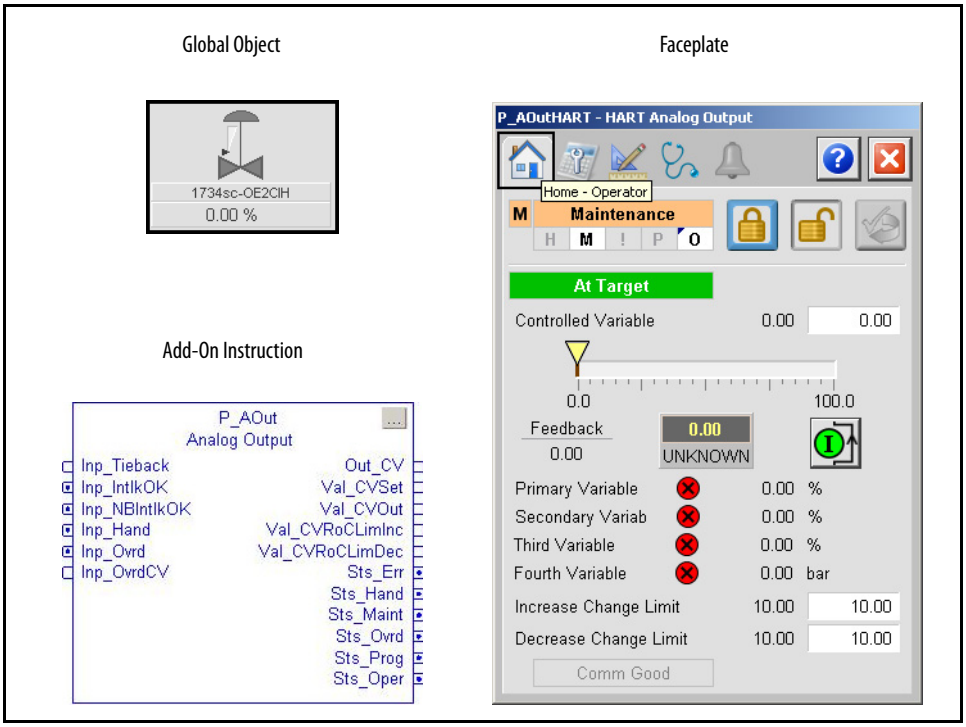
Notes:

HART Analog Output (P_AOutHART)

The following table lists the topics in this chapter.

The P_AOutHART (HART Analog Output) Add-On Instruction is used to manipulate an analog output to control a field device, such as a control valve or a motorized gate positioner. The output responds to an Operator (manual) or Program setting of the Controlled Variable (CV) signal.

The P_AOutHART instruction controls the analog output in various modes (Operator, Program, Override, Maintenance, Hand), monitoring for fault conditions. The global object and faceplate shown in the following image are examples of the graphical interface tools for this Add-On Instruction.



Controller Code

This section describes the parameter references for this Add-On Instruction.

InOut Structure for HART Analog Input

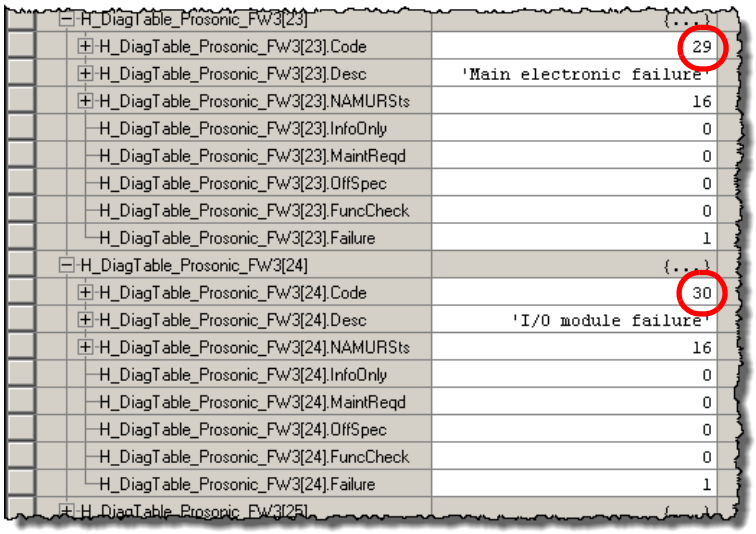
InOut parameters are used to link the Add-On Instruction to external tags that contain necessary data for the instruction to operate. These external tags must be of the data type shown.

Table 36 - P_AOutHART InOut Parameters

InOut Parameters	Data Type	Description
Ref_ChanData	HART_ChanData	Channel Data from HART AO Channel
Ref_DiagTable	P_DiagTable[1]	Lookup table for Diagnostic Code to text

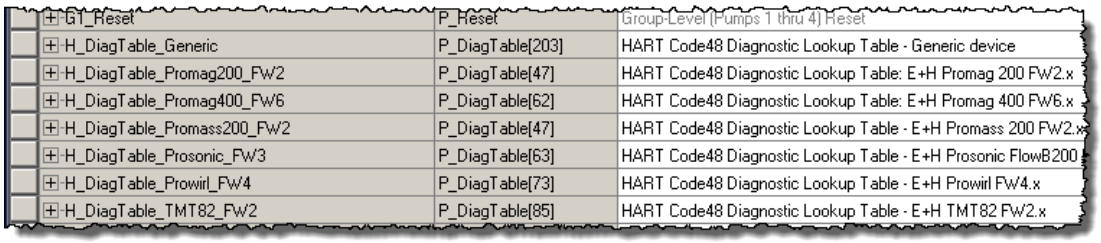
The diagnostic lookup table (Ref_DiagTable) is a tag that contains a list (array) of entries with diagnostic codes, the corresponding description, and a 'NAMUR status'.

The following image shows diagnostic codes 29 and 30 from the E+H Prosonic lookup table.



The code corresponds to a bit offset in the HART Code48 response from the device. Byte 0 bit 0 of the Code48 response is code '0'. Byte 0 bit 1 is code '1'. Byte 10 bit 0 is code '80' (8 bits per byte). The highest code number is 199, which is byte 24 bit 7.

There are several Diagnostic Lookup tables that are provided in the Premier Integration Samples ACD file. A 'generic' HART diagnostic table and several tables for Endress+Hauser HART instruments.



G1_Reset	P_Reset	Group-Level (Pumps 1 thru 4) Reset
H_DiagTable_Generic	P_DiagTable[203]	HART Code48 Diagnostic Lookup Table - Generic device
H_DiagTable_Promag200_FW2	P_DiagTable[47]	HART Code48 Diagnostic Lookup Table: E+H Promag 200 FW2.x
H_DiagTable_Promag400_FW6	P_DiagTable[62]	HART Code48 Diagnostic Lookup Table: E+H Promag 400 FW6.x
H_DiagTable_Promass200_FW2	P_DiagTable[47]	HART Code48 Diagnostic Lookup Table - E+H Promass 200 FW2.x
H_DiagTable_Prosonic_FW3	P_DiagTable[63]	HART Code48 Diagnostic Lookup Table - E+H Prosonic FlowB200
H_DiagTable_Prowirl_FW4	P_DiagTable[73]	HART Code48 Diagnostic Lookup Table - E+H Prowirl FW4.x
H_DiagTable_TMT82_FW2	P_DiagTable[85]	HART Code48 Diagnostic Lookup Table - E+H TMT82 FW2.x

Input Structure for HART Analog Output

Input parameters include the following:

- Input data elements (Inp_) are typically used to connect field inputs from I/O modules or signals from other objects.
- Configuration data elements (Cfg_) are used to set configurable capabilities and features of the instruction.
- Commands (PCmd_, OCmd_, MCmd_) are used by program logic, operators, and maintenance personnel to request instruction actions.
- Settings (PSet_, OSet_, MSet_) are used by program logic, operators, and maintenance personnel to establish runtime setpoints, thresholds, and so forth. A setting (without a leading P, O, or M) establishes runtime settings regardless of role or mode.

Table 37 - P_AOutHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
EnableIn	BOOL		1	Enable Input - System Defined Parameter
Inp_IntlkOK	BOOL		1	1 = Interlocks OK, Analog Output can be set
Inp_NBIntlkOK	BOOL		1	1 = Non-bypassable interlocks OK, analog output can be set if bypassable interlocks are bypassed.
Inp_IOFault	BOOL		0	Input Communication Status: 0 = OK 1 = Fail
Inp_Sim	BOOL		0	Simulation input. When set to 0, the instruction operates normally. When set to 1, the instruction acts as normal but the output is held to at zero.
Inp_Hand	BOOL	Mode.Inp_Hand	0	1 = Acquire Hand (typically hardwired local) Mode 0 = Release Hand Mode
Inp_Ovrd	BOOL	Mode.Inp_Ovrd	0	1 = Acquire Override (higher priority program logic) Mode 0 = Release Override Mode
Inp_OvrdCV	REAL		0.0	CV target in Override Mode
Inp_Reset	BOOL		0	1 = Reset latched Alarms
Cfg_ShedHold	BOOL		0	1 = Hold Output on Interlock 0 = Go to Cfg_IntlkCV
Cfg_SkipRoCLim	BOOL		0	1 = Skip rate of change limiting in Interlock, Maintenance, and Override modes

Table 37 - P_AOutHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_SetTrack	BOOL		1	This parameter is used to configure bumpless behavior of setting parameters when switching modes. When this parameter is 1 and the instruction is in Program mode, the operator settings track the program settings. When this parameter is 1 and the instruction in Operator mode the program settings track the operator settings; and the simulation inputs match the output values (transitions are bumpless). When this parameter is 0, the operator settings and program settings are not modified by this instruction. In this case, when the mode is changed, the effective value of the setting can change depending on the program-set and operator-set values.
Cfg_SetTrackOvrdHand	BOOL		0	1 = Program/Operator settings track Override/Hand CV
Cfg_HasHART	BOOL		1	1 = HART instrument 0 = non-HART (4…20 mA only) instrument
Cfg_HasPV	BOOL		1	1 = Digital variable is configured and displayed: PV (primary variable) SV (secondary variable) TV (third variable) FV (fourth variable)
Cfg_HasSV				
Cfg_HasTV				
Cfg_HasFV				
Cfg_UseHARTText	BOOL		0	1 = Use HART text for Description, Label, Tag, Engineering Units 0 = Manually entered
Cfg_UseHARTScaling	BOOL		0	1 = Use HART scaling for raw, engineering units ranges 0 = Manually entered ranges
Cfg_AutoUpdDevInfo	BOOL		1	1 = Automatically update device information 0 = No auto update
Cfg_ManUpdDevInfo	BOOL		0	1 = Allow manual device information update request 0 = disallow
Cfg_HasIntlkObj	BOOL		0	1 = Tells the HMI that an interlock object is connected to Inp_Intlk. **IMPORTANT:** The name of the Interlock object in the controller must be this object name with the suffix '_Intlk'. For example, if your P_AOutHART object has the name 'AOut123', then its Interlock object must be named 'AOut123_Intlk'.
Cfg_HasCVNav	BOOL		0	1 = Tells HMI to enable navigation to a connected CV object by using the tag name in Cfg_CVNavTag
Cfg_PCmdClear	BOOL	Mode.Cfg_PCmdClear	1	When this parameter is 1, program commands are cleared once they are acted upon. When set to 0, program commands remain set until cleared by the application program logic. **IMPORTANT:** Clearing this parameter online can cause unintended program command execution.
Cfg_ProgDefault	BOOL	Mode.Cfg_ProgDefault	0	This parameter defines the Default mode. When this parameter is 1, the mode defaults to Program if no mode is being requested. When this parameter is 0, the mode defaults to Operator if no mode is being requested. **IMPORTANT:** Changing this parameter online can cause unintended mode changes.
Cfg_OvrdIntlk	BOOL		0	1 = Override ignores Bypassable Interlock 0 = always use Interlock
Cfg_ShedOnIOFault	BOOL		1	1 = Hold output or set output to interlock CV and Alarm on I/O Fault (see Cfg_ShedHold on page 101) 0 = Alarm only on I/O Fault
Cfg_HasIntlkTripAlm	BOOL	IntlkTrip.Cfg_Exists	0	1 = Interlock Trip alarm or I/O fault alarm exists and is checked
Cfg_HasIOFaultAlm		IOFault.Cfg_Exists		
Cfg_IntlkTripResetReqd	BOOL	IntlkTrip.Cfg_ResetReqd	0	1 = A reset is required to clear Interlock Trip alarm or I/O Fault Alarm
Cfg_IOFaultResetReqd		IOFault.Cfg_ResetReqd		

Table 37 - P_AOutHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_IntlkTripAckReqd	BOOL	IntlkTrip.Cfg_AckReqd	1	1 = An acknowledge is required for Interlock Trip Alarm or I/O Fault Alarm
Cfg_IOFaultAckReqd		IOFault.Cfg_AckReqd		
Cfg_IntlkTripSeverity	INT	IntlkTrip.Cfg_Severity	500	These parameters determine the severity of each alarm. This severity drives the color and symbol that are used to indicate alarm status on the faceplate and global object. The following are valid values: 1…250 = Low 251…500 = Medium 501…750 = High 751…1000 = Urgent **IMPORTANT:** For FactoryTalk® View software version 7.0, these severity parameters drive only the indication on the global object and faceplate. The Alarms and Events definition of severity drives the color and symbol that is used on the alarm banner and alarm summary and the value returned by FactoryTalk Alarms and Events display commands.
Cfg_IOFaultSeverity		IOFault.Cfg_Severity	1000	
Cfg_MinCV	REAL		0.0	Minimum CV (in engineering units, for limiting)
Cfg_MaxCV	REAL		100.0	Maximum CV (in engineering units, for limiting)
Cfg_MaxCVRoClnc	REAL		10.0	Maximum allowed CV Rate of Change (Increasing) or maximum allowed CV Rate of Change (Decreasing) setting (engineering units/sec)
Cfg_MaxCVRoCDec				
Cfg_IntlkCV	REAL		0.0	CV Target when interlocked (if not Cfg_ShedHold)
Cfg_CVEUMin	REAL		0.0	CV Minimum in Engineering Units (for scaling)
Cfg_CVEUMax	REAL		100.0	CV Maximum in Engineering Units (for scaling)
Cfg_CVRawMin	REAL		0.0	CV Minimum in I/O (raw) Units (for scaling)
Cfg_CVRawMax	REAL		100.0	CV Maximum in I/O (raw) Units (for scaling)
Cfg_MaxInactiveCV	REAL		0.0	When Val_CVOut is greater than this value (in CV engineering units) set Sts_Active (for HMI)
PSet_CV	REAL		0.0	Program Setting of Controlled Variable (output) (in engineering units)
PSet_CVRoCLimInc	REAL		0.0	Program setting of CV Rate of Change limit, increasing or decreasing (in engineering units/second)
PSet_CVRoCLimDec				
PSet_Owner	DINT		0	Program Owner Request ID (nonzero) or Release (zero)
OSet_CV	REAL		0.0	Operator Setting of Controlled Variable (output) (in engineering units)
OSet_CVRoCLimInc	REAL		0.0	Operator setting of CV Rate of Change limit, increasing or decreasing (in engineering units/second)
OSet_CVRoCLimDec				
Set_SimHARTPV	REAL		0.0	Setting value of Variable in Simulation (Inp_Sim = 1) PV (PVEU) SV (SVEU) TV (TVEU) FV (FVEU)
Set_SimHARTSV				
Set_SimHARTTV				
Set_SimHARTFV				
PCmd_Acq	BOOL	Mode.PCmd_Acq	0	When Cfg_PCmdClear is 1: • Set PCmd_Acq to 1 to Acquire • Set PCmd_Rel to 1 to Release • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_Acq to 1 to Acquire • Set PCmd_Acq to 0 to Release • PCmd_Rel is not used • These parameters do not reset automatically
PCmd_Rel		Mode.PCmd_Rel		

Table 37 - P_AOutHART Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
PCmd_Lock	BOOL	Mode.PCmd_Lock	0	When Cfg_PCmdClear is 1: • Set PCmd_Lock to 1 to Lock • Set PCmd_Unlock to 1 to Unlock • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_Lock to 1 to Lock • Set PCmd_Lock to 0 to Unlock • PCmd_Unlock is not used • These parameters do not reset automatically
PCmd_Unlock		Mode.PCmd_Unlock		
PCmd_Reset	BOOL		0	• Set PCmd_Reset to 1 to reset all alarms requiring reset • This parameter is always reset automatically
PCmd_IntlkTripAck	BOOL	IntlkTrip.PCmd_Ack	0	• Set PCmd_<Alarm>Ack to 1 to Acknowledge alarm • The parameter is reset automatically
PCmd_IOFaultAck		IOFault.PCmd_Ack		
PCmd_IntlkTripSuppress	BOOL	IntlkTrip.PCmd_Suppress	0	When Cfg_PCmdClear is 1: • Set PCmd_<Alarm>Suppress to 1 to suppress alarm • Set PCmd_<Alarm>Unsuppress to 1 to unsuppress alarm • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_<Alarm>Suppress to 1 to suppress alarm • Set PCmd_<Alarm>Suppress to 0 to unsuppress alarm • PCmd_<Alarm>Unsuppress is not used • These Parameters do not reset automatically
PCmd_IOFaultSuppress		IOFault.PCmd_Suppress		
PCmd_IntlkTripUnsuppress		IntlkTrip.PCmd_Unsuppress		
PCmd_IOFaultUnsuppress		IOFault.PCmd_Unsuppress		
PCmd_IntlkTripUnshelve	BOOL	IntlkTrip.PCmd_Unshelve	0	• Set PCmd_<Alarm>Unshelve to 1 to Unshelve alarm • The parameter is reset automatically
PCmd_IOFaultUnshelve		IOFault.PCmd_Unshelve		
MCmd_UpdDevInfo	BOOL		0	Maintenance Command to request update of device info
OCmd_Bypass	BOOL		0	Operator Command to Bypass all Bypassable Interlocks
OCmd_Check	BOOL		0	Operator Command to Check (not bypass) all Interlocks
MCmd_Disable	BOOL		0	Maintenance Command to Disable Analog Output
MCmd_Enable	BOOL		0	Maintenance Command to Enable Analog Output
MCmd_Acq	BOOL	Mode.MCmd_Acq	0	Maintenance Command to Acquire Ownership (Operator/Program/Override to Maintenance)
MCmd_Rel	BOOL	Mode.MCmd_Rel	0	Maintenance Command to Release Ownership (Maintenance to Operator/Program/Override)
OCmd_AcqLock	BOOL	Mode.OCmd_AcqLock	0	Operator Command to Acquire (Program to Operator) /Lock Ownership
OCmd_Unlock	BOOL	Mode.OCmd_UnlockRel	0	Operator Command to Unlock / Release (Operator to Program) Ownership
OCmd_Reset	BOOL		0	Operator Command to Reset all Alarms requiring Reset
OCmd_ResetAckAll	BOOL		0	Operator Command to Reset all Alarms and latched Shed conditions

Output Structure for HART Analog Output

Output parameters include the following:

- Output data elements (Out_) are the primary outputs of the instruction, typically used by hardware output modules; however, they are used by other application logic.
- Value data elements (Val_) are numeric outputs of the instruction for use by the HMI. Values are also used by other application logic or software packages.
- Source and Quality data elements (SrcQ_) are outputs of the instruction that is used by the HMI to indicate PV source and quality.
- Status data elements (Sts_) are bit outputs of the instruction for use by the HMI. Status bits are also used by other application logic.
- Error data elements (Err_) are outputs of the instruction that indicate a particular configuration error. If any Err_ bit is set, then the Sts_Err configuration error summary status is set and the Invalid Configuration indicator is displayed on the HMI.
- Not Ready data elements (Nrdy_) are bit outputs of the instruction for use by the HMI for displaying the Device Not Ready indicator. These bits are also by other application logic.
- Alarm data elements (Alm_) are outputs of the instruction that indicate a particular alarm has occurred.
- Acknowledge data elements (Ack_) are outputs of the instruction that indicate the corresponding alarm has been acknowledged.
- Ready data elements (Rdy_) are bit outputs of the instruction used by the HMI to enable or disable Command buttons and Setting entry fields.

Table 38 - P_AOutHART Output Parameters

Output Parameter	Data Type	Alias For	Description
EnableOut	BOOL		Enable Output - System Defined Parameter
Out_CV	REAL		CV Output in Raw (I/O Card) Units
Val_CVSet	REAL		Value of selected CV Setting (before rate limiting, in engineering units)
Val_CVOut	REAL		Value of CV Output (after rate limiting) (in engineering units)
Val_CVFdbk	REAL		Value of CV read back from analog output channel **IMPORTANT:** This variable is an echo of the CV provided by the I/O card and does NOT represent an actual position of any actuator device. The actual position can be configured as one of the HART variables: PV, SV, TV or FV, and depends on what data the device is configured to send in those variables.
Val_CVRoCLimInc	REAL		Value of CV Rate of Change Limit, Increasing (in engineering units/second)
Val_CVRoCLimDec	REAL		Value of CV Rate of Change Limit, Decreasing (in engineering units/second)
Val_CVEUMin	REAL		Minimum of scaled range = minimum (Cfg_CVEUMin, Cfg_CVEUMax)
Val_CVEUMax	REAL		Maximum of scaled range = maximum (Cfg_CVEUMin, Cfg_CVEUMax)
Val_PV val_SV Val_TV Val_FV	REAL		Value of HART variable: • Primary Variable (PV) • Secondary Variable (SV) • Third Variable (TV) • Fourth Variable (FV)

Table 38 - P_AOutHART Output Parameters

Output Parameter	Data Type	Alias For	Description
Val_DiagCode1	DINT		HART Diagnostic Code (0…199, -1 = no diagnostics): #1 #2 #3
Val_DiagCode2			
Val_DiagCode3			
Val_NAMURSts1	DINT		NAMUR NE107 Status for HART Diagnostic Code: 0 = OK 1 = Information 2 = Maintenance required 4 = Off specification (uncertain) 8 = Function check (substitution) 16 = Failure
Val_NAMURSts2			
Val_NAMURSts3			
SrcQ_IO	SINT		Source and Quality of primary I/O (enumeration)
SrcQ			Final analog source and quality: GOOD 0 = I/O live and confirmed good quality 1 = I/O live and assumed good quality 2 = No feedback configured, assumed good quality TEST 8 = Device simulated 9 = Device loopback simulation 10 = Manually entered value UNCERTAIN 16 = Live input, off-specification 17 = Value substituted at device/bus 18 = Value substituted by maintenance (Has and not Use) 19 = Shed, using last good value 20 = Shed, using replacement value BAD 32 = Signal failure (out-of-range, NaN, invalid combination) 33 = I/O channel fault 34 = I/O module fault 35 = Bad I/O configuration (for example, scaling parameters)
SrcQ_PV	SINT		Source and Quality of HART value: PV SV TV FV
SrcQ_SV			
SrcQ_TV			
SrcQ_FV			
Val_Sts	SINT		0 = At target 1 = Ramp down 2 = Ramp up 3 = Clamp minimum 4 = Clamp maximum 33 = Disabled
Val_Fault	SINT		Device fault status: 0 = None 32 = I/O fault 34 = Configuration error

Table 38 - P_AOutHART Output Parameters

Output Parameter	Data Type	Alias For	Description
Val_Mode	SINT	Mode.Val	The current mode is shown with status bits and also as an enumeration 'Val-Mode' as follows: 0 = No mode 1 = Hand 2 = Maintenance 3 = Override 4 = Program (locked) 5 = Operator (locked) 6 = Program (unlocked, Operator is default) 7 = Operator (unlocked, Program is default) 8 = Program (unlocked, Program is default) 9 = Operator (unlocked, Operator is default)
Val_Owner	DINT		Current Object Owner ID (0 = not owned)
Val_Notify	SINT		Current alarm level and acknowledgement (enumeration): 0 = No alarm 1 = Alarm cleared: a reset or acknowledge is required 2 = Low (acknowledged) 3 = Low (unacknowledged) 4 = Medium (acknowledged) 5 = Medium (unacknowledged) 6 = High (acknowledged) 7 = High (unacknowledged) 8 = Urgent (acknowledged) 9 = Urgent (unacknowledged)
Sts_Ramping	BOOL		1 = CV is ramping to target
Sts_Clamped	BOOL		1 = CV Set is clamped at CVMin or CVMax
Sts_SkipRoCLim	BOOL		1 = Rate of Change Limiting was skipped in this scan (Maintenance, Override, Interlock, or Hand)
Sts_Active	BOOL		1 = CV is greater than Cfg_MaxInactiveCV, show graphic symbol as 'active'
Sts_Available	BOOL		1 = Analog Output available for control by automation (Program)
Sts_Bypass	BOOL		1 = Bypassable Interlocks are Bypassed
Sts_BypActive	BOOL		1 = Bypassing Active (Bypassed or Maintenance)
Sts_Disabled	BOOL		1 = Output is Disabled
Sts_NotRdy	BOOL		1 = Device Not Ready, see detail bits for reason
Nrdy_Disabled	BOOL		1 = Device Not Ready: • Device disabled by Maintenance • Configuration Error • Interlock Not OK • I/O Fault (Shed Requires Reset) • Device Logic Disabled/NO Mode
Nrdy_CfgErr			
Nrdy_Intlk			
Nrdy_IOFault			
Nrdy_NoMode			
Sts_MaintByp	BOOL		1 = Device has a Maintenance Bypass function active
Sts_AlmInh	BOOL		1 = One or more Alarms Shelved, Disabled, or Suppressed
Sts_Err	BOOL		1 = Error in configuration: see detail bits for reason
Err_Limit	BOOL		1 = Error in configuration: • CV limits swapped. • Scaled CV engineering units minimum = maximum • Raw output scaling minimum = maximum • Alarm minimum on time or severity
Err_EU			
Err_Raw			
Err_Alarm			
Sts_Hand	BOOL	Mode.Sts_Hand	1 = Mode is Hand (supersedes Maintenance, Override, Program, and Operator)

Table 38 - P_AOutHART Output Parameters

Output Parameter	Data Type	Alias For	Description
Sts_Maint	BOOL	Mode.Sts_Maint	1 = Mode is Maintenance (supersedes Override, Program, and Operator)
Sts_Ovrd	BOOL	Mode.Sts_Ovrd	1 = Mode is Override (supersedes Program and Operator)
Sts_Prog	BOOL	Mode.Sts_Prog	1 = Mode is Program
Sts_Oper	BOOL	Mode.Sts_Oper	1 = Mode is Operator
Sts_ProgOperLock	BOOL	Mode.Sts_ProgOperLock	1 = Program or Operator has requested Mode Lock
Sts_NoMode	BOOL	Mode.Sts_NoMode	1 = Mode is No Mode (no owner, disabled or not scanned)
Sts_MAcqRcvd	BOOL	Mode.Sts_MAcqRcvd	1 = Maintenance Acquire command received this scan
Sts_IntlkTrip	BOOL	IntlkTrip.Inp	1 = Status: CV held or forced by interlock NOT OK (1-shot)
Sts_IOFault		IOFault.Inp	1 = I/O Fault Status (0 = OK, 1 = Bad)
Alm_IntlkTrip	BOOL	IntlkTrip.Alm	1 = Alarm: CV held or forced by interlock Not OK or I/O Fault alarm
Alm_IOFault		IOFault.Alm	
Ack_IntlkTrip	BOOL	IntlkTrip.Ack	1 = Interlock Trip or I/O Fault alarm has been acknowledged
Ack_IOFault		IOFault.Ack	
Sts_IntlkTripDisabled	BOOL	IntlkTrip.Disabled	1 = Interlock Trip or I/O Fault alarm has been Disabled by Maintenance
Sts_IOFaultDisabled		IOFault.Disabled	
Sts_IntlkTripShelved	BOOL	IntlkTrip.Shelved	1 = Interlock Trip or I/O Fault alarm has been Shelved by Operator
Sts_IOFaultShelved		IOFault.Shelved	
Sts_IntlkTripSuppressed	BOOL	IntlkTrip.Suppressed	1 = Interlock Trip or I/O Fault alarm has been Suppressed by Program
Sts_IOFaultSuppressed		IOFault.Suppressed	
Rdy_UpdDevInfo	BOOL		1 = Ready to receive: • MCmd_UpdDevInfo • OCmd_Bypass • OCmd_Check • MCmd_Disable • MCmd_Enable **IMPORTANT** All of the preceding enable the HMI button
Rdy_Bypass			
Rdy_Check			
Rdy_Disable			
Rdy_Enable			
Rdy_Reset	BOOL		1 = At least one Alarm requires Reset
Rdy_ResetAckAll	BOOL		1 = At least one Alarm or latched Shed condition requires Reset or Acknowledge
Rdy_CV	BOOL		1 = Ready to receive: • OSet_CV • OSet_CVRoCLimInc • OSet_CVRoCLimDec **IMPORTANT** All of the preceding enable the corresponding data entry field
Rdy_CVRoCLimInc			
Rdy_CVRoCLimDec			
P_AOutHART	BOOL		Unique Parameter Name for auto - discovery

Local Configuration Tags for HART Analog Output

Configuration parameters that are array, string, or structure data types cannot be configured as parameters for Add-On Instructions. Configuration parameters of these types appear as local tags to the Add-On Instruction. Local tags can be configured through the HMI faceplates or in Studio 5000 Logix Designer® application. This configuration is performed by opening the instruction logic of the Add-On Instruction instance and then opening the data monitor on a local tag. These parameters cannot be modified by using controller logic or Logix Designer application export/import functionality.

Table 39 - P_AOutHART Local Configuration Tags

Tag Name	Data Type	Default	Description
Cfg_CVNavTag	STRING_NavTag	''	Tag name for destination of CV Navigation button. **IMPORTANT:** This function does not apply to FactoryTalk View ME software.
Cfg_Desc	STRING_40	'Analog Output'	Description for display on HMI
Cfg_EU	STRING_8	'%'	Engineering units for CV display on HMI
Cfg_FVEU	STRING_8	''	Engineering units for HART FV display on HMI
Cfg_FVLabel	STRING_16	''	Label for Fourth Variable for display on HMI
Cfg_Label	STRING_20	'Analog Output'	Label for graphic symbol displayed on HMI
Cfg_PVEU	STRING_8	''	Engineering units for HART PV display on HMI
Cfg_PVLabel	STRING_16	''	Label for Primary Variable for display on HMI
Cfg_SVEU	STRING_8	''	Engineering units for HART SV display on HMI
Cfg_SVLabel	STRING_16	''	Label for Secondary Variable for display on HMI
Cfg_Tag	STRING_20	'P_AOutHART'	Tag name for display on HMI
Cfg_TVEU	STRING_8	''	Engineering units for HART TV display on HMI
Cfg_TVLabel	STRING_16	''	Label for Third Variable for display on HMI

Operations

This section describes the primary operations for Add-On Instructions.

Modes

This instruction uses the following standard modes, which are implemented by using an embedded P_Mode Add-On Instruction.

Table 40 - Modes

Mode	Description
Operator	The Operator owns control of the device. Operator commands (OCmd_) and Operator settings (OSet_) from the HMI are accepted.
Program	Control of the loop is owned by Program logic. Program Commands (PCmd_) and Program Settings (PSet_) are accepted.
Override	Priority logic owns control of the device and supersedes Operator and Program control. Override Inputs (Inp_OvrdCmd and other Inp_OvrdXxxx values) are accepted. If so configured, bypassable interlocks and permissives are bypassed.
Maintenance	Maintenance owns control of the device and supersedes Operator, Program, and Override control. Operator commands and settings from the HMI are accepted. Bypassable interlocks and permissives are bypassed, and device timeout checks are not processed.
Hand	Hardwired logic or other logic outside the instruction owns control of the device. The instruction tracks the state of the device for bumpless transfer back to one of the other modes.
No Mode	The device is disabled and has no owner because the EnableIn input is false. The main instruction Logic routine is not being scanned. See Execution section for more information on EnableInFalse processing.

See Rockwell Automation® Library of Process Objects: Common Mode Block (P_Mode) Reference Manual, publication SYSLIB-RM005, for more information.

Alarms

This instruction uses the following alarms, which are implemented by using embedded P_Alarm and P_Gate Add-On Instructions.

Table 41 - Alarms

Alarm Name	P_Alarm Name	P_Gate Name	Description
Interlock Trip	IntlkTrip	None	Raised when an interlock 'not OK' condition causes the output CV to be changed to the configured Interlock CV value or held at its last value. If interlocks are not bypassed, a bypassable interlock or a non-bypassable interlock 'not OK' condition initiates an interlock trip. If interlocks are bypassed, only a non-bypassable interlock 'not OK' condition initiates an interlock trip.
I/O Fault	IOFault	None	Raised when the Inp_IOFault input is true. This input is used to indicate to the instruction that a communication failure has occurred for its I/O. If the I/O Fault is configured as a shed fault, the output CV is set to the configured Interlock CV or held at its last value until reset.

Parameters of the P_Alarm object can be accessed by using the following convention: [P_Alarm Name].[P_Alarm Parameter].

See Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

Simulation

Simulation in P_AOutHART simulates the requested CV, sets the Out_CV output to 0, and ignores any I/O Faults.

You can simulate digital inputs by using the following parameters:

- Set_SimHARTPV
- Set_SimHARTSV
- Set_SimHARTTV
- Set_SimHARTFV

You must set the Inp_Sim parameter in the controller to '1' to enable simulation. The Simulation/Loopback Test icon is displayed at the bottom left of the Operator faceplate, indicating the device is in simulation.

When you have finished in simulation, set the Inp_Sim parameter in the controller to '0' to return to normal operation.

Execution

The following table explains the handling of instruction execution conditions.

Table 42 - Execution Conditions

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (False Rung) is handled the same as if the Analog Output were disabled by command. The CV output is de-energized (zeroed) and the Analog Output instruction is shown as disabled on the HMI. The mode is shown as No mode.
Powerup (prescan, first scan)	The embedded P_Mode and P_Alarm instructions handle processing of modes and alarms on prescan and powerup. See their manuals for details. On powerup, the analog output ownership is cleared; otherwise, all data remains in the state it was in at power down.
Postscan (SFC transition)	No SFC postscan logic is provided.

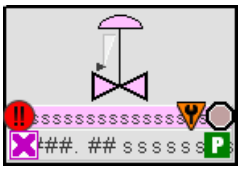
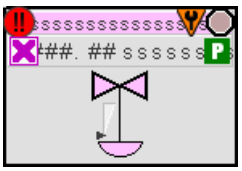
See the Logix5000™ Controllers Add-On Instructions Programming Manual, publication 1756-PM010, for more information.

Display Elements

A display element (global object) is created once and can be referenced multiple times on multiple displays in an application. When changes are made to the original (base) object, the instantiated copies (reference objects) are automatically updated. Use of global objects, with tag structures in the ControlLogix® system, aid consistency and save engineering time.

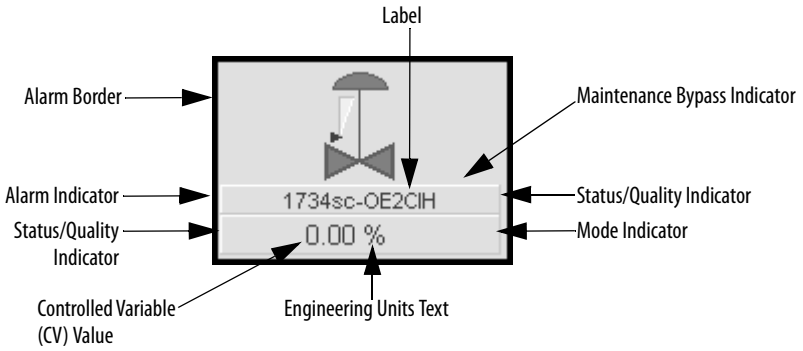
IMPORTANT The P_AOutHART instruction uses the same display elements as the Analog Output (P_AOut) instruction.

Table 43 - P_AOut Display Elements Description

Display Element Name	Display Element	Description
GO_P_AOut		Standard analog output global object.
GO_ProcessControlValve		Normal controlled valve symbol for horizontal pipe.
GO_ProcessControlValve1		Inverted controlled valve symbol for horizontal pipe.
GO_ProcessControlValve2		Controlled valve symbol for vertical pipe (pipe to the left).
GO_ProcessControlValve3		Controlled valve symbol for vertical pipe (pipe to the right).

Common attributes of the P_AOut global object include the following:

- Graphical representation of the device with output bar
- Label
- Maintenance Bypass indicator
- Current value of the CV with its engineering units
- Mode indicator
- Alarm indicator that changes color with the severity of an alarm
- Border that changes color and blinks for an unacknowledged alarm
- Status/Quality indicator



Status/Quality Indicators

One of these symbols appears on the graphic symbol when the described condition is true.

Table 44 - Status/Quality Indicators

Graphic Symbol	Description
	Invalid configuration.
	Data quality bad/failure.
	Data Quality degraded: uncertain, test, simulation, substitution, or out of specification.
	The input or device has been disabled.
	Output CV clamped to minimum/maximum.

TIP When the Invalid Configuration indicator appears, you can find what configuration setting is invalid by following the indicators. Click the graphic symbol to open the faceplate. The invalid configuration indicator appears next to the appropriate tab at the top of the faceplate to guide you in finding the configuration error. Once you navigate to the tab, the misconfigured item is flagged with this indicator or appears in a magenta box.

For the Analog Output instruction, the invalid Configuration indicator appears under the following conditions:

- Configured maximum CV clamp value (Cfg_CVMax) is less than the minimum CV clamp value (Cfg_CVMin)
- Scaled CV engineering units minimum and engineering units maximum scaling parameters are set to the same value
- Output raw minimum and raw maximum scaling parameters are set to the same value

- Alarm Minimum On Time or Shelf Time invalid.
- Alarm Severity is set to a value less than 1 or greater than 1000

TIP When the Not Ready indicator appears, you can find what condition helps prevent operation by following the indicators. Click the graphic symbol to open the faceplate. The Not Ready indicator appears next to the appropriate tab at the top of the faceplate to guide you in finding the condition. When you navigate to the tab, the condition that prevents operation is flagged.

For the Analog Output Instruction, the Device Not Ready indicator appears under the following conditions:

- Device has been disabled by Maintenance.
- There is a configuration error.
- Interlock is not OK.
- I/O Fault and shed requires reset.
- Device logic is disabled or there is no mode.

Mode Indicators

One of these symbols appears on the right side of the graphic symbol to indicate the mode of the object instruction.

Table 45 - Mode Indicators

Graphic Symbol	Description
Transparent	Operator mode (if the default mode is Operator and the current mode is Operator, the mode indicator is transparent).
	Operator mode (if the default mode is Program).
	Operator mode locked.
Transparent	Program mode (if the default mode is Program and the current mode is Program, the mode indicator is transparent).
	Program mode (if the default mode is Operator).
	Program mode locked.
	Override mode.
	Maintenance mode.
	Hand mode.
	No mode.

When the object is in the default mode, the mode indicator is transparent.

TIP The images that are provided for the Operator and Program default modes are transparent; therefore, no mode indicators are visible if the device is in its default mode. This behavior can be changed by replacing the image files for these mode indicators with images that are not transparent.

See Rockwell Automation Library of Process Objects: Common Mode Block (P_Mode) Reference Manual, publication SYSLIB-RM005, for more information.

Alarm Indicators

One of these symbols appears on the left side of the label to indicate the described alarm condition and the alarm border and label background change color. The alarm border and label background blink if acknowledgement of an alarm condition is required. Once the alarm is acknowledged, the alarm border and label background remain the color that corresponds to the severity of the alarm.

Table 46 - Alarm Indicators

Symbol	Border and Label Background	Description
	No change in color	Alarm Inhibit: an alarm is suppressed by the Program, disabled by Maintenance, or shelved by the Operator.
	White	Return to normal (no alarm condition), but a previous alarm has not been acknowledged.
	Blue	Low severity alarm.
	Yellow	Medium severity alarm.
	Red	High severity alarm.
	Magenta	Urgent severity alarm.
No symbol	No change in color	No alarm or alarm inhibit condition, and all alarms are acknowledged.

See Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

Maintenance Bypass Indicator

This symbol appears to the right of the label to indicate that a maintenance bypass has been activated.

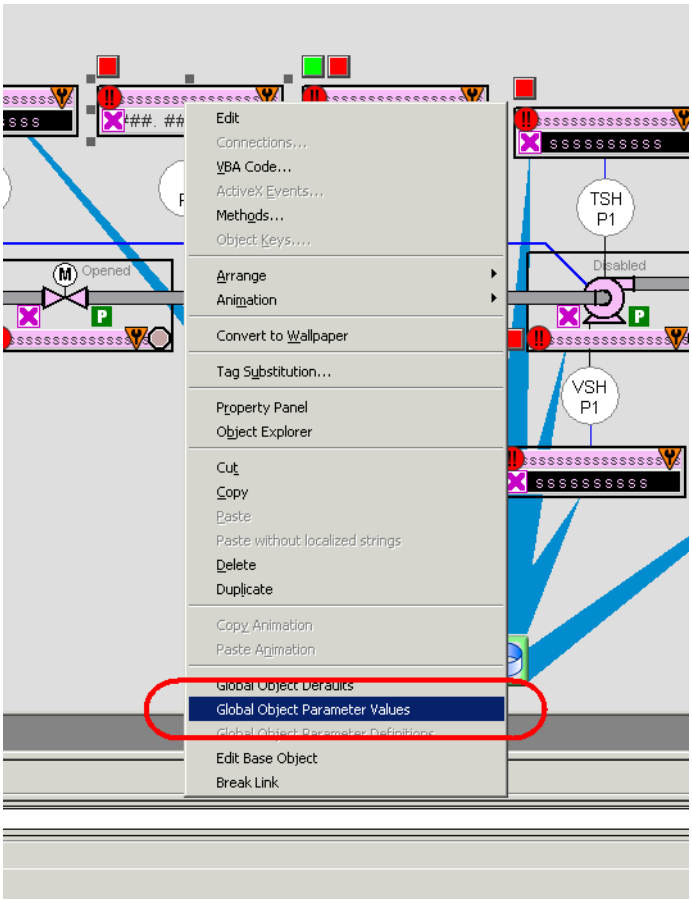
TIP When the Maintenance bypass indicator appears, you can find what condition was bypassed by following the indicators. Click the graphic symbol to open the faceplate. The Maintenance bypass indicator appears next to the appropriate tab at the top of the faceplate to guide you in finding the bypass. Once you navigate to the tab, the bypassed item is flagged with this indicator.

For the HART Analog Output instruction, the Maintenance Bypass indicator appears when bypassable interlocks have been bypassed.

Using Display Elements

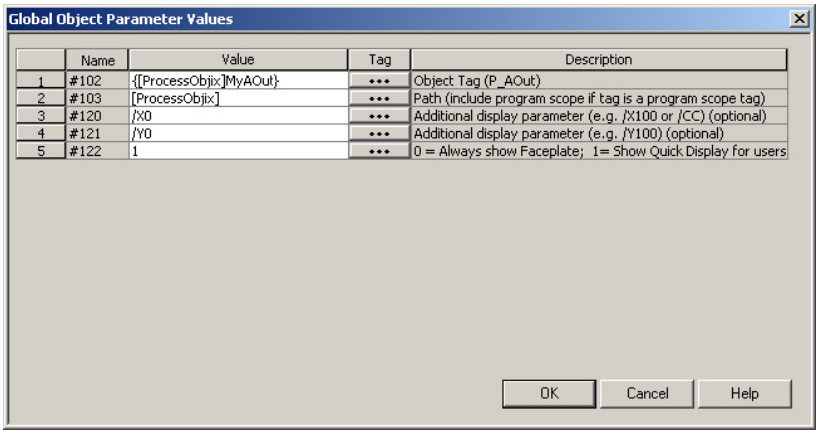
The global objects for P_AOutHART can be found in the global object file (RA-BAS) Process Graphics Library.ggfx. Follow these steps to use a global object.

1. Copy the global object from the global object file and paste it in the display file.



2. In the display, right-click the global object and choose Global Object Parameter Values.

   The Global Object Parameter Values dialog box appears.



   The global object parameters are as follows.

Table 47 - Global Object Parameters

Parameter	Required	Description
#102	Y	Object tag to point to the name of the associated object Add-On Instruction in the controller.
#103	Y	Path used for display navigation features to other objects. Include program scope if tag is a program scope tag.
#120	N	Additional parameter to pass to the display command to open the faceplate. Typically used to define position for the faceplate.
#121	N	Additional parameter to pass to the display command to open the faceplate. If defining X and Y coordinate, separate parameters so that X is defined by #120 and Y is defined by #121. This separation lets these same parameters to be used in subsequent display commands originating from the faceplate.
#122	Y	These are the options for the global object display: 0 = Always show faceplate 1 = Show Quick Display for users without Maintenance access (Code C) 2 = Always show Quick Display

3. In the Value column, type the tag or value as specified in the Description column.

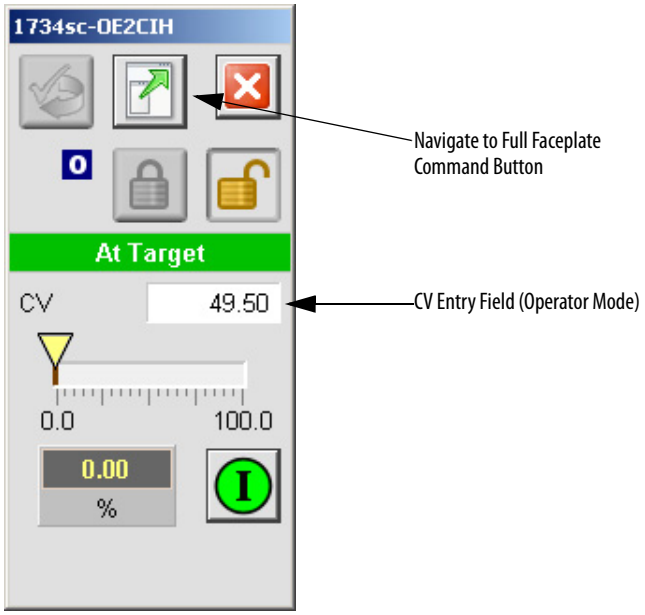
   TIP Click the ellipsis (…) to browse and select a tag.

   Values for items marked '(optional)' can be left blank.

4. Click OK.

Quick Display

The Quick Display screen provides means for operators to perform simple interactions with the P_AOutHART instruction instance. From the Quick Display, you can navigate to the faceplate for full access.

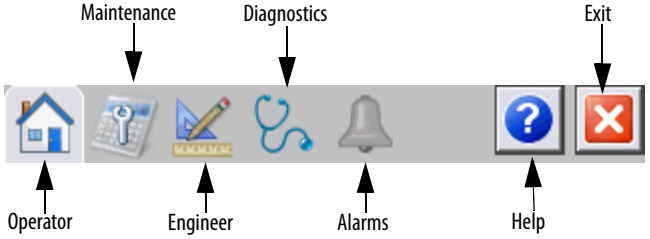


Faceplate

The P_AOutHART faceplate consists of five tabs and each tab consists of one or more pages.

The title bar of the faceplate contains the value of local configuration tags Cfg_Tag and Cfg_Desc.

The Operator tab is displayed when the faceplate is initially opened. Click the appropriate icon at the top of the faceplate to access a specific tab.



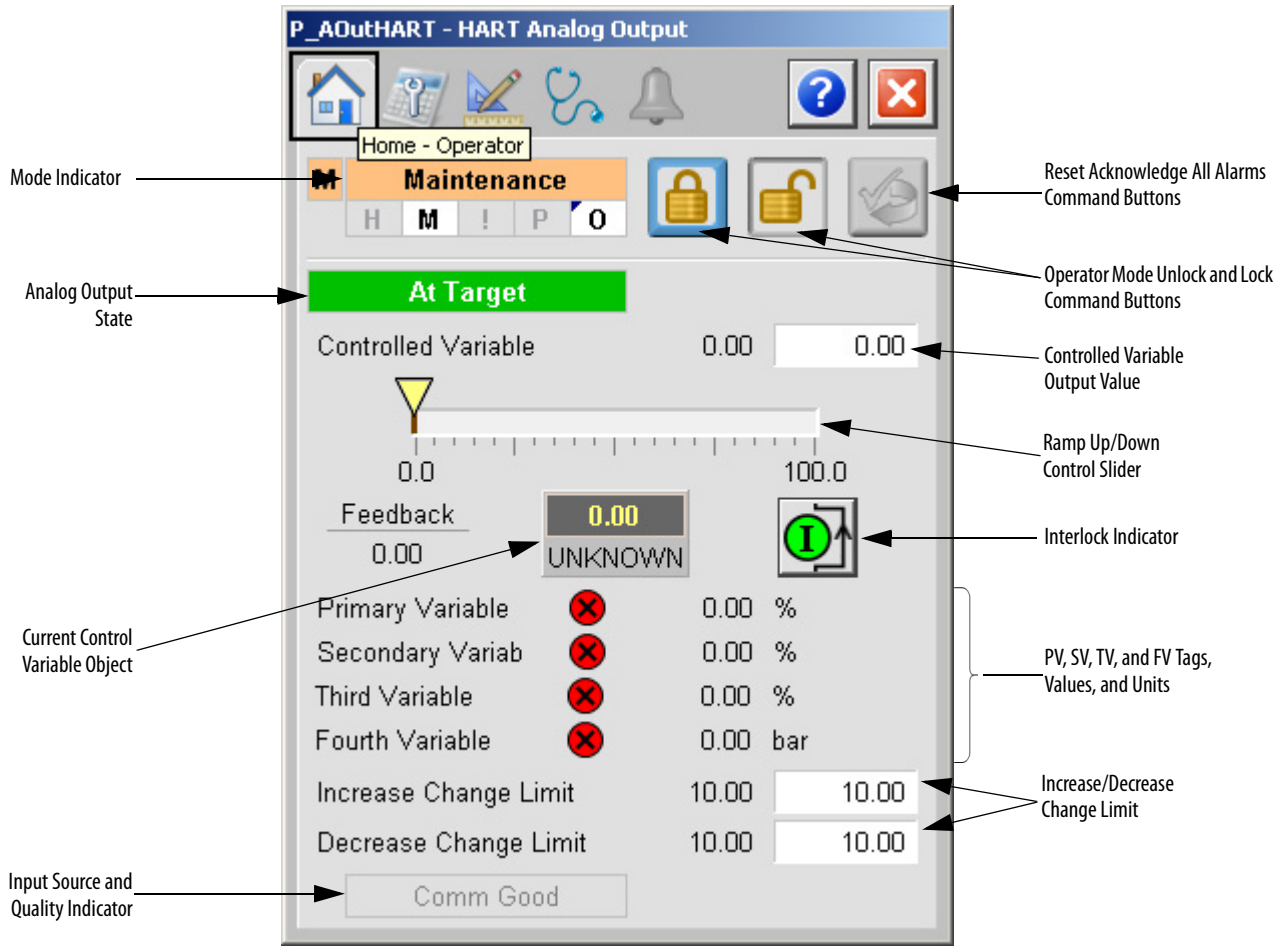
The faceplate provides the means for operators, maintenance personnel, engineers, and others to interact with the P_AOutHART Add-On Instruction instance, including viewing its status and values and manipulating it through its commands and settings. When a given input is restricted via FactoryTalk View security, the required user security code letter is shown in the tables that follow.

Operator Tab

The faceplate initially opens to the Operator ('Home') tab. From here, an operator can monitor the device status and manually operate the device when it is in Operator mode.

The Operator tab shows the following information:

- Current mode (Operator, Program, Override, Maintenance, or Hand)
- Analog Output State (At Target, Ramping Down, Ramping Up, Clamped at min, Clamped at max, or disabled)
- CV output value
- Input Source and Quality indicator (See 'SrcQ' in the Output parameters table on page 106 for details)
- Bar graph that displays the current output Control Variable (CV) as a yellow pointer and the target CV as a red line
- Bar graph range is the Maximum/Minimum CV Target Clamp Limits
- Increasing and decreasing rates of change for the output CV
- Interlock state



The following table shows the functions included on the Operator tab.

Table 48 - Operator Tab Descriptions

Function	Action	Security
	Click to lock in Operator mode. Function locks the mode in Operator mode and prevents the program from taking control.	Manual Device Operation (Code B)
	Click to unlock Operator mode. Function unlocks Operator mode, allowing the program to take control.	
	Click to request Program mode.	
	Click to request Operator mode.	
	Click to reset and acknowledge all alarms.	Acknowledge Alarms (Code F)
	Click to open the Interlock faceplate. The Interlock Status symbol becomes a button to call up the Interlock Faceplate if the P_AOut instruction is configured to have an associated P_Intlk Instruction.	None
Controlled Variable Output Value	Type to change the Controlled Variable output value.	Normal Operation (Code A)
Ramp Up/Down Slider	Drag the slider to ramp up or ramp down the target.	
Increase Change Limit	Type the Rate of Change Limit for increasing or decreasing CV.	
Decrease Change Limit		
Simulated device PV, SV, TV, and FV	Type the values for the simulated device values. This entry is available only when input simulation is enabled. (See Simulation on page 111 for more information.)	
Current Control Variable (CV) Object	Click this object to navigate to the faceplate specified by the associated tag name. **IMPORTANT:** 'Allow navigation' on Engineering Tab Page 3 on page 132 must be checked and a tag name provided to enable this object.	None

If the object is configured to have an interlock object (for example, Cfg_HasIntlkObj is true), the interlock indication becomes a button that opens the faceplate of the source object that is used as an interlock (often this is a P_Intlk interlock object). If the object is not configured in this way, the interlock is an indicator only.

See the Rockwell Automation Library of Process Objects: Interlock with First Out and Bypass (P_Intlk) Reference Manual, publication SYSLIB-RM004.

One of these symbols appears to indicate the described interlock condition.

Table 49 - Interlock Status Indicators

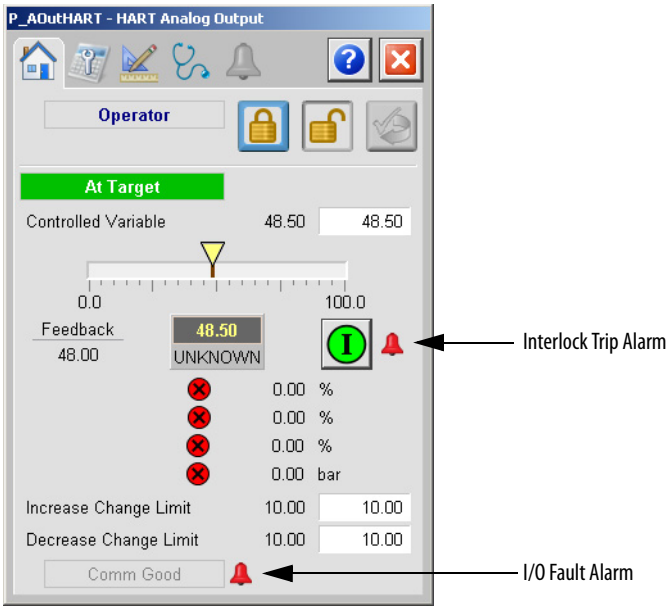
Graphic Symbol	Description
	One or more conditions not OK
	Non-bypassed conditions OK
	All conditions OK, bypass active
	All conditions OK

The following table shows the alarm status on the Operator tab.

Table 50 - Operator Tab Alarm Status Symbols

Graphic Symbol	Alarm Status
	In alarm (active alarm)
	In alarm and acknowledged
	Out of alarm but not acknowledged
	Alarm suppressed (by operator) (alarm is logged but not displayed)
	Alarm disabled (by Maintenance)
	Alarm shelved (disabled by Program Logic)

Alarm indicators appear on the Operator tab when the corresponding alarm occurs.



Maintenance Tab

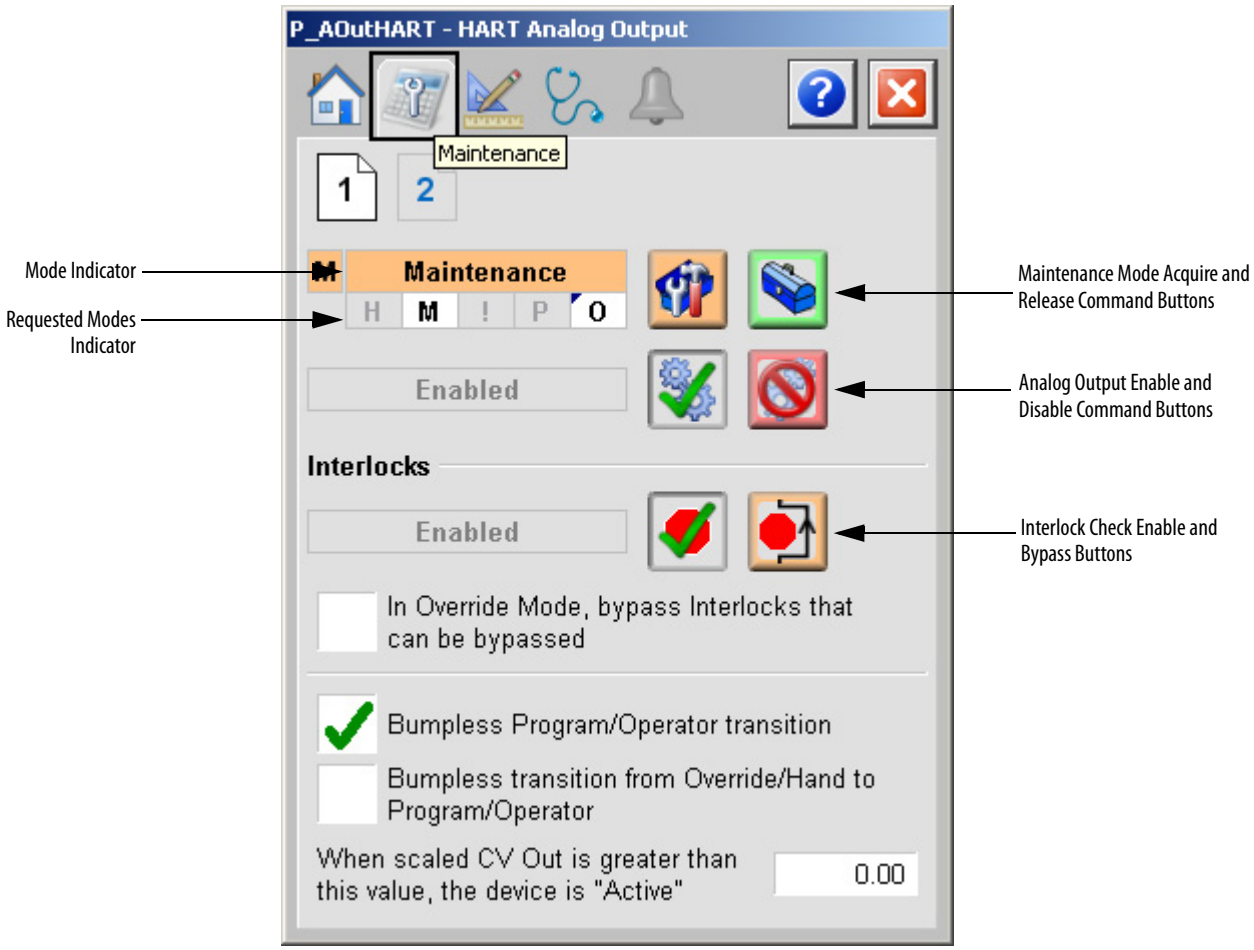
Maintenance personnel use the information and controls on the Maintenance tab to make adjustments to device parameters. The tabs also is used to troubleshoot and temporarily work around device problems, and disable the device for routine maintenance.

The Maintenance tab is divided into two pages.

Maintenance Tab Page 1

Page 1 of the Maintenance tab shows the following information:

- Current mode (Program, Operator, or Maintenance).
- Requested Modes indicator - this display highlights all modes that have been requested. The leftmost highlighted mode is the active mode.



The following table shows the functions on page 1 of the Maintenance tab.

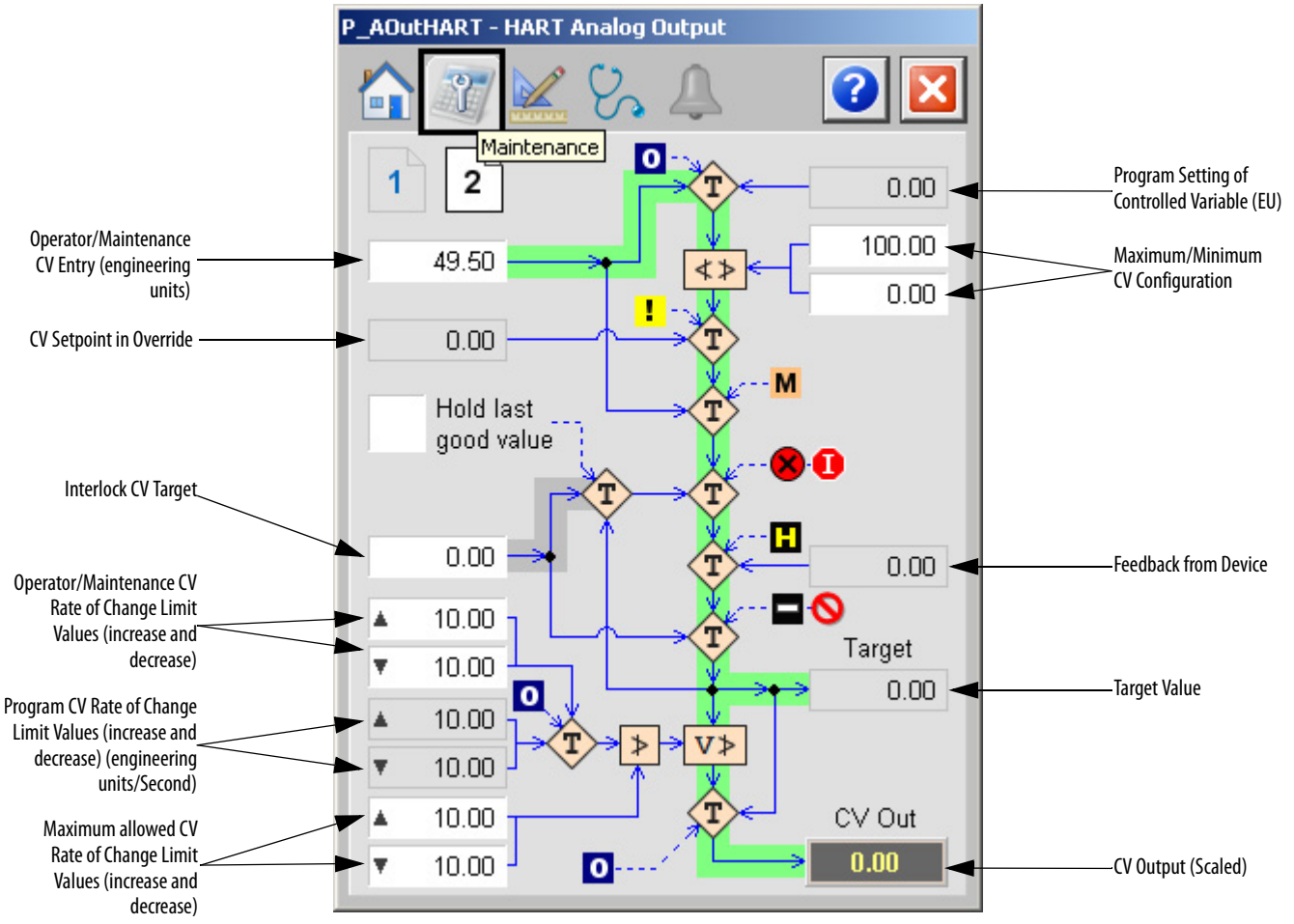
Table 51 - Maintenance Tab Page 1 Description

Function	Action	Security	Configuration Parameters
	Click for Maintenance mode.	Equipment Maintenance (Code C)	None
	Click to release Maintenance mode.		
	Click to Enable analog output.		
	Click to Disable analog output.		
	Click to Enable checking of all interlocks and permissives.		
	Click to Bypass checking of bypassable interlocks and permissives.		
In Override Mode, bypass Interlocks that can be bypassed	Check while in Override mode to bypass Interlocks that can be bypassed.	Configuration and Tuning Maintenance (Code D)	• Cfg_OvrdIntlk
Bumpless Program/ Operator Transition	When checked, the operator settings track the program settings when mode is Program, and program settings track the operator settings when the mode is Operator. Transition between modes is bumpless. When not checked, the operator settings and program settings are not modified by this instruction and retain their values regardless of mode. When the mode is changed, the value of a limit can change, such as from the Program-set value to the Operator-set value.		• Cfg_SetTrack
Bumpless Transition from Override/Hand to Program/Operator	When checked, the Program and Operator Settings of the CV track the output CV when the mode is Hand or Override.		• Cfg_SetTrackOverdHand
When scaled CV Out is greater than this value, the device is 'Active'	Type the CV value above which the device shows as 'Active'. When Val_CVOut is greater than this value, Sts_Active is set to 1, and the HMI shows the graphic symbol in the active state (for example, control valve shown as Open). When Val_CVOut is less than or equal to this value, Sts_Active is set to 0. The HMI shows the graphic symbol in the inactive state (for example, control valve shown as Closed).		• Cfg_MaxInactiveCV

Maintenance Tab Page 2

Page 2 of the Maintenance tab shows the following information:

- Current value
- Input tag description
- Source of the data that is used to determine the Output CV along with the configuration and device states that affect the final output value
- Entry field for the operator mode CV Target
- Program mode CV Target
- Entry fields for the CV Target clamping limits (maximum and minimum)
- Override mode CV Target
- Hand mode CV Target
- Current Target CV
- Program mode rate of change limits
- Entry fields for the Operator mode rate of change limits
- Entry fields for the maximum allowed rate of change limit entry values
- Output CV
- Entry field for the Interlock CV



The following table shows the functions of Page 2 of the Maintenance tab.

Table 52 - Maintenance Tab Page 2 Description

Function	Action	Security	Configuration Parameters
Operator CV Target	Type the Operator mode CV Target in engineering units. This entry is available in Operator mode and Maintenance mode. It is available in other modes if Bumpless Program/Operator Transition is not selected on Page 1 of the Maintenance tab.	Normal Operation of Devices (Code A)	None
CV Target Clamp Limits	Type the clamping limits for the Controlled Variable in engineering units. Clamping limits are enforced in Operator and Program modes only.	Configuration and Tuning Maintenance (Code D)	• Cfg_MinCV • Cfg_MaxCV
Hold Last Good Value	Check. The CV holds at the last good value when an Interlock trips or an I/O Fault occurs. Clear this checkbox and the CV goes to the Interlock CV value when an Interlock trips or an I/O Fault occurs.	Engineering Configuration (Code E)	• Cfg_ShedHold
Interlock CV Value	Type the interlock target CV in engineering units. This value is used for the CV when interlocked or on an I/O Fault, but only if Hold Last Good Value is not selected.	Configuration and Tuning Maintenance (Code D)	• Cfg_IntlkCV
Operator CV Rate of Change Limit Values (increase or decrease)	Type the CV Rate of Change Limit in engineering units per second. This value determines the rate at which the CV output changes upon a change in CV target. A value of zero disables rate of change limiting. The maximum allowed value for this entry is determined by the Maximum Rate of Change Limit (see next parameter). This entry is available in Operator Mode and Maintenance Mode. It is available in other modes if Bumpless Program / Operator Transition is not selected on Maintenance Tab Page 1.	Normal Operation of Devices (Code A)	None
Maximum allowed CV Rate of Change Limit Values (increase and decrease)	Type the maximum allowed value for the Rate of Change Limit in engineering units per second. A value of zero allows any rate of change to be requested by the Program or Operator.	Configuration and Tuning Maintenance (Code D)	• Cfg_MaxCVRoCInc • Cfg_MaxCVRoCDec

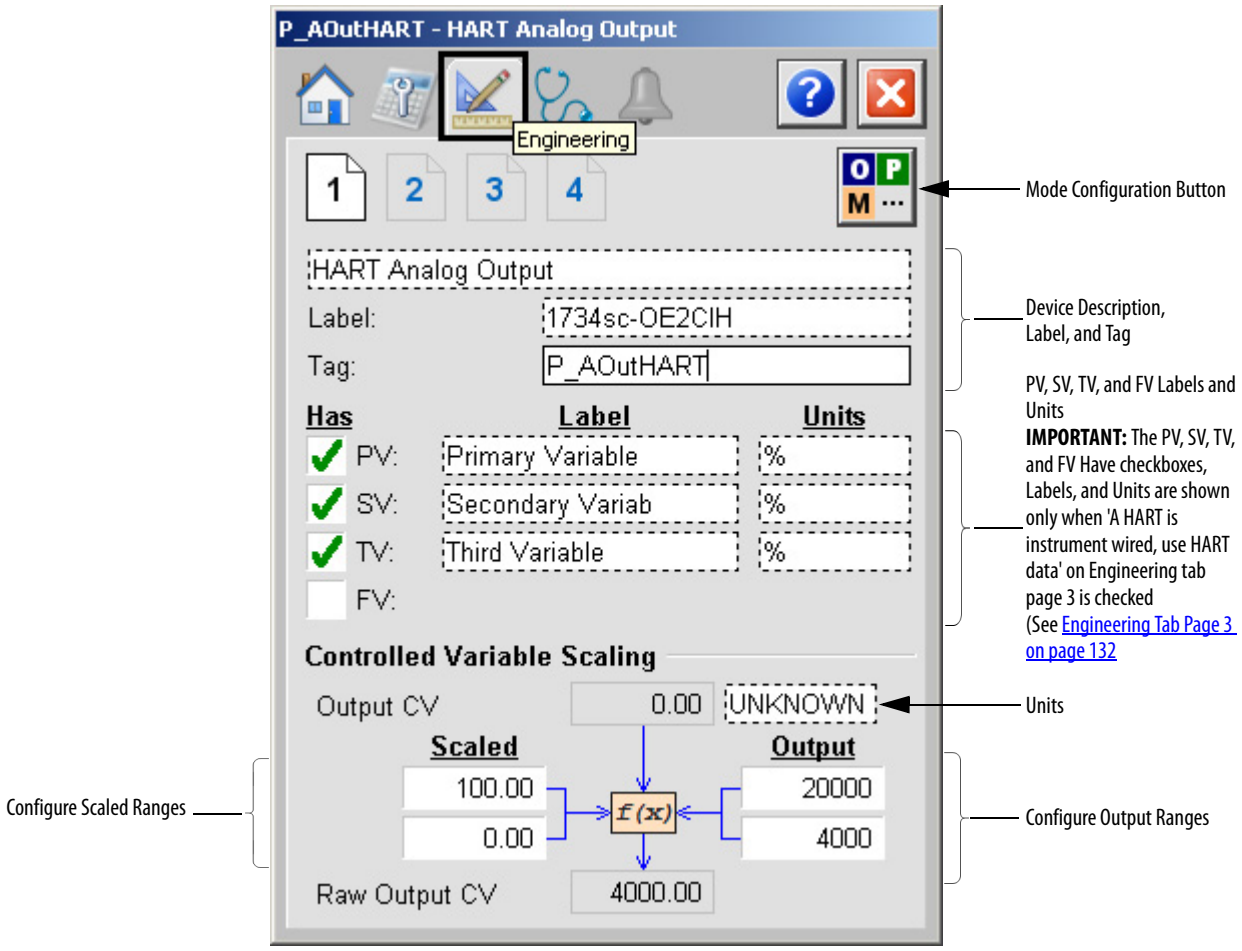
Engineering Tab

The Engineering tab provides access to device configuration parameters and ranges, options for device and I/O setup, displayed text, and faceplate-to-faceplate navigation settings, for initial system commissioning or later system changes.

The Engineering tab is divided into four pages.

Engineering Tab Page 1

On Page 1 of the Engineering tab, you can configure the mode, description, label, tag, and CV units for the device.

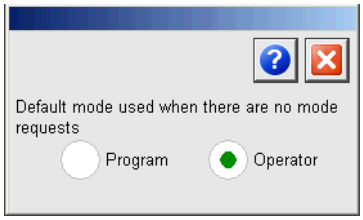


The following table lists the functions on page 1 of the Engineering tab.

Table 53 - Engineering Tab Page 1 Description

Function	Action	Security	Configuration Parameters
	Click to open the Mode Configuration display.	None	See Mode Configuration display on page 129
Description	Type the device description to show on the faceplate title bar.	Engineering Configuration (Code E)	• Cfg_Desc
Label	Type the label to show on the graphic symbol.		• Cfg_Label
Tag	Type the tag name to show on the faceplate title bar and on the tooltip. **IMPORTANT**: Pausing the mouse over this fields displays a tool tip with the configured Logix tag/path.		• Cfg_Tag
Has PV, SV, TV, and FV	Click to show the corresponding label and units entry fields. Clear the checkbox to hide the corresponding label and units entry fields.		• Cfg_HasPV • Cfg_HasSV • Cfg_HasTV • Cfg_HasFV
Units	Engineering Units label		• Cfg_EU
PV, SV, TV, and FV Labels	Type the label to show on the Operator tab. **IMPORTANT:** 'A HART is instrument wired, use HART data' on Engineering Tab Page 3 on page 132 must be checked for these fields to be available.		• Cfg_PVEULabel • Cfg_SVEULabel • Cfg_TVEULabel • Cfg_FVEULabel
PV, SV, TV, and FV Units	Type the engineering units to show on the Operator tab. **IMPORTANT:** 'A HART is instrument wired, use HART data' on Engineering Tab Page 3 on page 132 must be checked for these fields to be available.		• Cfg_PVEU • Cfg_SVEU • Cfg_TVEU • Cfg_FVEU
Controlled Variable Scaling	Type values for the maximum and minimum scaled (engineering units) and output (Raw) scaling ranges. **IMPORTANT:** 'Use scaling configuration parameters from HART module' on Engineering Tab Page 3 on page 132 must be clear for these fields to be available.		• Cfg_CVEUMax • Cfg_CVEUMin • Cfg_OutRawMax • Cfg_OutRawMin

Mode Configuration Display

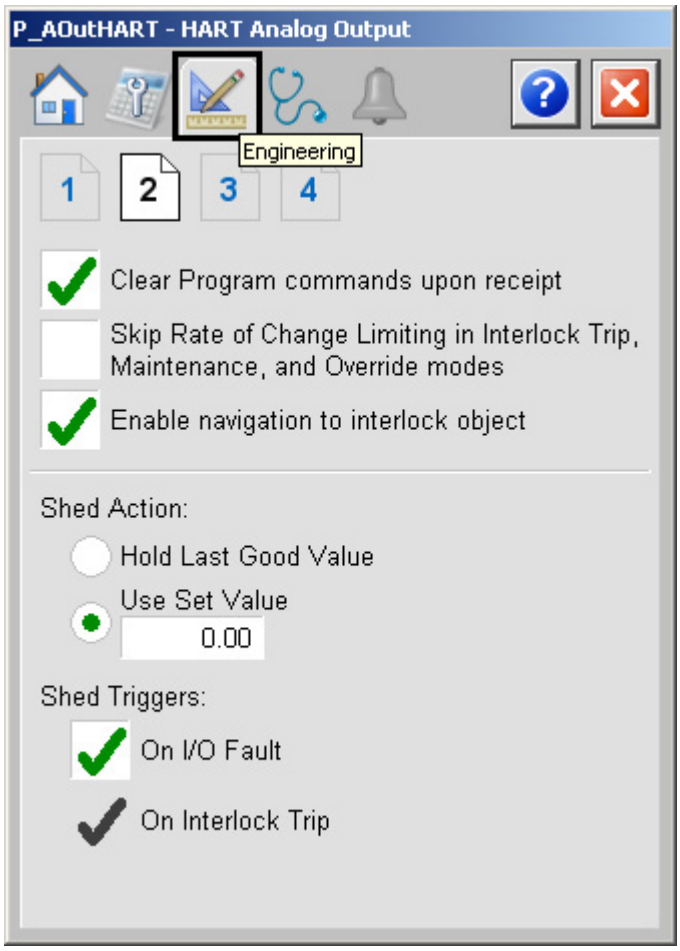


This display lets you select the default mode for the object by selecting the appropriate mode.

IMPORTANT If no mode is being requested, changing the default mode changes the mode of the instruction.

You must have FactoryTalk View security code E to select the default mode on this display.

Engineering Tab Page 2



The following table shows the functions on page 2 of the Engineering tab.

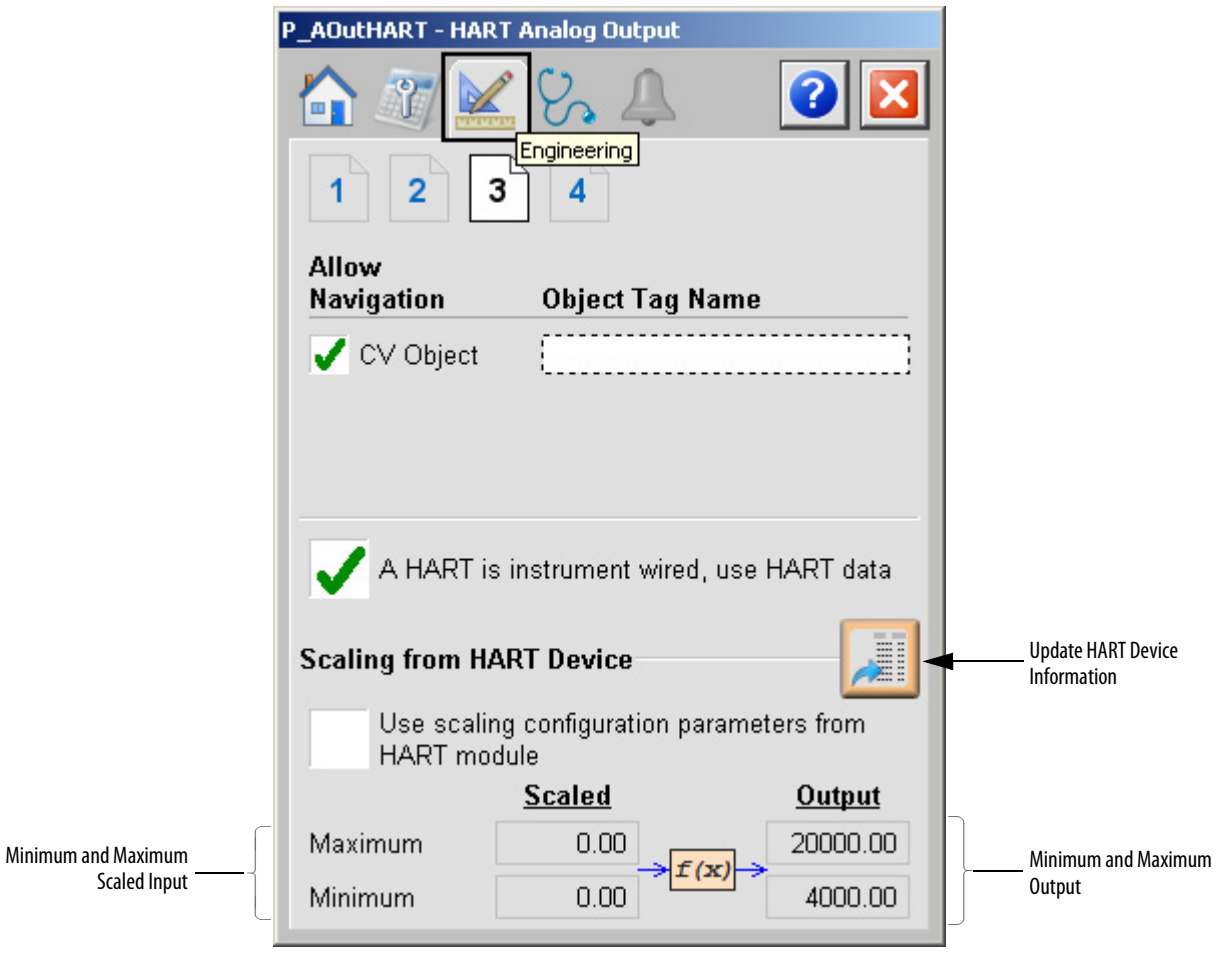
Table 54 - Engineering Tab Page 2 Description

Function	Action	Security	Configuration Parameters
Clear Program commands upon receipt	Check to clear program commands on receipt.	Engineering Configuration (Code E)	• Cfg_PCmdClear
Skip Rate of change Limiting in Interlock Trip, Maintenance, and Override modes	Check to have the CV immediately go to its target value or configured Interlock CV value when an Interlock trips or the instruction is placed in Maintenance or Override Mode. Clear this checkbox to have the CV always use rate of change limiting (ramping) of the CV output.		• Cfg_SkipRoCLim

Table 54 - Engineering Tab Page 2 Description

Function	Action	Security	Configuration Parameters
Enable navigation to interlock object	Check if an interlock object is connected to Inp_IntlkOK. The Interlock indicator becomes a button that opens the P_Intlk faceplate. **IMPORTANT:** The name of the Interlock object in the controller must be this object name with the suffix '_Intlk'. For example, if your P_AOutHART object has the name 'AOutHART123', then its Interlock object must be named 'AOutHART123_Intlk.	Engineering Configuration (Code E)	• Cfg_HasIntlkObj
Shed Action: Hold Last Good Value	Choose this option to hold the analog output at its last good value when a condition configured as a shed trigger occurs.		• Cfg_ShedHold = 1
Shed Action: Use Set Value	Choose this option to set the analog output to the configured shed set value when a condition configured as a shed trigger occurs.		• Cfg_ShedHold = 0
Set Value	Type the value to be sent to the output when a shed condition occurs and the Use Set Value option is selected		• Cfg_IntlkCV
Shed Triggers: On I/O Fault	Check so that an I/O Fault triggers a shed of the output, to the configured shed set value or to hold last good output. The shed condition is latched internal to the Add-On Instruction. When the I/O Fault condition clears, a Reset command is required to return to normal operation. Clear this checkbox so that the I/O Fault condition does not affect operation (but can still generate an alarm).		• Cfg_ShedOnIOFault
Shed Triggers: On Interlock Trip	This selection cannot be changed. The configured shed action always takes place on an interlock trip		None

Engineering Tab Page 3



The following table shows the functions on page 3 of the Engineering tab.

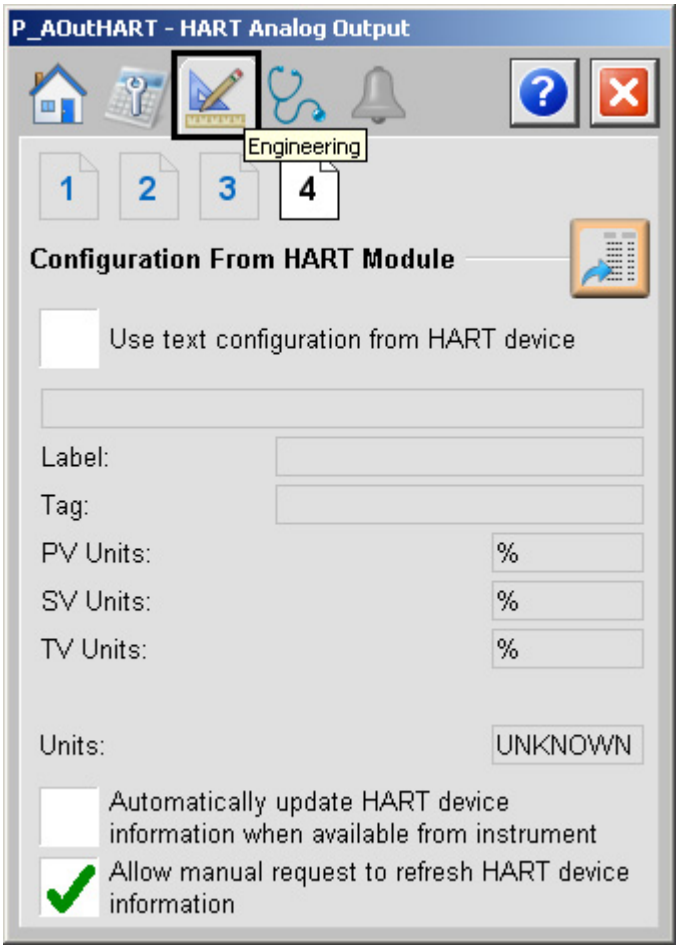
Table 55 - Engineering Tab Page 3 Description

Function	Action	Security	Configuration Parameters
	Click to update get an update of HART device information. **IMPORTANT:** "Allow manual request to refresh HART device information' on Engineering Tab Page 4 on page 134 must be checked for this button to be active.	Configuration and Tuning Maintenance (Code D)	None
Allow Navigation to CV Object	Check to enable navigation to the faceplate for the PlantPAx® object that is providing the CV for this object (PSet_CV).	Engineering Configuration (Code E)	• Cfg_HasCVNav
Object Tag Name	Enter the tagname of the object to navigate to when the CV navigation touch field on the Operator tab is clicked. **IMPORTANT:** This function does not apply to FactoryTalk View ME software.		• Cfg_CVNavTag

Table 55 - Engineering Tab Page 3 Description

Function	Action	Security	Configuration Parameters
A HART is instrument wired, use HART data	Check to use HART data from the connected instrument. Clear this checkbox to use local data. **IMPORTANT:** When this checkbox is checked, Engineering Tab page 4 is shown. **IMPORTANT:** When this checkbox is checked, PV, SV, TV, and FV on Engineering tab page 1 are available for use (See Engineering Tab Page 1 on page 127).	Engineering Configuration (Code E)	• Cfg_HasHART
Use scaling configuration parameters from HART module	Check to use scaling configuration parameters from HART module. Clear this checkbox to use local scaling parameters that are entered on Engineering page 1. **IMPORTANT:** When this checkbox is checked, Controlled Variable Scaling on Engineering tab page 1 is inactive (See Engineering Tab Page 1 on page 127).		• Cfg_UseHARTScaling

Engineering Tab Page 4



The following table shows the functions on page 4 of the Engineering tab.

Table 56 - Engineering Tab Page 4 Description

Function	Action	Security	Configuration Parameters
	Click to get an update of HART device information. **IMPORTANT:** This button is active only when "Allow manual request to refresh HART device information' is checked.	Configuration and Tuning Maintenance (Code D)	None

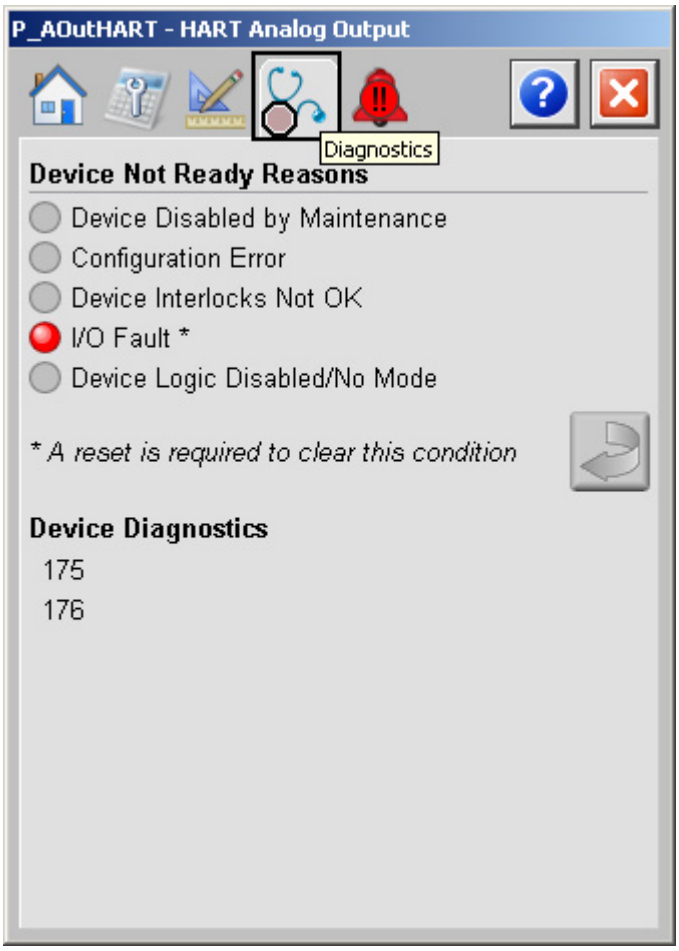
Table 56 - Engineering Tab Page 4 Description

Function	Action	Security	Configuration Parameters
Use text configuration from HART module	Check to use text configuration from HART module. Clear this checkbox to use manually-entered text that is entered on Engineering tab 1.	Engineering Configuration (Code E)	• Cfg_UseHARTText
Automatically update HART device information when available from instrument	Check to automatically update HART device information when available. Clear this checkbox to disable automatic updating of HART device information.		• Cfg_AutoUpdDevInfo
Allow manual request to refresh HART device information	Check to allow operator to update HART device information. Clear this checkbox to prevent operator from manually updating HART device information.		• Cfg_ManUpdDevInfo

Diagnostics Tab

The Diagnostic tab provides indications that are helpful in diagnosing or preventing device problems. These problems can include specific reasons a device is 'Not Ready', device warnings and faults, warning and fault history, and predictive/preventive maintenance data.

The Diagnostics tab displays messages for up to three Code48 status bits received from the HART device.

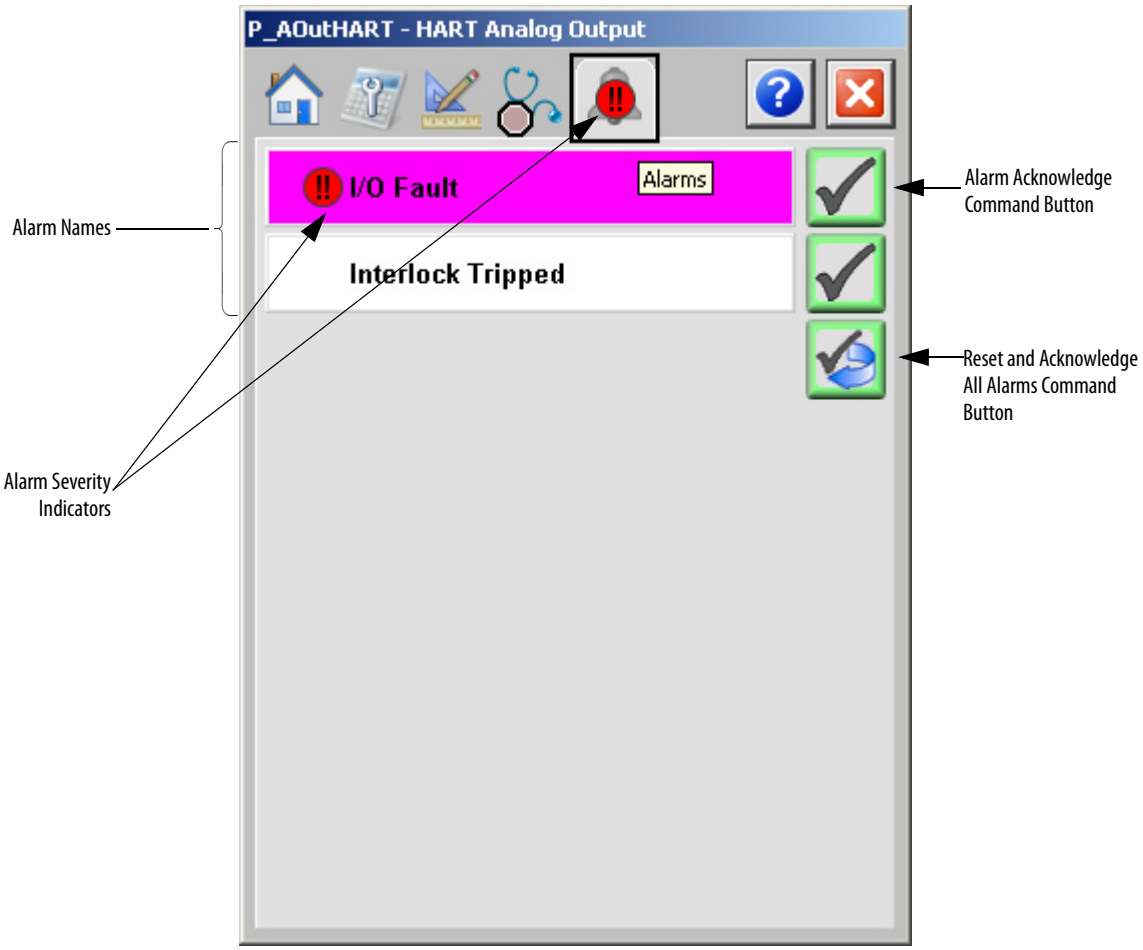


Only the first three codes encountered are shown on the Diagnostics page. These codes differ depending on the device used.

Alarms Tab

The Alarms tab displays each configured alarm for the P_AOutHART instruction. The icon on the tab for the alarms page changes color based on the current active alarms. A blinking alarm icon indicates that one or more alarms must be acknowledged or the device must be reset.

IMPORTANT	Alarms are provided for the analog value only. There are no alarms for the digital PV, SV, TV, or FV.



Click an alarm name to open the P_Alarm faceplate for that alarm. From the P_Alarm faceplate, you can configure and perform additional operations on the alarm.

If an alarm is active, the panel behind the alarm changes color to match the severity of the alarm. The color of the bell icon at the top of the faceplate shows the severity of the highest active alarm. The icon blinks if any alarm is unacknowledged or requires reset.

Table 57 - Alarm Severity Colors

Color	Definition
Magenta	Urgent
Red	High
Yellow	Medium
Blue	Low
White (bell icon)	Alarm has cleared but is unacknowledged
Background (Light Gray)	No alarm

The following table shows the functions on the Alarms tab.

Table 58 - Alarms Tab Description

Function	Action	Security
Alarm Name	Click an alarm name to open the associated P_Alarm faceplate.	None
	Click to acknowledge the alarm.	Acknowledge Alarms (Code F)
	Click to reset and acknowledge all alarms.	

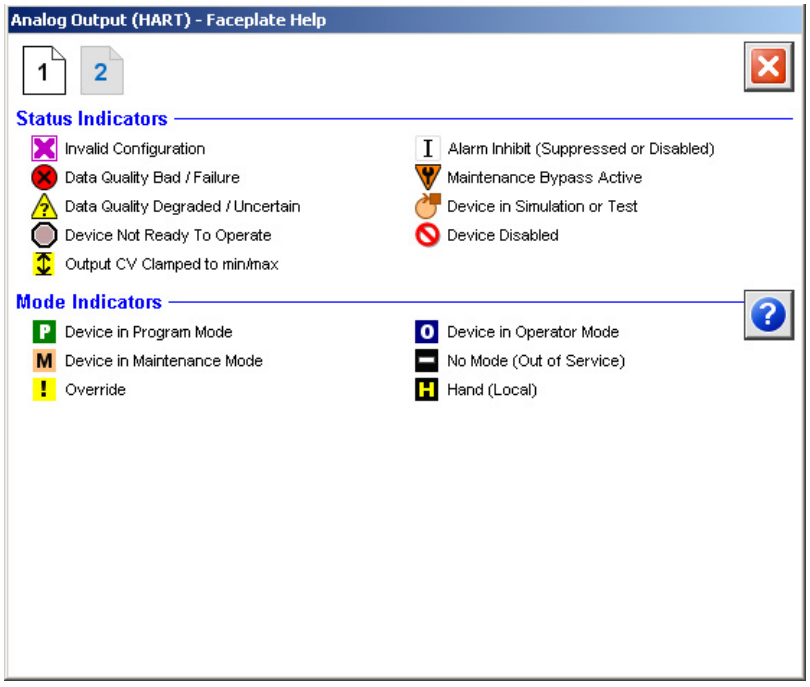
When the Reset and Acknowledge All Alarms button is enabled, the panel behind the alarm blinks, indicating the alarm requires acknowledgement or reset. The Alarm Acknowledge button is enabled if the alarm requires acknowledgment. Click the button with the check mark to acknowledge the alarm.

See Rockwell Automation Library of Process Objects: Common Alarm Block (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

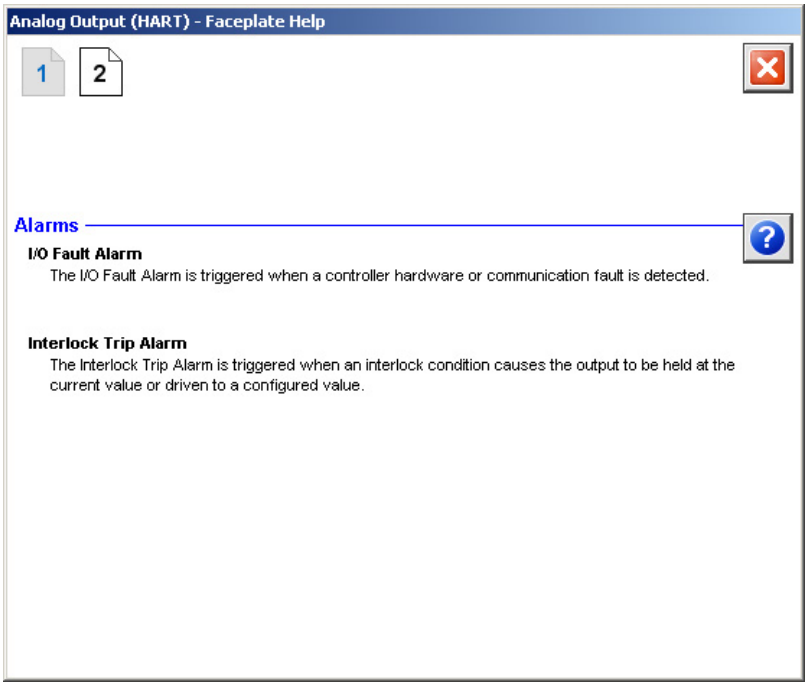
HART Analog Output Faceplate Help

The Faceplate Help is divided into two pages.

Faceplate Help Page 1



Faceplate Help Page 2



Notes:

Module Messaging Reference

This section shows message (MSG) instruction configuration for all HART Analog I/O modules.

If you use the RUNG import procedure that is outlined on page 24 to create the module Add-On Instruction instances, these MSG configurations are set for you on import. However, you can refer to this section if you are having trouble getting HART device information or diagnostics from your module.

Configuration for ControlLogix I/O (1756) and Spectrum Controls POINT I/O (1734sc)

MSG configuration for the Allen-Bradley® ControlLogix® I/O (1756) HART analog modules and for Spectrum Controls POINT I/O™ (1734sc) HART analog modules is applicable to the following modules:

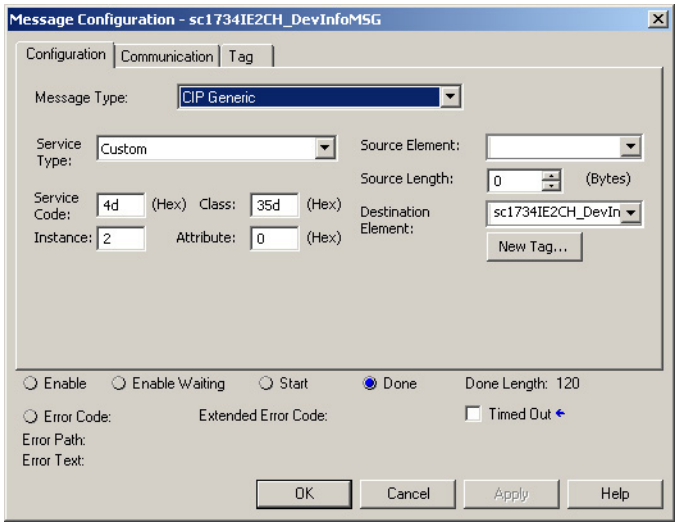
- 1756-IF8H
- 1756-IF8IH
- 1756-IF16H
- 1756-IF16IH
- 1756-OF8H
- 1756-OF8IH
- 1734sc-IE2CH
- 1734sc-IE4CH
- 1734sc-OE2CIH

MSG Instruction to Get Device Information

This section covers the MSG instruction that is used to get device information from tag <base>_DevInfoMSG.

Configuration Tab

The Configuration tab can be used to set the Message Type, Destination Element, and other MSG settings.

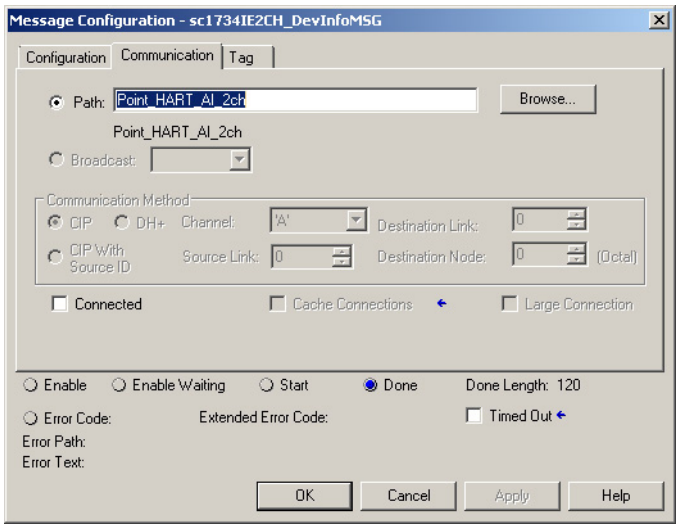


The following table shows example message configuration settings for a 1734sc-IE2CH module.

Field	Value
Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Custom.
Service Code	Type 4d.
Class	Type 35d.
Instance	This field is set by Add-On Instruction logic as required.
Attribute	Type zero.
Source Element	None, leave blank.
Source Length	Type zero.
Destination Element	Click the pull-down arrow and choose the following: Tag: <base>_DevInfoBuf (device information buffer) Type: HART_DevInfo (not an array)

Communication Tab

The Communication tab is used to set the Path. Use Browse to navigate to and select the Path.



The following table shows the message communication setting for the example 1734sc-IE2CH module

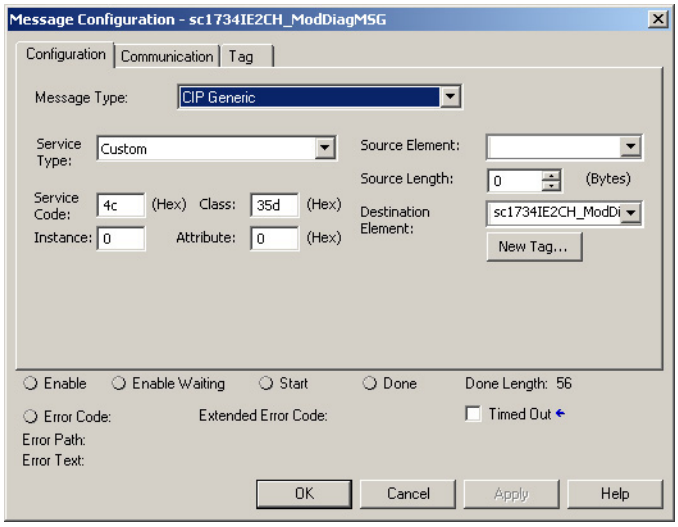
Field	Value
Path	Click Browse and choose the path to the HART module name in the I/O configuration tree.
Connected	Leave the box blank (unchecked).

MSG Instruction to Get Module Diagnostic Data

This section covers the MSG instruction that is used to get diagnostic data from tag <base>_ModDiagMSG.

Configuration Tab

The Configuration tab can be used to set the Message Type, Destination Element, and other MSG settings.



The following table shows example message configuration settings for a 1734sc-IE2CH module.

Field	Value
Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Custom.
Service Code	Type 4c.
Class	Type 35d.
Instance	This field is set by Add-On Instruction logic as required.
Attribute	Type zero.
Source Element	None, leave blank.
Source Length	Type zero.
Destination Element	Click the pull-down arrow and choose the following: Tag: <base>_ModDiagBuf[0] (Module Diagnostic Buffer) Type: SINT array. The size of the array is [28]*number of I/O channels on the module: • 2-channels: SINT[56] • 4-channels: SINT[112] • 8-channels: SINT[224] • 16-channels: SINT[448] The MSG instruction must point to element [0] of the array.

Communication Tab

This information is identical to Device Information Message

Field	Value
Path	Click Browse and choose the path to the Point I/O HART module name in the I/O configuration tree.
Connected	Leave the box blank (unchecked).

MSG configuration for FLEX I/O (1794) HART Analog Module

.This section covers the following modules:

- 1794-IF8IH
- 1794-OF8IH
- 1794-IF8IHNFXT

MSG Instructions to Get Device Information

There are three MSG instructions that are used to get device information:

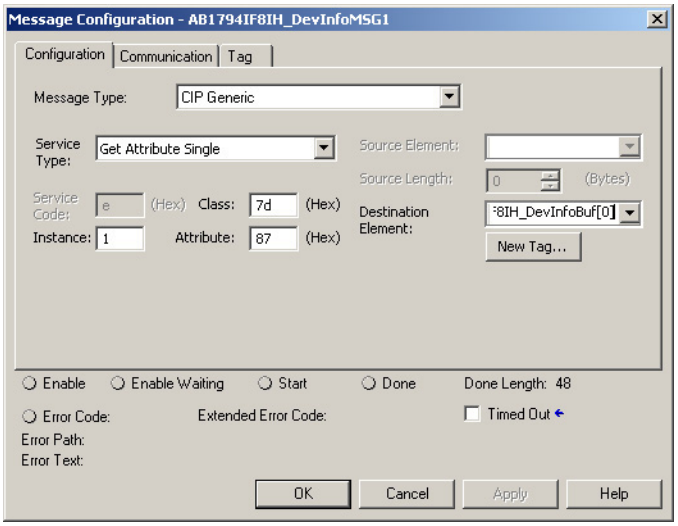
- MSG 1 of 3 to get Device Information (Tag: <base>_DevInfoMSG1)
- MSG 2 of 3 to get Device Information (Tag: <base>_DevInfoMSG2)
- MSG 3 of 3 to get Device Information (Tag: <base>_DevInfoMSG3)

All three MSG instructions are configured the same. The module Add-On Instruction manages the differences in Instance and Attribute values for the three MSG instruction instances.

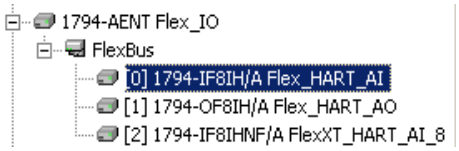
IMPORTANT The Flex™ I/O communication adapter acts as a proxy for the HART I/O module. The module Add-On Instruction for the Flex I/O HART modules must have the correct slot number configured in Cfg_Slot.

Configuration Tab

The Configuration tab can be used to set the Message Type, Destination Element, and other MSG settings.

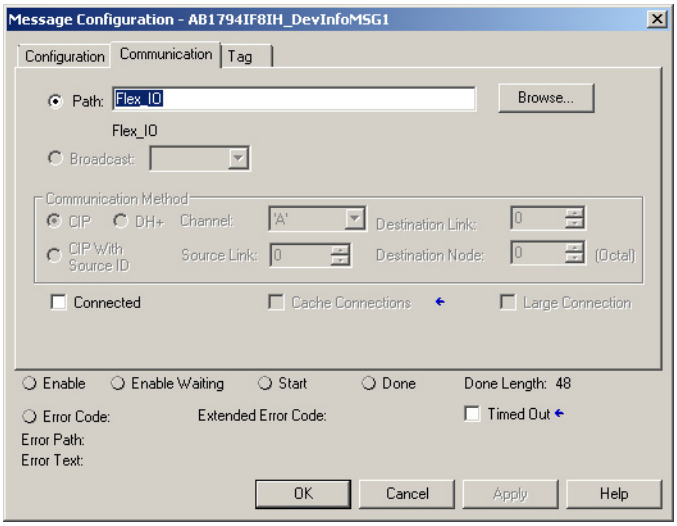


The following table shows example message configuration settings for a 1794-IF8IH module.

Field	Value
Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Get Attribute Single.
Service Code	0e (hex) (field cannot be entered for Get Attribute Single service)
Class	Type 7d.
Instance	This field is set by the module Add-On Instruction. However, you must properly configure the slot number in Cfg_Slot. For the example below, the slot number is 0.  (The instance value is simply the slot number plus 1.)
Attribute	This field is set by the module Add-On Instruction as required.
Source Element	None (field cannot be entered for Get Attribute Single service).
Source Length	0 (field cannot be entered for Get Attribute Single service).
Destination Element	Tag: <base>_DevInfoBuf[0] **IMPORTANT:** The TAG type for the DevInfoBuf for 1794 modules only is SINT[60], an array of 60 bytes. Each MSG instruction must point to element [0] of the array.

Communication Tab

The Communication tab can be used to set the Path.



The following table shows the message communication settings for the example 1794-IF8IH module.

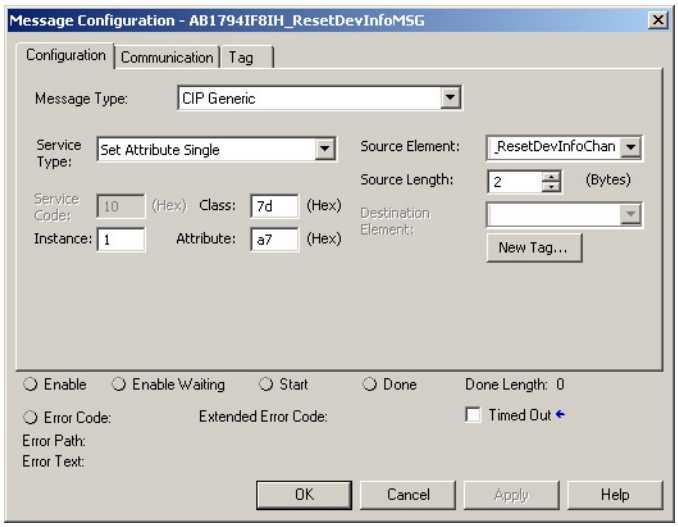
Field	Value
Path	Click Browse and choose the path to the FLEX I/O adapter name in the I/O configuration tree. **IMPORTANT:** For 1794 modules only, the FLEX I/O adapter, and **not** the FLEX I/O HART module, must be the target of the MSG instruction. The FLEXBus does not support CIP messaging, and the I/O adapter serves as a proxy for the HART I/O Module. In the example above, the FLEX I/O adapter, named 'Flex_IO', is used in the MSG Path.
Connected	Leave the box blank (unchecked).

MSG to Reset the Device Information Available Flag

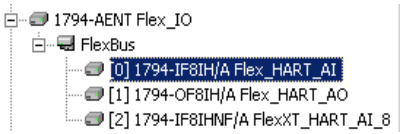
This section covers the MSG instruction that is used to reset the Device Information Available Flag data from tag <base>_ResetDevInfoMSG.

Configuration Tab

The Configuration tab can be used to set the Message Type, Source Element, and other MSG settings



The following table shows the message configuration settings for the example 1794-IF8IH input module.

Field	Value
Message Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Set attribute Single.
Service Code	10 (field cannot be entered for Set Attribute Single service).
Class	Type 7d.
Instance	This field is set by the module Add-On Instruction as required. However, you must properly configure the slot number in Cfg_Slot. For the example, the slot number shown is 0.  (The instance value is simply the slot number plus 1.)
Attribute	This field is set by the module Add-On Instruction as required.

Field	Value
Source Element	Click the pull-down arrow and choose the following: Tag: <base>_ResetDevInfoChan (type INT) The value of this tag is set by the module Add-On Instruction as required.
Source Length	Type 2.
Destination Element	None (field cannot be entered for Set Attribute Single service).

Communication Tab

This information is the same as the Get Device Information MSG instructions.

Field	Value
Path	Click Browse and choose the path to the FLEX I/O adapter name in the I/O configuration tree. **IMPORTANT:** For 1794 modules only, the FLEX I/O adapter, and **not** the FLEX I/O HART module, must be the target of the MSG instruction. The FlexBus does not support CIP messaging, and the I/O adapter serves as a proxy for the HART I/O Module.
Connected	eave the box blank (unchecked).

Spectrum Controls Compact I/O (1769sc)

There is no message configuration for the following Spectrum Controls Compact I/O™ (1769sc) HART analog modules:

- 1769sc-IF4IH
- 1769sc-OF4IH

These modules do not use message instructions to get HART device information.

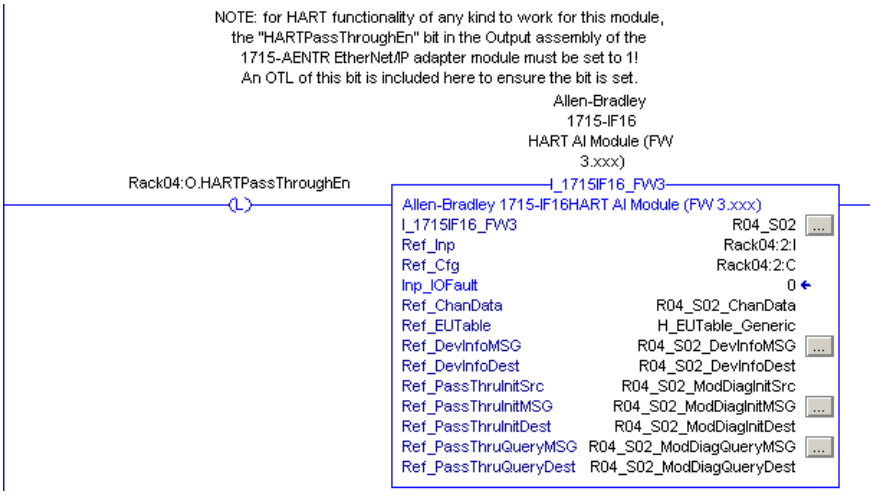
Configuration for Redundant I/O (1715) Modules

This section covers the following modules:

- 1715-IF16
- 1715-OF8I

Firmware in these modules must be at least major revision 3 (FW3.x or later) for these modules to support HART communication. In addition, the module must have HART pass-thru messaging enabled.

The rung imports provided include an OTL instruction to enable pass-thru messaging.

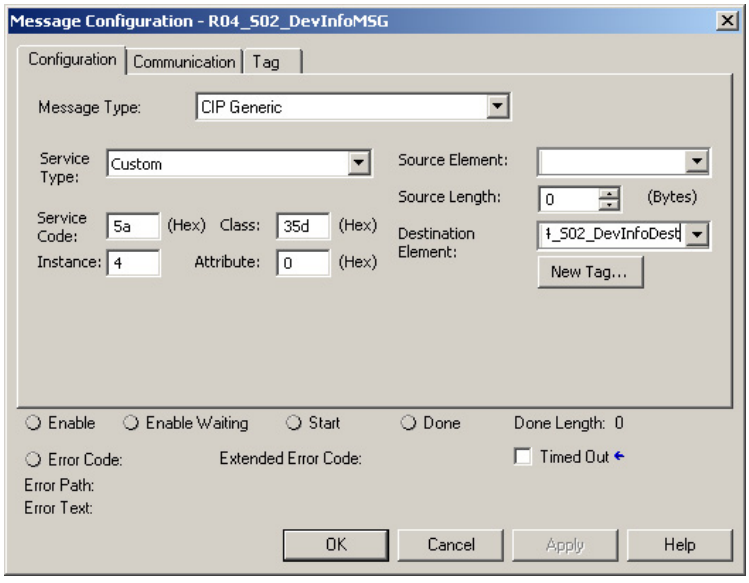


MSG Instruction to Get Device Information

This section covers the MSG Instruction that is used to get device information. The MSG tag name is <base>_DevInfoMSG.

Configuration Tab

Use the Configuration tab to set the Message Type, Destination Element, and other MSG settings.

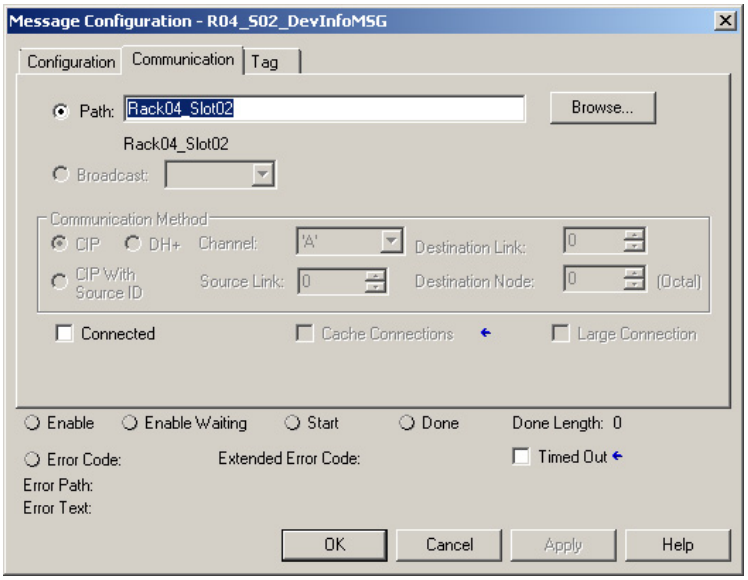


The following table shows example message configuration settings for a 1715-IF16 module.

Field	Value
Message Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Custom.
Service Code	Type 5a.
Class	Type 35d.
Instance	This field is set by Add-On Instruction logic as required.
Attribute	Type zero.
Source Element	None, leave blank.
Source Length	Type zero.
Destination Element	Click the pull-down arrow and choose the following: Tag: <base>_DevInfoBuf Type: HART_DevInfo (not an array)

Communication Tab

Use the Communication tab to set the path to the module. Click Browse and navigate to the module in the I/O configuration tree to select the path.



The following table shows the message communication settings for the example 1715-IF16 module.

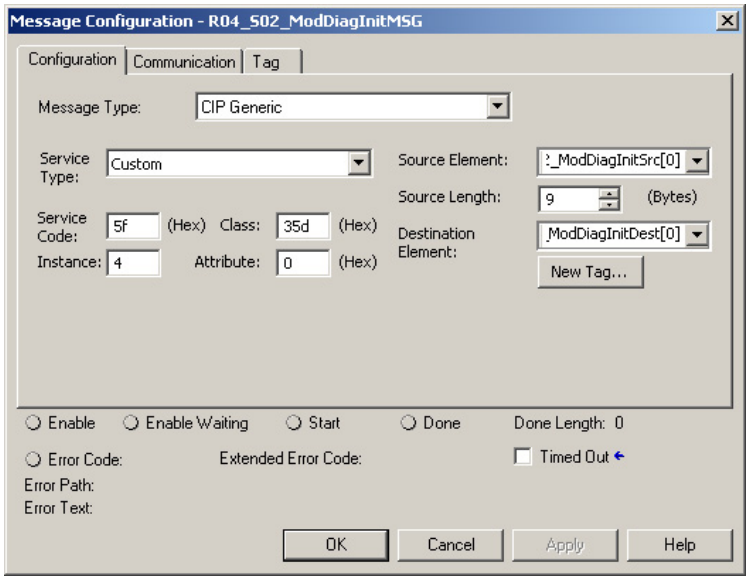
Field	Value
Path	Click Browse and choose the path to the module name in the I/O configuration tree.
Connected	Leave the box blank (unchecked).

MSG Instruction to Initiate Retrieval of Module Diagnostic Data

This section covers the MSG instruction that is used to initiate retrieval of diagnostic data from the device. The MSG tag name is <base>_MSG.ModDiagInitMSG.

Configuration Tab

Use the Configuration tab to set the Message Type, Destination Element, and other MSG settings.



The following table shows the message configuration settings for the example 1715-IF16 module.

Field	Value
Message Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Custom.
Service Code	Type 5f.
Class	Type 35d.
Instance	This field is set by Add-On Instruction logic as required.
Attribute	Type zero.
Source Element	Click the pull-down arrow and choose the following: Tag: <base>_ModDiagInitSrc[0] Type: SINT[10]
Source Length	Type 9.
Destination Element	Click the pull-down arrow and choose the following: Tag: <base>_ModDiagInitDest[0] Type: SIINT[10]

Communication Tab

Use the Communication tab to set the path to the module. The path is the same as for the Device Information message.

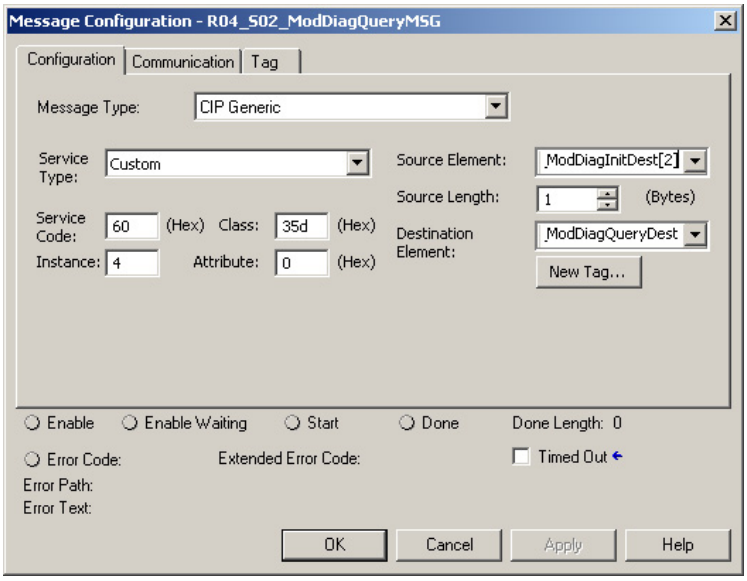
See page 151.

MSG Instruction to Complete Retrieval of Module Diagnostic Data

This section covers the MSG instruction that is used to complete the retrieval of diagnostic data from the device. The MSG tag name is <base>_MSG.ModDiagInitMSG.

Configuration Tab

Use the Configuration tab to set the Message Type, Destination Element, and other MSG settings.



The following table shows the message configuration settings for the example 1715-IF16 module.

Field	Value
Message Type	Click the pull-down arrow and choose CIP Generic.
Service Type	Click the pull-down arrow and choose Custom.
Service Code	Type 60.
Class	Type 35d.
Instance	This field is set by Add-On Instruction logic as required.
Attribute	Type zero.

Field	Value
Source Element	Click the pull-down arrow and choose the following: Tag: <base>_ModDiagInitDest[2] Type: SINT (This is member [2] of the data received by the 'Init' message.)
Source Length	Type 1.
Destination Element	Click the pull-down arrow and choose the following: Tag: <base>_ModDiagQueryDest Type: SIINT[50]

Communication Tab

Use the Communication tab to set the path to the module. The path is the same as for the device information message.

See page 151.

Q

R

S

T

V

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication PROCES-RM010B-EN-P - January 2017

Supersedes Publication PROCES-RM010A-EN-P - March 2016