Reference Manual

PlantPAx
Process Automation System

Rockwell Automation Library of Process Objects: Proportional + Integral + Derivative Enhanced (P_PIDE)

Version 3.1





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.

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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.

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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).

Notes:

This document is updated throughout for version 3.1 of the Rockwell Automation Library of Process Objects. Changes for this revision are marked by change bars shown in the right margin.

Software Compatibility and Content Revision

Table 1 - Summary of Changes

Topic	Page
Changed title from 'PlantPAx® Library of Process Objects' to 'Rockwell Automation Library of Process Objects'	Front Cover
Changed version of Rockwell Automation Library of Process Objects from 3.0 to 3.1	5, 9, 11
Changed references to Knowledgebase Answer ID 62682 to Product Compatibility and Download Center	
Visualization Files - added Important note concerning the order files are to be imported	9
Input Parameters table: added 'Alias For' column and aliases added MCmd_Acq and MCmd_Rel parameters	11
Output Parameters table: added 'Ack_', 'Alm_', and 'Err-' parameter descriptions to bullet list added 'Alias For' column and aliases added Sts_ShedResetReqd and Sts_MAcqRcvd parameters	 18 18
Operations - added Simulation section	27
Status/Quality Indicators table - added symbol and descriptions for 'value clamped to minimum/maximum, 'Device disabled', and 'PV within SP Deadband'	34
Faceplate: added information about the content of the faceplate title bar.	41
Interlock and Permissive status - added indicators table	45
Operator faceplate - added Alarm Locations image	45
Trends Tab - replaced both images	65

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.

For general library considerations, see Rockwell Automation Library of Process Objects, publication PROCES-RM002.

Additional Resources

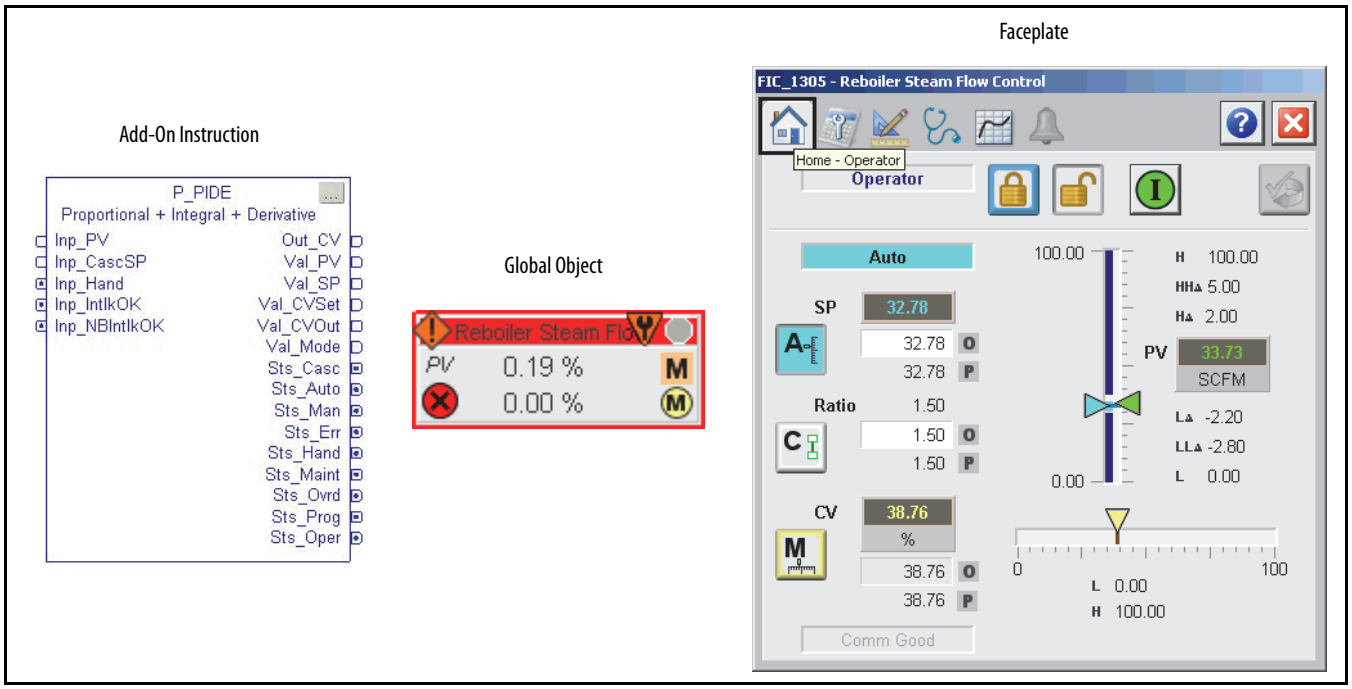
These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
PlantPAx Process Automation System Selection Guide, publication PROCES-SG001	Provides information to assist with equipment procurement for your PlantPAx system.
PlantPAx Process Automation System Reference Manual, publication PROCES-RM001	Provides characterized recommendations for implementing your PlantPAx system.
Rockwell Automation Library of Process Objects, publication PROCES-RM002	Provides general considerations for the PlantPAx system library of process objects.
FactoryTalk® View Machine Edition User Manual, publication VIEWME-UM004	Provides details on how to use this software package for creating an automation application.
FactoryTalk View Site Edition User Manual, publication VIEWSE-UM006	Provides details on how to use this software package for developing and running human-machine interface (HMI) applications that can involve multiple users and servers, distributed over a network.
Logix5000™ Process Control Drives Instructions Reference Manual, publication 1756-RM006	Provides detailed information on the built-in (firmware) PIDE instruction that is used within the P_PIDE Add-On Instruction for PID algorithm implementation.
Logix5000 Controllers Add-On Instructions Programming Manual, publication 1756-PM010	Provides information for designing, configuring, and programming Add-On Instructions.
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. Generally the P_Alarm faceplate is accessible from the Alarms tab.
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 usually 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.

Proportional + Integral + Derivative Enhanced (P_PIDE)

The P_PIDE (Proportional + Integral + Derivative Enhanced) Add-On Instruction provides the functionality of the RSLogix™ 5000 PIDE function block with a user experience consistent with the rest of the Rockwell Automation Library of Process Objects. The global object and faceplate shown below are examples of the graphical interface tools for this Add-On Instruction.



Guidelines

Use this instruction when you plan to use the PIDE for loop control and provide visualization to the operator.

Functional Description

The primary operations of the P_PIDE Add-On Instructions and its faceplate include the following:

- All the functions of the PIDE built-in instruction for PID loop control
- Process Library alarm objects for deviation alarms, and additional alarm status information and functionality, including limits, deadbands, and severities
- Additional context for display, including a description, label, tag, and engineering units
- P_Mode (mode) object for ownership
- Links for the P_Intlk (interlocks) instruction for interlocking
- Power-up Setpoint, Output, and Loop mode settings

Autotune

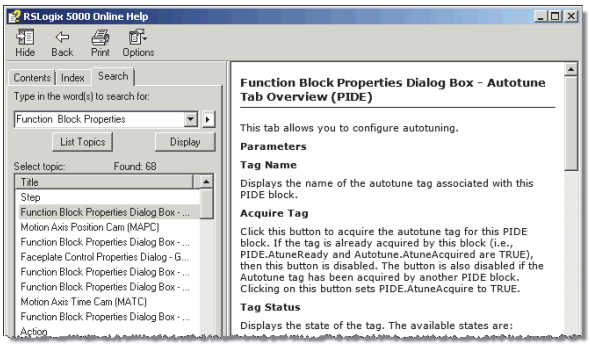
You must have a license to edit the autotune tag entry field on the PIDE instruction. Do these steps to enable the functionality.

1. Open the Logic routine of the 'P_PIDE_only' Add-On Instruction.
2. Edit the function block diagram to set the autotune tag to 'Ref_Autotune'.
3. Save your changes and download to your controller.

Once this change has been made, the outer P_PIDE instruction automatically checks on powerup for response from the Autotune function and automatically enables the Autotune button on the faceplate. This is a supported end-user/solution-provider enhancement that does not void tech support.

For information on how to use the Autotune function, refer to the following RSLogix 5000/Studio 5000 Logix Designer™ online help topics:

- Function Block Properties Dialog Box – Autotune Tab Overview (PIDE)
- PIDE Autotune Dialog Box Overview



Required Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets 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 File

The P_PIDE_3_1-**00**_AOI.L5X Add-On Instruction 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

The following files for this Add-On Instruction can be downloaded from the Product Compatibility and Download Center at http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page.

IMPORTANT Files must be imported in the following order: image files, then global object files, and then graphic files. This order is required to properly configure the visualization files.

Table 2 - P_PIDE Visualization File Types

Application Type	File Type	FactoryTalk View SE Software	FactoryTalk View ME Software	Description
Graphics - Displays	GFX	(RA-BAS) P_PIDE-Faceplate	(RA-BAS-ME) P_PIDE-Faceplate	The PID faceplate display used for the object.
		(RA-BAS) P_PIDE-Help	(RA-BAS-ME) P_PIDE-Help	Help information that is accessed from the P_PIDE Help faceplate.
		(RA-BAS) P_PIDE-Quick	(RA-BAS-ME) P_PIDE-Quick	The Quick display used for the object.
		(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 alarm faceplate display used for the object.
		(RA-BAS) P_Alarm-Help	(RA-BAS-ME) P_Alarm-Help	P_Alarm information that is accessed from the P_PIDE Help 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	Configuration display used to set Default mode.
		(RA-BAS) P_Mode-Help	(RA-BAS-ME) P_Mode-Help	Mode Help information that is accessed from the P_PIDE Help faceplate.

Table 2 - P_PIDE Visualization File Types

Application Type	File Type	FactoryTalk View SE Software	FactoryTalk View ME Software	Description
Optional Graphic Displays	GFX	(RA-BAS) Built-In Autotune-Faceplate	(RA-BAS-ME) Built-In Autotune-Faceplate	The Autotune faceplate display used for the object. Use this file if your Proportional + Integral + Derivative Enhanced has an associated Autotune object and you enable navigation to its faceplate from the Proportional + Integral + Derivative Enhanced faceplate.
		(RA-BAS) Built-In Autotune-Help	(RA-BAS-ME) Built-In Autotune-Help	Autotune Help information that is accessed from the Autotune faceplate. Use this file if you use the Autotune faceplate.
		(RA-BAS) P_Intlk-Faceplate	(RA-BAS-ME) P_Intlk-Faceplate	The interlock faceplate display used for the object. Use this file if your Proportional + Integral + Derivative Enhanced has an associated P_Intlk object and you enable navigation to its faceplate from the Proportional + Integral + Derivative Enhanced faceplate.
		(RA-BAS) P_IntlkPerm-Help	(RA-BAS-ME) P_IntlkPerm-Help	Interlock/Permissives Help information that is accessed from the P_Intlk or P_Perm faceplate. Use this file if you use the Interlock or Permissive faceplate.
		(RA-BAS) P_Perm-Faceplate	(RA-BAS-ME) P_Perm-Faceplate	The Permissive faceplate display used for the object. Use this file if your Proportional + Integral + Derivative Enhanced has an associated P_Perm object and you enable navigation to its faceplate from the Proportional + Integral + Derivative Enhanced faceplate.
Graphics - Global Objects	GGFX	(RA-BAS) P_PID Graphics Library	(RA-BAS-ME) P_PID Graphics Library	PID display elements in the graphics library for this instruction.
		(RA-BAS) Common Faceplate Objects	(RA-BAS-ME) Common Faceplate Objects	Common 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 Faceplate Analog Objects	(RA-BAS-ME) Process Faceplate Analog Objects	Global Objects used on analog device faceplates.
		(RA-BAS) Process Help Objects	(RA-BAS-ME) Process Help Objects	Global objects used for help on 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	Common global objects used for managing modes on Process Object faceplates.
Optional Graphics Global Objects		(RA-BAS) BuiltIn Faceplate Objects	(RA-BAS-ME) BuiltIn Faceplate Objects	Builtin global objects used for Process Object Builtin faceplates.
		(RA-BAS) BuiltIn Help Objects	(RA-BAS-ME) BuiltIn Help Objects	Global objects used for help on Process Objects Builtin help displays.
Graphics - Images	PNG	All .png files in the images folder	All .png files in the images folder	These are the common icons used in the global objects and faceplates for all Process Objects. When PNG graphic formats are imported, they are renamed like a BMP file but retain a PNG format.

Table 2 - P_PIDE Visualization File Types

Application Type	File Type	FactoryTalk View SE Software	FactoryTalk View ME Software	Description
HMI Tags	CSV	N/A	FTVME_PlantPAxLib_Tags_3_1_**00**.csv(1)	These tags must be imported into the FactoryTalk View ME project to support switching tabs on any Process Object faceplate.
Macros	MCR	NavToObject	N/A	This macro must be imported into the FactoryTalk View SE project to support faceplate-to-faceplate navigation by tagname.

(1) The service release number (boldfaced) can change as service revisions are created.

Controller Code

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

Proportional + Integral + Derivative Enhanced Input Structure

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 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
EnableIn	BOOL		1	**Ladder Diagram:** If the rung-in condition is true, the instruction's Logic routine executes. If the rung-in condition is false, the instruction's EnableInFalse routine executes. **Function Block Diagram:** If true, or not connected, the instruction's Logic routine executes. If the parameter is exposed as a pin and wired, and the pin is false, the instruction's EnableInFalse routine executes. **Structured Text:** No effect. The instruction's Logic routine executes.
Inp_PV	REAL	Wrk_PIDE.PV	0.0	Input signal Process Variable (PV) from sensor (PV engineering units).
Inp_CascSP	REAL	Wrk_PIDE.SPCascade	0.0	Setpoint in cascade, independent PV in Ratio (PV engineering units).
Inp_FF	REAL	Wrk_PIDE.FF	0.0	FeedForward term (Controlled Variable (CV)%).
Inp_FFPrev	REAL	Wrk_PIDE.FFPrevious	0.0	FeedForward feedback from downstream block (CV%).
Inp_CVInitVal	REAL	Wrk_PIDE.CVInitValue	0.0	Value to initialize the CV to when requested (CV engineering units).
Inp_CVPrev	REAL	Wrk_PIDE.CVPrevious	0.0	CV feedback from downstream block (CV%).
Inp_PVSrcQ	SINT		0	Source and Quality of Inp_PV (enumeration)

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Inp_OvrdCmd	SINT		0	Override Loop mode command: 0 = None 1 = Manual 2 = Automatic 3 = Cascade
Inp_OvrdRatio	REAL		1.0	Ratio to use in Override mode (unitless).
Inp_OvrdSP	REAL		0.0	Setpoint (SP) to use in Override mode (PV engineering units).
Inp_OvrdCV	REAL		0.0	CV to use in Override mode (CV%).
Inp_HandFdbk	REAL	Wrk_PIDE.HandFB	0.0	CV feedback used in Hand mode (CV%).
Inp_PVBad	BOOL	Wrk_PIDE.PVFault	0	Bad signal quality/communication status for inputs (1 = Bad, 0 = OK). If PV is read from an analog input, then this is normally read from the analog input channel fault status.
Inp_PVUncertain	BOOL		0	Uncertain quality for inputs (1 = Uncertain, 0 = OK). This is optional status for the input that can be used to drive the status of the output (Sts_PVUncertain).
Inp_CVIOFault	BOOL	Wrk_PIDE.CVFault	0	1 = CV I/O communication status bad 0 = OK
Inp_UseFFPrev	BOOL	Wrk_PIDE.FFSetPrevious	0	1 = Use Inp_FFPrev as previous FF value 0 = Use last scan value
Inp_UseCVInitVal	BOOL	Wrk_PIDE.CVInitReq	0	1 = Initialize CV to Inp_CVInitValue
Inp_UseCVPrev	BOOL	Wrk_PIDE.CVSetPrevious	0	1 = Use Inp_CVPrev as previous CV value 0 = Use last scan value
Inp_WindupHi	BOOL	Wrk_PIDE.WindupHIn	0	Windup high signal 1 = Regulator does not increase the output
Inp_WindupLo	BOOL	Wrk_PIDE.WindupLIn	0	Windup low signal 1 = Regulator does not decrease the output
Inp_Ovrd	BOOL	Mode.Inp_Ovrd	0	1 = Acquire Override (higher priority program logic) mode 0 = Release Override mode
Inp_Hand	BOOL	Mode.Inp_Hand	0	1 = Acquire Hand (hard-wired local) mode 0 = Release Hand mode
Inp_HandFdbkBad	BOOL	Wrk_PIDE.HandFBFault	0	1 = Inp_HandFdbk input quality or I/O communication status bad 0 = OK
Inp_IntlkOK	BOOL		1	1 = Interlocks and non-bypassable Interlocks OK, analog output can be set.
Inp_NBIntlkOK				
Inp_HiHiDevGate	BOOL	HiHiDevGate.Inp_Gate	1	High-High deviation status gate: 1 = Enabled.
Inp_HiDevGate		HiDevGate.Inp_Gate		High deviation status gate: 1 = Enabled
Inp_LoDevGate		LoDevGate.Inp_Gate		Low deviation status gate: 1 = Enabled
Inp_LoLoDevGate		LoLoDevGate.Inp_Gate		Low-Low deviation status gate: 1 = Enabled
Inp_Reset	BOOL		0	Input parameter used to programatically reset alarms. When set to 1, all alarms requiring reset are reset.
Cfg_HasRatio	BOOL	Wrk_PIDE.UseRatio	0	1 = Cascade Loop mode uses ratio 0 = Cascade Loop mode does not use ratio
Cfg_HasCasc	BOOL	Wrk_PIDE.AllowCasRat	0	1 = Enable the loop to be placed into Cascade/ratio mode

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_PVTrack	BOOL	Wrk_PIDE.PVTracking	1	1 = SP tracks PV in manual 0 = No PV tracking
Cfg_CtrlAction	BOOL	Wrk_PIDE.ControlAction	0	1 = Direct acting (E = PV-SP) 0 = Reverse acting (E = SP-PV)
Cfg_Depend	BOOL	Wrk_PIDE.DependIndepend	1	1 = Dependent gains equation 0 = Independent gains
Cfg_DerivSmooth	BOOL	Wrk_PIDE.DSmoothing	0	1 = Use derivative smoothing
Cfg_ZCOff	BOOL	Wrk_PIDE.ZCOff	0	1 = Need not cross zero error to be in deadband 0 = Must cross zero error
Cfg_LimitManCV	BOOL	Wrk_PIDE.CVManLimiting	0	1 = CV limits enforced in manual 0 = No CV limiting in manual
Cfg_InitToMan	BOOL	Wrk_PIDE.ManualAfterInit	0	1 = Go to Manual Loop mode when a CV initialization request is seen
Cfg_PropSPAct	BOOL	Wrk_PIDE.PVEProportional	0	Proportional action on SP change: 1 = None (PV only) 0 = Full (loop error)
Cfg_DerivSPAct	BOOL	Wrk_PIDE.PVEDerivative	1	Derivative action on SP change: 1 = None (PV only) 0 = Full (loop error)
Cfg_PwrupLM	SINT		0	Powerup Loop mode: 0 = No change (last) 1 = Manual (with CV) 2 = Automatic (with SP) 3 = Cascade/Ratio
Cfg_SetTrack	BOOL		1	This parameter is used to set up 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; 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 inputs (CV, SP, Ratio)
Cfg_HasIntlkObj	BOOL		0	1 = Tells HMI an interlock object (for example, P_Intlk) is used for Inp_IntlkOK and navigation to the interlock object's faceplate is enabled **IMPORTANT:** The name of the Interlock object in the controller must be this object's name with the suffix '_Intlk'. For example, if your P_PIDE object has the name 'PIDE123', then its Interlock object must be named 'PIDE123_Intlk'.
Cfg_HasCascSPNav	BOOL		0	1 = Tells HMI to enable navigation to a connected cascade SP object
Cfg_HasPVNav	BOOL		0	1 = Tells HMI to enable navigation to a connected PV object
Cfg_HasCVNav	BOOL		0	1 = Tells HMI to enable navigation to a connected CV object
Cfg_OvrdIntlk	BOOL		0	1 = Override ignores bypassable interlock 0 = Always use interlock
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.

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
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_HasHiHiDevAlm	BOOL	HiHiDev.Cfg_Exists	0	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_HasHiDevAlm		HiDev.Cfg_Exists		
Cfg_HasLoDevAlm		LoDev.Cfg_Exists		
Cfg_HasLoLoDevAlm		LoLoDev.Cfg_Exists		
Cfg_HasIntlkTripAlm		IntlkTrip.Cfg_Exists		
Cfg_HasFailAlm		Fail.Cfg_Exists		
Cfg_HiHiDevResetReqd	BOOL	HiHiDev.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 HiHiDev.OCmd_Reset are required to clear Alm_HiHiDev 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_HiDevResetReqd		HiDev.Cfg_ResetReqd		
Cfg_LoDevResetReqd		LoDev.Cfg_ResetReqd		
Cfg_LoLoDevResetReqd		LoLoDev.Cfg_ResetReqd		
Cfg_IntlkTripResetReqd		IntlkTrip.Cfg_ResetReqd		
Cfg_FailResetReqd		Fail.Cfg_ResetReqd		
Cfg_HiHiDevAckReqd	BOOL	HiHiDev.Cfg_AckReqd	1	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_HiDevAckReqd		HiDev.Cfg_AckReqd		
Cfg_LoDevAckReqd		LoDev.Cfg_AckReqd		
Cfg_LoLoDevAckReqd		LoLoDev.Cfg_AckReqd		
Cfg_IntlkTripAckReqd		IntlkTrip.Cfg_AckReqd		
Cfg_FailAckReqd		Fail.Cfg_AckReqd		
Cfg_HiHiDevSeverity	INT	HiHiDev.Cfg_Severity	750	These parameters determine the severity of each alarm. This 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 FactoryTalk Alarms and Events definition of severity drives the color and symbol that is used on the alarm banner and alarm summary as well as the value returned by FactoryTalk Alarms and Events display commands.
Cfg_HiDevSeverity		HiDev.Cfg_Severity	500	
Cfg_LoDevSeverity		LoDev.Cfg_Severity	500	
Cfg_LoLoDevSeverity		LoLoDev.Cfg_Severity	750	
Cfg_IntlkTripSeverity		IntlkTrip.Cfg_Severity	500	
Cfg_FailSeverity		Fail.Cfg_Severity	1000	
Cfg_MinRatio	REAL	Wrk_PIDE.RatioLLimit	1.0	Minimum and maximum allowed ratio (unitless).
Cfg_MaxRatio		Wrk_PIDE.RatioHLimit	1.0	
Cfg_MinSP	REAL	Wrk_PIDE.SPLLimit	0.0	Minimum allowed setpoint (SP) value (PV engineering units).
Cfg_MaxSP	REAL	Wrk_PIDE.SPHLimit	100.0	Maximum allowed setpoint (SP) value (PV engineering units).
Cfg_PVEUMin	REAL	Wrk_PIDE.PVEUMin	0.0	PV engineering units Minimum value (PV engineering units).
Cfg_PVEUMax	REAL	Wrk_PIDE.PVEUMax	100.0	PV (Output) maximum for scaling to engineering units.
Cfg_CVEUMin	REAL	Wrk_PIDE.CVEUMin	0.0	CV engineering units minimum value (CV engineering units).

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
Cfg_CVEUMax	REAL	Wrk_PIDE.CVEUMax	100.0	CV engineering units maximum value (CV engineering units). **TIP:** The P_PIDE instruction supports reverse CV EU scaling, Cfg_CVEUMax can be less than (but not equal to) Cfg_CVEUMin.
Cfg_CVRoCLim	REAL	Wrk_PIDE.CVROCLimit	0.0	CV rate of change limit (CV%/s), zero means do not limit.
Cfg_PGain	REAL	Wrk_PIDE.PGain	0.0	Proportional (independent) or loop (dependent) gain (unitless).
Cfg_IGain	REAL	Wrk_PIDE.IGain		Integral gain (1/min independent or min/repeat dependent).
Cfg_DGain	REAL	Wrk_PIDE.DGain		Derivative gain (min).
Cfg_ZCDB	REAL	Wrk_PIDE.ZCDeadband	0.0	Normal zero crossing deadband (PV engineering units).
Cfg_MinCV	REAL	Wrk_PIDE.CVLLimit	0.0	Minimum or maximum allowed controlled variable (CV) value (CV%).
Cfg_MaxCV	REAL	Wrk_PIDE.CVHLimit	100.0	
Cfg_MaxInactiveCV	REAL		0.0	When Val_CV is greater than this value (CV%) set Sts_Active (for HMI).
Cfg_IntlkCV	REAL	Wrk_PIDE.CVOverride	0.0	CV to use when interlocks not OK (CV%).
Cfg_DevDB	REAL	Wrk_PIDE.DevDeadband	0.0	Deviation alarm deadband (PV engineering units).
Cfg_PwrupSP	REAL		0.0	Loop SP on powerup, used if Cfg_PwrupLM = 1 (manual) or 2 (automatic).
Cfg_PwrupCV	REAL		0.0	Loop CV (CV %) on powerup, used if Cfg_PwrupLM <> 0 (none).
Cfg_HiHiDevOnDly	DINT	HiHiDevGate.Cfg_OnDly	0	These parameters determine the minimum time (in seconds) the loop deviation must remain beyond the status threshold for the status to be set. On-delay times are used to avoid unnecessary alarms when the deviation momentarily overshoots its threshold (for example, Val_HiHiDevLim).
Cfg_HiDevOnDly		HiDevGate.Cfg_OnDly		
Cfg_LoDevOnDly		LoDevGate.Cfg_OnDly		
Cfg_LoLoDevOnDly		LoLoDevGate.Cfg_OnDly		
Cfg_HiHiDevOffDly	DINT	HiHiDevGate.Cfg_OffDly	0	These parameters determine the amount of time (in seconds) the loop deviation must stay within each status threshold to clear the status. Off delay times are used to reduce chattering alarms. **EXAMPLE:** If Cfg_HiDevOffDly is 5 seconds, the loop deviation must be below the status limit (Val_HiHiDevLim) minus deadband (Cfg_DevDB) for 5 seconds before the status is returned to normal.
Cfg_HiDevOffDly		HiDevGate.Cfg_OffDly		
Cfg_LoDevOffDly		LoDevGate.Cfg_OffDly		
Cfg_LoLoDevOffDly		LoLoDevGate.Cfg_OffDly		
Cfg_HiHiDevGateDly	DINT	HiHiDevGate.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_HiDevGateDly		HiDevGate.Cfg_GateDly		
Cfg_LoDevGateDly		LoDevGate.Cfg_GateDly		
Cfg_LoLoDevGateDly		LoLoDevGate.Cfg_GateDly		
PSet_Ratio	REAL		1.0	Program setting for ratio (loop cascade and ratio enabled) (unitless).
PSet_SP			0.0	Program setting for setpoint (loop auto) (PV engineering units).
PSet_CV			0.0	Program setting for controlled variable (loop manual) (CV%).
PSet_HiHiDevLim	REAL		3.40282347e+038	Program setting for High-High, High, Low, or Low-Low deviation status threshold (PV engineering units).
PSet_HiDevLim				
PSet_LoDevLim			-3.40282347e+038	
PSet_LoLoDevLim				
PSet_Owner	DINT		0	Program owner request ID (non-zero) or release (zero).

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
OSet_Ratio	REAL		1.0	Operator setting for ratio (loop cascade and ratio enabled) (unitless).
OSet_SP			0.0	Operator setting for setpoint (loop auto) (PV engineering units).
OSet_CV			0.0	Operator setting for controlled variable (loop manual) (CV%).
OSet_HiHiDevLim			3.40282347e+038	Operator settings for High-High, High, Low, or Low-Low deviation status threshold (PV engineering units).
OSet_HiDevLim				
OSet_LoDevLim			-3.40282347e+038	
OSet_LoLoDevLim				
PCmd_Casc	BOOL		0	When Cfg_PCmdClear is 1: • Set PCmd_Casc to 1 to select Cascade/Ratio Loop mode • Set PCmd_Auto to 1 to select Automatic Loop mode • Set PCmd_Man to 1 to select Manual Loop mode • These parameters reset automatically When Cfg_PCmdClear is 0: • Set PCmd_Casc to 1 to select Cascade/Ratio Loop mode • Set PCmd_Auto to 1 to select Automatic Loop mode • Set PCmd_Auto and PCmd_Casc to 0 to select Manual Loop mode • PCmd_Man is not used • These parameters do not reset automatically
PCmd_Auto				
PCmd_Man				
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_HiHiDevAck	BOOL	HiHiDev.PCmd_Ack	0	• Set PCmd_<Alarm>Ack to 1 to Acknowledge alarm • The parameter is reset automatically
PCmd_HiDevAck		HiDev.PCmd_Ack		
PCmd_LoDevAck		LoDev.PCmd_Ack		
PCmd_LoLoDevAck		LoLoDev.PCmd_Ack		
PCmd_IntlkTripAck		IntlkTrip.PCmd_Ack		
PCmd_FailAck		Fail.PCmd_Ack		

Table 3 - P_PIDE Input Parameters

Input Parameter	Data Type	Alias For	Default	Description
PCmd_HiHiDevSuppress	BOOL	HiHiDev.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_HiDevSuppress		HiDev.PCmd_Suppress		
PCmd_LoDevSuppress		LoDev.PCmd_Suppress		
PCmd_LoLoDevSuppress		LoLoDev.PCmd_Suppress		
PCmd_IntlkTripSuppress		IntlkTrip.PCmd_Suppress		
PCmd_FailSuppress		Fail.PCmd_Suppress		
PCmd_HiHiDevUnsuppress	BOOL	HiHiDev.PCmd_Unsuppress	0	
PCmd_HiDevUnsuppress		HiDev.PCmd_Unsuppress		
PCmd_LoDevUnsuppress		LoDev.PCmd_Unsuppress		
PCmd_LoLoDevUnsuppress		LoLoDev.PCmd_Unsuppress		
PCmd_IntlkTripUnsuppress		IntlkTrip.PCmd_Unsuppress		
PCmd_FailUnsuppress		Fail.PCmd_Unsuppress		
PCmd_HiHiDevUnshelve	BOOL	HiHiDev.PCmd_Unshelve	0	• Set PCmd_<Alarm>Unshelve to 1 to Unshelve alarm • The parameter is reset automatically
PCmd_HiDevUnshelve		HiDev.PCmd_Unshelve		
PCmd_LoDevUnshelve		LoDev.PCmd_Unshelve		
PCmd_LoLoDevUnshelve		LoLoDev.PCmd_Unshelve		
PCmd_IntlkTripUnshelve		IntlkTrip.PCmd_Unshelve		
PCmd_FailUnshelve		Fail.PCmd_Unshelve		
OCmd_Casc	BOOL		0	Operator commands to select Cascade/ratio (Casc), Automatic (Auto), or Manual (Man) Loop mode.
OCmd_Auto	BOOL		0	
OCmd_Man	BOOL		0	
OCmd_Bypass	BOOL		0	Operator command to bypass the bypassable interlocks.
OCmd_Check	BOOL		0	Operator command to check (not bypass) all interlocks.
MCmd_Disable	BOOL		0	Maintenance command to disable or enable PID loop.
MCmd_Enable				
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 of the alarms requiring reset.
OCmd_ResetAckAll	BOOL		0	Operator command to reset all of the alarms and latched shed conditions.

Proportional + Integral + Derivative Enhanced Output Structure

Output parameters include the following:

- Output data elements (Out_) are the primary outputs of the instruction, typically used by hardware output modules; however, they can be used by other application logic.
- 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.
- Not Ready data elements (Nrdy_) are bit outputs of the instruction for use by the HMI for displaying the Device Not Ready indicator. Not Ready bits can also be used 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 4 - P_PIDE Output Parameters

Output Parameter	Data Type	alias For	Description
EnableOut	BOOL		Enable output: The EnableOut signal is not manipulated by this instruction. Its output state always reflects EnableIn input state.
Out_CV	REAL	Wrk_PIDE.CVEU	CV to final control element (CV engineering units).
Val_PV	REAL		Loop PV (PV engineering units).
Val_Ratio	REAL	Wrk_PIDE.Ratio	The current ratio (unitless).
Val_SPSet	REAL		Value of selected SP (before clamping) (PV engineering units).
Val_SP	REAL	Wrk_PIDE.SP	Value of SP being used (after clamping) (PV engineering units).
Val_E	REAL	Wrk_PIDE.E	Loop error (PV-SP) (PV engineering units).
Val_CVSet	REAL		Value of CV output (before ramping and clamping (CV%).
Val_CVOut	REAL	Wrk_PIDE.CV	Value of CV output (after ramping and clamping (CV%).
Val_PVPercent	REAL	Wrk_PIDE.PVPercent	Loop PV (percent of span).
Val_SPPercent	REAL	Wrk_PIDE.SPPercent	Loop SP (percent of span).
Val_EPercent	REAL	Wrk_PIDE.EPercent	Loop error (PV-SP) (percent of span).
Val_ActExecT	REAL	Wrk_PIDE.DeltaT	Actual PID algorithm execution time (elapsed time between updates) (seconds).
Val_Init	REAL		Initialization value for this loop's cascade primary (PV engineering units).

Table 4 - P_PIDE Output Parameters

Output Parameter	Data Type	alias For	Description
Val_PVEUMin	REAL		Minimum of PV scaled range (PV engineering units).
Val_PVEUMax	REAL		Maximum of PV scaled range (PV engineering units).
Val_CVEUMin	REAL		Minimum of CV scaled range (CV engineering units).
Val_CVEUMax	REAL		Maximum of CV scaled range (CV engineering units).
SrcQ_IO	SINT		I/O signal source and quality.
SrcQ			Final 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)
Val_Sts	SINT		Loop status enumeration: 0 = Unknown 1 = Manual 2 = Auto 3 = Cascade 4 = Ratio 33 = Disabled
Val_Fault	SINT		Loop fault status: 0 = None 22 = Low Deviation 23 = High Deviation 27 = Low-Low Deviation 28 = High-High Deviation 29 = Interlock Trip Shed 32 = FailShed 34 = Configuration Error
Val_State			Loop algorithm state: 1 = In deadband 2 = Outside deadband controlling 5 = Ratio clamped 6 = SP clamped 7 = CV clamped 8 = Windup Low 9 = Windup High 13 = Interlocked 14 = Hand 15 = Initializing

Table 4 - P_PIDE 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)
Val_HiHiDevLim	REAL	Wrk_PIDE.DevHHLimit	Current High-High, High, Low, Low-Low deviation status threshold (PV engineering units). These parameters are aliased to parameter DevHHLimit, DevHLimit, DevLLimit, or DevLLLimit of the contained PIDE built-in instruction.
Val_HiDevLim		Wrk_PIDE.DevHLimit	
Val_LoDevLim		Wrk.PIDE.DevLLimit	
Val_LoLoDevLim		Wrk.PIDE.DevLLLimit	
Sts_InstrFaults1	DINT	2#0000_0000_0000_0000_0000_0000_0000_0000	PIDE Block Status 1 Instruction Fault bits (see PIDE Instruction Help).
Sts_InstrFaults2		2#0000_0000_0000_0000_0000_0000_0000_0000	PIDE Block Status 2 Instruction Fault bits (see PIDE Instruction Help).
Sts_Casc	BOOL	Wrk_PIDE.CasRat	1 = Loop mode is cascade/ratio, automatic, or manual.
Sts_Auto		Wrk_PIDE.Auto	
Sts_Man		Wrk_PIDE.Manual	
Sts_Initializing	BOOL	Wrk_PIDE.CVInitializing	1 = CV is initializing because of request from this loop's secondary.
Sts_InitReq	BOOL	Wrk_PIDE.InitPrimary	1 = CV initialize request to this loop's primary.
Sts_WindupHi	BOOL	Wrk_PIDE.WindupHOut	1 = This loop winding up High, to Inp_WindupHi of this loop's primary.
Sts_WindupLo	BOOL	Wrk_PIDE.WindupLOut	1 = This loop winding up Low, to Inp_WindupLo of this loop's primary.
Sts_ZCDBOn	BOOL	Wrk_PIDE.ZCDeadbandOn	Deadband indicator: 1 = Error is within zero-crossing deadband and CV does not change
Sts_RatioClamped	BOOL		1 = Selected ratio (PSet/OSet_Ratio or Inp_OvrdRatio) has been clamped.
Sts_SPBad	BOOL	Wrk_PIDE.SPOperInv	1 = SP Value is bad (quality) or invalid or Casc SP communication fault.
Sts_SPClamped	BOOL		1 = Selected SP is being clamped (for faceplate animation).
Sts_PVBad	BOOL	Wrk_PIDE.PVFaulted	1 = PV Value, communication, quality, or engineering units limit is bad.
Sts_PVUncertain	BOOL		1 = PV Value is uncertain (quality).
Sts_FFBad	BOOL	Wrk_PIDE.FFInv	1 = Feedforward term value is invalid.

Table 4 - P_PIDE Output Parameters

Output Parameter	Data Type	alias For	Description
Sts_FFPrevBad	BOOL	Wrk_PIDE.FFPreviousInv	1 = Inp_FFPrev is <-100.0, >100.0, or not a number (NaN).
Sts_CVBad	BOOL	Wrk_PIDE.CVFaulted	1 = CV Value is bad (quality) or invalid or there is a CV communication fault.
Sts_CVPrevBad	BOOL	Wrk_PIDE.CVPreviousInv	1 = Inp_CVPrev is <0.0, >100.0, or not a number (NaN).
Sts_CVInitValBad	BOOL		1 = Inp_CVInitVal is <0.0, >100.0, or not a number (NaN).
Sts_HandFdbkBad	BOOL	Wrk_PIDE.HandFBFaulted	1 = Hand feedback (tieback) value is bad (quality), invalid, or communication fault.
Sts_IntlkCV	BOOL		1 = CV value being set by shed to Interlock CV.
Sts_CVClamped	BOOL		1 = Selected CV is being clamped (for faceplate animation).
Sts_CVRamping	BOOL	Wrk_PIDE.CVROCAlarm	1 = CV is ramping toward Val_CVSet 0 = Ramp complete
Sts_Active	BOOL		1 = CV is greater than Cfg_MaxInactiveCV, show graphic symbol as 'active' (for example. valve open).
Sts_Available	BOOL		1 = Instruction 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 = Loop is disabled (held at configured Interlock CV).
Sts_NotRdy	BOOL		1 = Loop is not ready to be operated. See detail Not Ready bit for reason.
Nrdy_Disabled			1 = Loop Not Ready: • Loop disabled by Maintenance • Configuration error • Interlock not OK • Initialized to Manual mode • I/O Fault (shed requires reset) • Loop logic disabled/no mode
Nrdy_CfgErr			
Nrdy_Intlk			
Nrdy_Init			
Nrdy_IOFault			
Nrdy_NoMode			
Sts_MaintByp	BOOL		1 = Loop 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 error bits for reason.
Err_RatioLim	BOOL	Wrk_PIDE.RatioLimitsInv	1 = Error in configuration: ratio clamping limits invalid.
Err_SPLim	BOOL	Wrk_PIDE.SPLimitsInv	1 = Error in configuration: setpoint clamping limits invalid.
Err_PVEU	BOOL	Wrk_PIDE.PVSpanInv	1 = Error in configuration: PV enginerring units (EU) maximum/minimum invalid.
Err_CVLim	BOOL	Wrk_PIDE.CVLimitsInv	1 = Error in configuration: CV clamping limits invalid.
Err_CVEU	BOOL	Wrk_PIDE.CVEUSpanInv	1 = Error in configuration: CV engineering units (EU) maximum/minimum invalid.
Err_Timer	BOOL		1 = Error in configuration: status on-delay or off-delay time invalid.
Err_DB	BOOL	Wrk_PIDE.ZCDeadbandInv	1 = Error in configuration: zero-crossing deadband invalid.
Err_Alarm	BOOL		1 = Error in configuration: alarm severity, minimum on time, or shelf time invalid.
Sts_Hand	BOOL	Mode.Sts_Hand	1 = Mode is Hand (supersedes Operator, Program, Override, and Maintenance), Maintenance (supersedes Operator, Program, and Override), Override (supersedes Operator and Program), Program, or Operator.
Sts_Maint		Mode.Sts_Maint	
Sts_Ovrd		Mode.Sts_Ovrd	
Sts_Prog		Mode.Sts_Prog	
Sts_Oper		Mode.Sts_Oper	
Sts_ProgOperLock	BOOL	Mode.Sts_ProgOperLock	1 = Program or Operator has requested mode lock.
Sts_NoMode	BOOL	Mode.Sts_NoMode	1 = No mode selected (instruction scanned false).

Table 4 - P_PIDE Output Parameters

Output Parameter	Data Type	alias For	Description
Sts_MAcqRcvd	BOOL	Mode.Sts_MAcqRcvd	1 = Maintenance Acquire command received this scan.
Sts_HiHiDevCmp	BOOL	HiHiDevGate.Inp	High-High, High, Low, or Low-Low deviation comparison result: 1 = Deviation beyond limit.
Sts_HiDevCmp		HiDevGate.Inp	
Sts_LoDevCmp		LoDevGate.Inp	
Sts_LoLoDevCmp		LoLoDevGate.Inp	
Sts_HiHiDevGate	BOOL	HiHiDevGate.Sts_Gate	High-High, High, Low, or Low-Low deviation gate delay status: 1 = done.
Sts_HiDevGate		HiDevGate.Sts_Gate	
Sts_LoDevGate		LoDevGate.Sts_Gate	
Sts_LoLoDevGate		LoLoDevGate.Sts_Gate	
Sts_HiHiDev	BOOL	HiHiDev.Inp	1 = PV deviation is above High-High, above High, below Low, or below Low-Low limit.
Sts_HiDev		HiDev.Inp	
Sts_LoDev		LoDev.Inp	
Sts_LoLoDev		LoLoDev.Inp	
Sts_IntlkTrip		IntlkTrip.Inp	1 = Interlock NOT OK caused loop output to hold or change.
Sts_Fail		Fail.Inp	1 = Loop Failure: PV Bad, SP Bad or CV Communication failure or bad.
Alm_HiHiDev	BOOL	HiHiDev.Alm	1 = Loop High-High, High, Low, or Low-Low deviation alarm.
Alm_HiDev		HiDev.Alm	
Alm_LoDev		LoDev.Alm	
Alm_LoLoDev		LoLoDev.Alm	
Alm_IntlkTrip		IntlkTrip.Alm	1 = Interlock trip alarm.
Alm_Fail		Fail.Alm	1 = Loop failure alarm: PV Bad, SP Bad or CV Communication failure or bad.
Ack_HiHiDev	BOOL	HiHiDev.Ack	1 = High-High, High, Low, or Low-Low deviation, Interlock Trip, or Loop Failure alarm has been acknowledged.
Ack_HiDev		HiDev.Ack	
Ack_LoDev		LoDev.Ack	
Ack_LoLoDev		LoLoDev.Ack	
Ack_IntlkTrip		IntlkTrip.Ack	
Ack_Fail		Fail.Ack	
Sts_HiHiDevDisabled	BOOL	HiHiDev.Disabled	1 = High-High, High, Low, or Low-Low deviation, Interlock Trip, or Loop Failure alarm has been disabled by Maintenance.
Sts_HiDevDisabled		HiDev.Disabled	
Sts_LoDevDisabled		LoDev.Disabled	
Sts_LoLoDevDisabled		LoLoDev.Disabled	
Sts_IntlkTripDisabled		IntlkTrip.Disabled	
Sts_FailDisabled		Fail.Disabled	
Sts_HiHiDevShelved	BOOL	HiHiDev.Shelved	1 = High-High deviation, High deviation, Low deviation, Low-Low deviation, Interlock Trip, or Loop Failure alarm has been shelved by Operator.
Sts_HiDevShelved		HiDev.Shelved	
Sts_LoDevShelved		LoDev.Shelved	
Sts_LoLoDevShelved		LoLoDev.Shelved	
Sts_IntlkTripShelved		IntlkTrip.Shelved	
Sts_FailShelved		Fail.Shelved	

Table 4 - P_PIDE Output Parameters

Output Parameter	Data Type	alias For	Description
Sts_HiHiDevSuppressed	BOOL	HiHiDev.Suppressed	1 = High-High deviation, High deviation, Low deviation, Low-Low deviation, Interlock Trip, or Loop Failure alarm has been suppressed by Program.
Sts_HiDevSuppressed		HiDev.Suppressed	
Sts_LoDevSuppressed		LoDev.Suppressed	
Sts_LoLoDevSuppressed		LoLoDev.Suppressed	
Sts_IntlkTripSuppressed		IntlkTrip.Suppressed	
Sts_FailSuppressed		Fail.Suppressed	
Rdy_Casc	BOOL		1 = Ready to receive operator command: cascade, automatic, manual, bypass, or check (enables HMI button).
Rdy_Auto			
Rdy_Man			
Rdy_Bypass			
Rdy_Check			
Rdy_Disable	BOOL		1 = Ready to receive MCmd_Disable (enables HMI button).
Rdy_Enable	BOOL		1 = Ready to receive MCmd_Enable (enables HMI button).
Rdy_Reset	BOOL		1 = Ready to receive OCmd_Reset (enables HMI button).
Rdy_ResetAckAll	BOOL		1 = At least one Alarm or latched Shed condition requires Reset or Acknowledge.
Rdy_Ratio	BOOL		1 = Ready to receive OSet_Ratio (enables data entry field).
Rdy_SP	BOOL		1 = Ready to receive OSet_SP (enables data entry field).
Rdy_CV	BOOL		1 = Ready to receive OSet_CV (enables data entry field).
Rdy_OSet	BOOL		1 = Ready to receive other OSets (enables data entry fields).
P_PIDE	BOOL		Unique parameter name for auto-discovery.

Proportional + Integral + Derivative Enhanced Local Configuration Tags

Configuration parameters that are arrayed, 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 RSLogix 5000 software 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 RSLogix 5000 software export/import functionality.

Table 5 - P_PIDE Input Local Configuration Tags

Tag Name	Data Type	Default	Description
Cfg_CascSPNavTag	STRING_20	' '	Tag name for destination of Cascade SP navigation button.
Cfg_CVEU	STRING_8	'%'	CV engineering units displayed on HMI.
Cfg_CVNavTag	STRING_20	' '	Tag name for destination of CV navigation button.
Cfg_Desc	STRING_40	'PID Control Loop'	Description for display on HMI. This string is shown in the title bar of the faceplate.
Cfg_Label	STRING_20	'PID Loop'	Label for graphic symbol displayed on HMI. This string appears on the graphic symbol.
Cfg_PVEU	STRING_8	'%'	PV/setpoint engineering units displayed on HMI.
Cfg_PVNavTag	STRING_20	' '	Tag name for destination of PV navigation button.
Cfg_Tag	STRING_20	'P_PIDE'	Tag name displayed on HMI. This string is shown in the title bar of the faceplate.

Operations

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

Modes

The P_PIDE Add-On Instruction uses the following standard modes, implemented by using an embedded P_Mode Add-On Instruction.

Graphic Symbol	Description
Operator mode	Control of the loop is owned by the Operator. Operator Commands (OCmd_) and Operator Settings (OSet_) from the HMI are accepted.
Program mode	Control of the loop is owned by Program logic. Program Commands (PCmd_) and Program Settings (PSet_) are accepted.
Override mode	Control of the loop is owned by priority logic, superseding Operator and Program control. Override Inputs (Inp_OvrdCmd and other Inp_OvrdXxxx values) are accepted. If so configured, bypassable interlocks are bypassed.
Maintenance mode	Control of the loop is owned by Maintenance. Operator Commands and Settings from the HMI are accepted. Bypassable interlocks are bypassed.
Hand mode	Control of the final control element is owned by hard-wired logic or other logic outside the instruction. The instruction CV tracks the hand feedback for bumpless transfer back to one of the other modes.
No mode	The loop is disabled and has no owner because the EnableIn input is false. The main instruction Logic routine is not being scanned. See Execution for more information on EnableInFalse processing.

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

Loop Modes

The P_PIDE Add-On Instruction uses the following Loop modes.

Loop Mode	Description
Manual (Man)	The P_PIDE controlled variable (CV) output is manipulated directly and the PID algorithm is not calculated.
Automatic (Auto)	The P_PIDE setpoint (SP) is manipulated. The PID algorithm uses the difference between the SP and the process variable (PV) to calculate a CV to bring the PV back to setpoint.
Cascade (Casc)	The P_PIDE setpoint is provided via the Inp_CascSP input. If ratio control is enabled, this input is multiplied by the current ratio to determine the loop setpoint. The PID algorithm uses the difference between the setpoint and the PV to calculate a CV to bring the PV to setpoint.

Alarms

The P_PIDE instruction uses the following alarms, implemented by using embedded P_Alarm and P_Gate Add-On Instructions.

Alarm Name	P_Alarm Name	P_Gate Name	Description
High-High Deviation	HiHiDev	HiHiDevGate	PV exceeds SP by High-High threshold. Threshold is set by Operator or Program. Deadband, gating, timing, and severity are set in configuration.
High Deviation	HiDev	HiDevGate	PV exceeds SP by High threshold. Threshold is set by Operator or Program. Deadband, gating, timing, and severity are set in configuration.
Low Deviation	Lo	LoDevGate	PV falls below SP by Low threshold. Threshold is set by Operator or Program. Deadband, gating, timing, and severity are set in configuration.
Low-Low Deviation	LoLo	LoLoDevGate	PV falls below SP by Low-Low threshold. Threshold is set by Operator or Program. Deadband, gating, timing, and severity are set in configuration.
Intlk Trip	IntlkTrip	None	An interlock condition has set the loop CV.
Fail	Fail		The internal PIDE has a fault. See the P_PIDE instruction status bits for the reason.

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

The P_PIDE Add-On Instruction does not have Simulation capability.

Execution

The following table explains the handling of instruction execution conditions

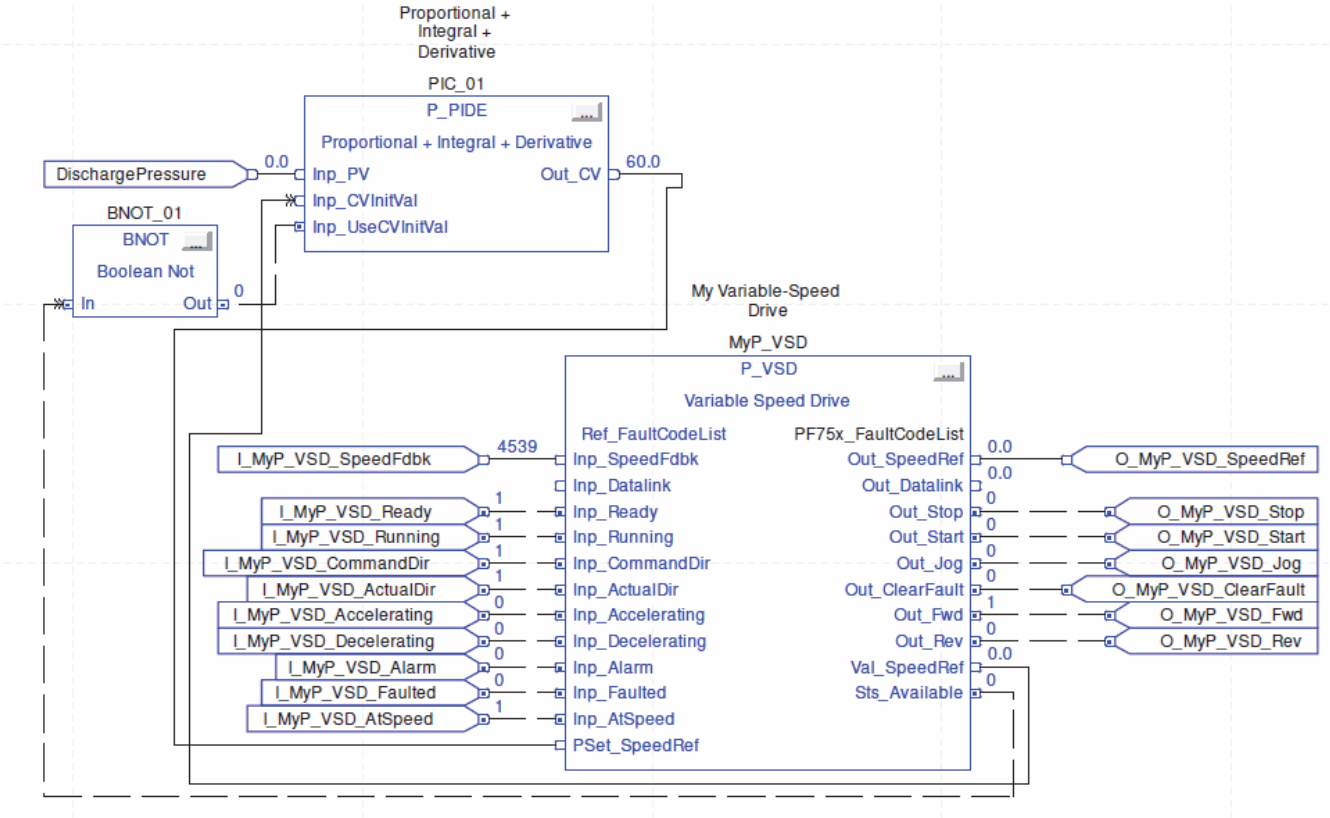
Condition	Description
EnableIn False (false rung)	The instruction Mode is shown as No Mode. The loop status is shown as disabled. The loop CV is set to the configured interlock CV value.
Powerup (prescan, first scan)	Received commands are cleared. The loop is initialized with the powerup Loop mode, CV, and SP.
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.

Programming Example

An example showing P_PIDE with P_VSD is shown below.

The output of the P_PIDE block (Out_CV) is used as the input to the P_VSD block (PSet_SpeedRef). The P_VSD output Sts_Available is True when the drive is available to be controlled by the program. When this value is False (the drive is not in program mode), the P_PIDE input Inp_UseCVInitVal is set to True, forcing the P_PIDE block to initialize its CV value to Inp_CVInitVal. Inp_CVInitVal is connected for the output Val_SpeedRef (speed target to the drive).



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.

Table 6 - P_PIDE Display Elements Description

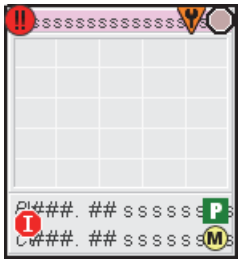
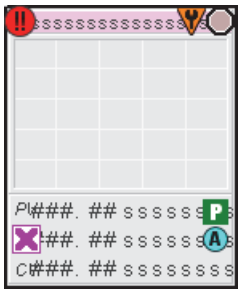
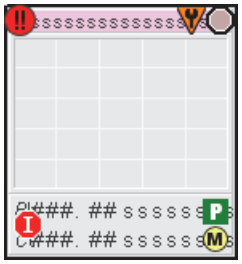
Display Element Name	Display Element	Description
GO_P_PID		Display element with PV and CV numeric displays.
GO_P_PID1		Display element with PV, SP, and CV numeric displays.
GO_P_PID2		Display element with SP and CV numeric displays.
GO_P_PID_Trend		Display Element with PV and CV numeric displays and a trend display plotting SP, PV, High and Low Deviations. The trend is scaled to PV EU Min and Max.
GO_P_PID_Trend1		Display Element with PV, SP, and CV numeric displays and a trend display plotting SP, PV, High and Low Deviations. The trend is scaled to PV EU Min and Max.
GO_P_PID_TrendWTarget		Display Element with PV and CV numeric displays and a trend display plotting SP, PV, High and Low Deviations. The trend is scaled by using the High and Low Deviations.

Table 6 - P_PIDE Display Elements Description

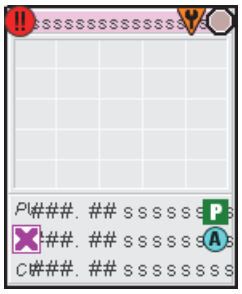
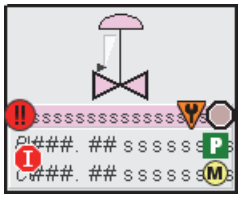
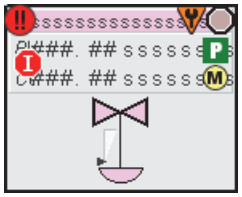
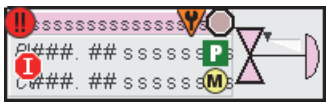
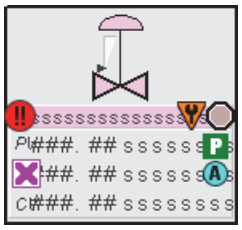
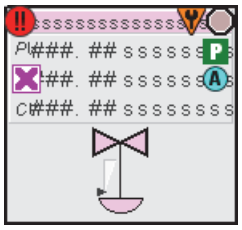
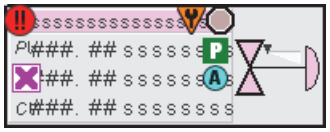
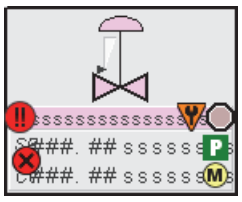
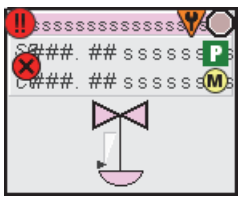
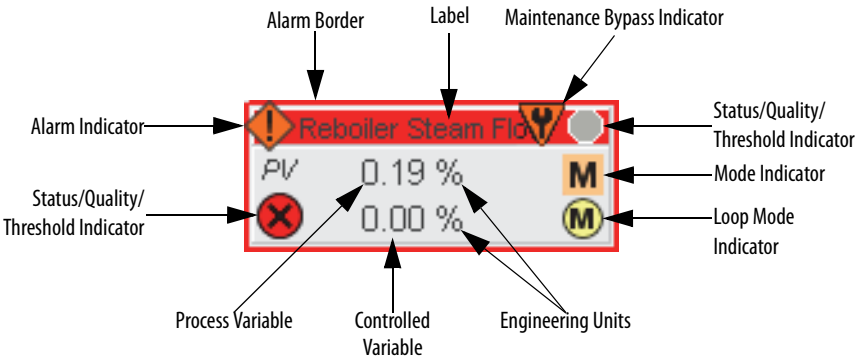
Display Element Name	Display Element	Description
GO_P_PID_TrendWTarget1		Display Element with PV, SP, and CV numeric displays and a trend display plotting SP, PV, High and Low Deviations. The trend is scaled by using the High and Low Deviations.
GO_P_PID_Indicator		Bar graph with SP on the left and PV on the right scaled by PV EU minimum and maximum.
GO_P_PID_Valve		Proportional Valve display element with PV and CV numeric displays.
GO_P_PID_Valve1		
GO_P_PID_Valve2		
GO_P_PID_Valve3		

Table 6 - P_PIDE Display Elements Description

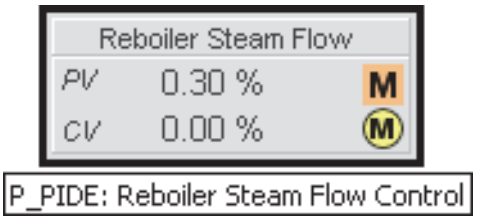
Display Element Name	Display Element	Description
GO_P_PID_Valve4		Proportional Valve display element with PV, CV, and Setpoint numeric displays.
GO_P_PID_Valve5		
GO_P_PID_Valve6		
GO_P_PID_Valve7		
GO_P_PID_Valve8		Proportional Valve display element with SP, CV, and Setpoint numeric displays.
GO_P_PID_Valve9		
GO_P_PID_Valve10		
GO_P_PID_Valve11		

Common attributes of the P_PIDE global objects include the following:

- Alarm border
- Alarm indicator
- Engineering units
- Various combinations of PV, SP, and CV
- Label
- Maintenance bypass indicator
- Mode indicator
- Loop mode indicator
- Status/Quality/Threshold indicators



Each graphic symbol includes a touch field over it that calls up the object's faceplate. In addition, there is a tooltip on the graphic symbol that displays the object's configured tag and description state indicators.



Loop Mode Indicators

These indicators show the control Loop mode.

Graphic Symbol	Description
	The loop is in Auto mode. (Cascade mode is not enabled.)
	The loop is in Auto mode. (Cascade mode is enabled.)
	The loop is in Cascade mode.
	The loop is in Manual mode.
	The CV has reached a high limit and cannot control the loop.
	The CV has reached a low limit and cannot control the loop.

Status/Quality/Threshold Indicators

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

Graphic Symbol	Description
	Invalid configuration
	PV, SP, or CV quality bad: Not a number, out of range, or communication failure
	PV, SP, or CV value uncertain
	The loop is not ready to operate
	Value clamped to minimum/maximum
	Value is being initialized
	Device is disabled
	PV within SP Deadband (no control action occurs)
No symbol displayed	PV, SP, and CV quality good

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.

The Invalid Configuration indicator appears when the following occurs:

- The Zero Crossing Deadband is less than zero.
- The Ratio Low (clamping) Limit is less than zero, or the Ratio High (clamping) Limit is less than the Ratio Low Limit.
- The Setpoint Low (clamping) Limit is less than the PV range minimum, the Setpoint High (clamping) Limit is greater than the PV range maximum, or the Setpoint High Limit is less than the Setpoint Low Limit.
- The Controlled Variable Low (clamping) Limit is less than the PV range minimum, the Controlled Variable High (clamping) Limit is greater than the PV range maximum, or the Controlled Variable High Limit is less than the Controlled Variable Low Limit.
- The PV span is invalid: PVEU range maximum is less than or equal to the PVEU range minimum.
- The CV span is invalid: CVEU range maximum is equal to the CVEU range minimum.

- A deviation status gate delay, on-delay or off-delay time is less than zero or greater than 2,147,483 seconds.
- An alarm minimum On time or shelf time is less than zero or greater than 2,147,483 seconds.
- 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 is preventing 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 preventing operation is flagged.

For the P_PIDE instruction, the Device Not Ready indicator appears under the following conditions:

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

These indicators show the deviation has exceeded a threshold.

Table 7 - Exceeded Deviation Thresholds

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

Maintenance Bypass Indicator

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

Graphic Symbol	Description
	A Maintenance bypass is active
No symbol displayed	No Maintenance bypass active

TIP The Maintenance Bypass indicator appears when bypassable interlocks have been bypassed. 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 P_PIDE Add-On Instruction, the Maintenance Bypass Indicator appears when the Interlocks have been bypassed.

Mode Indicators

One of these symbols appears to the right of the graphic symbol to indicate the instruction (ownership) mode.

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

Alarm Indicators

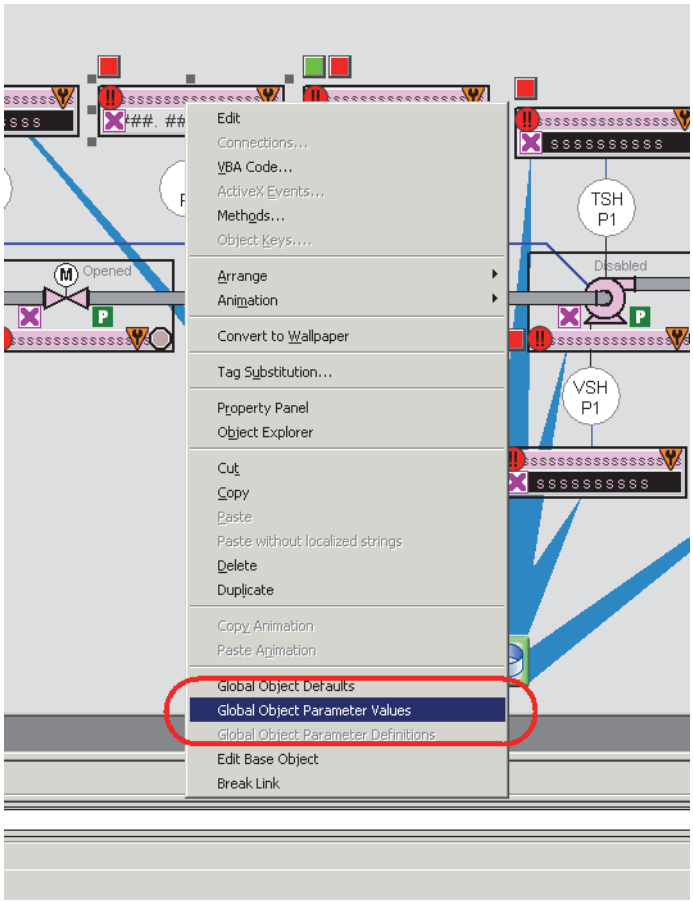
One of these symbols appears to the left of the label to indicate the described alarm condition. The alarm border and label background blink if acknowledgement or reset of an alarm condition is required.

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.

Using Display Elements

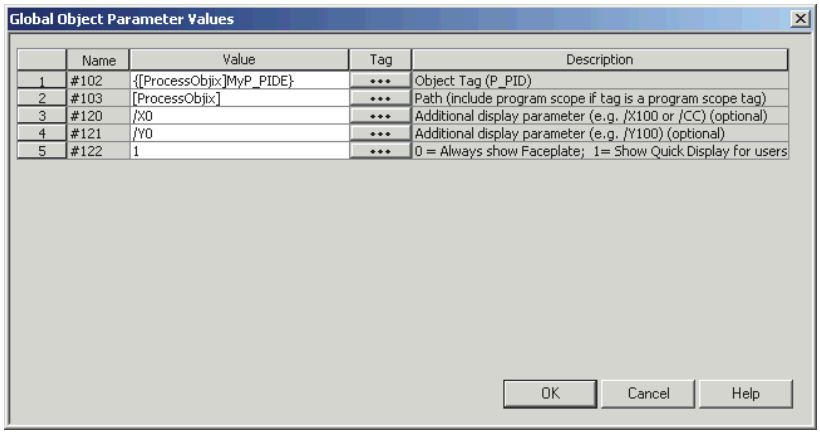
The global objects for P_PIDE can be found in the global object file (RA-BAS) P_PID Graphics Library.ggfx. Follow these steps to use a global object.

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.

Parameter	Required	Description
#102	Y	Object tag to point to the backing tagof 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 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.

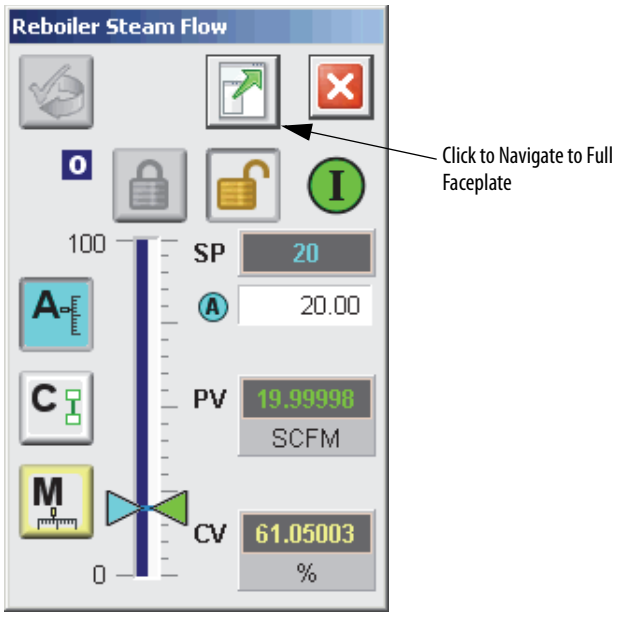
   TIP Click the ellipsis (. . .) to browse and select a tag.

   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_PIDE instruction instance. From the Quick Display, you can navigate to the faceplate for full access for operation, maintenance, and configuration for operation, maintenance, and configuration.

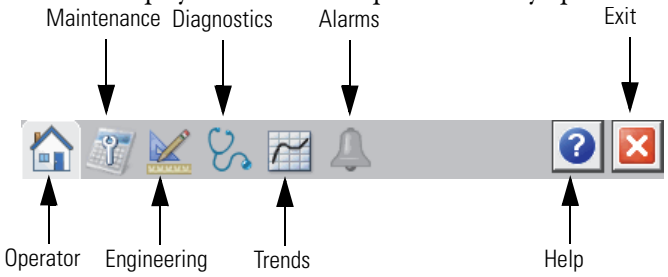


Faceplate

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

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

The Operator tab is displayed when the faceplate is initially opened.



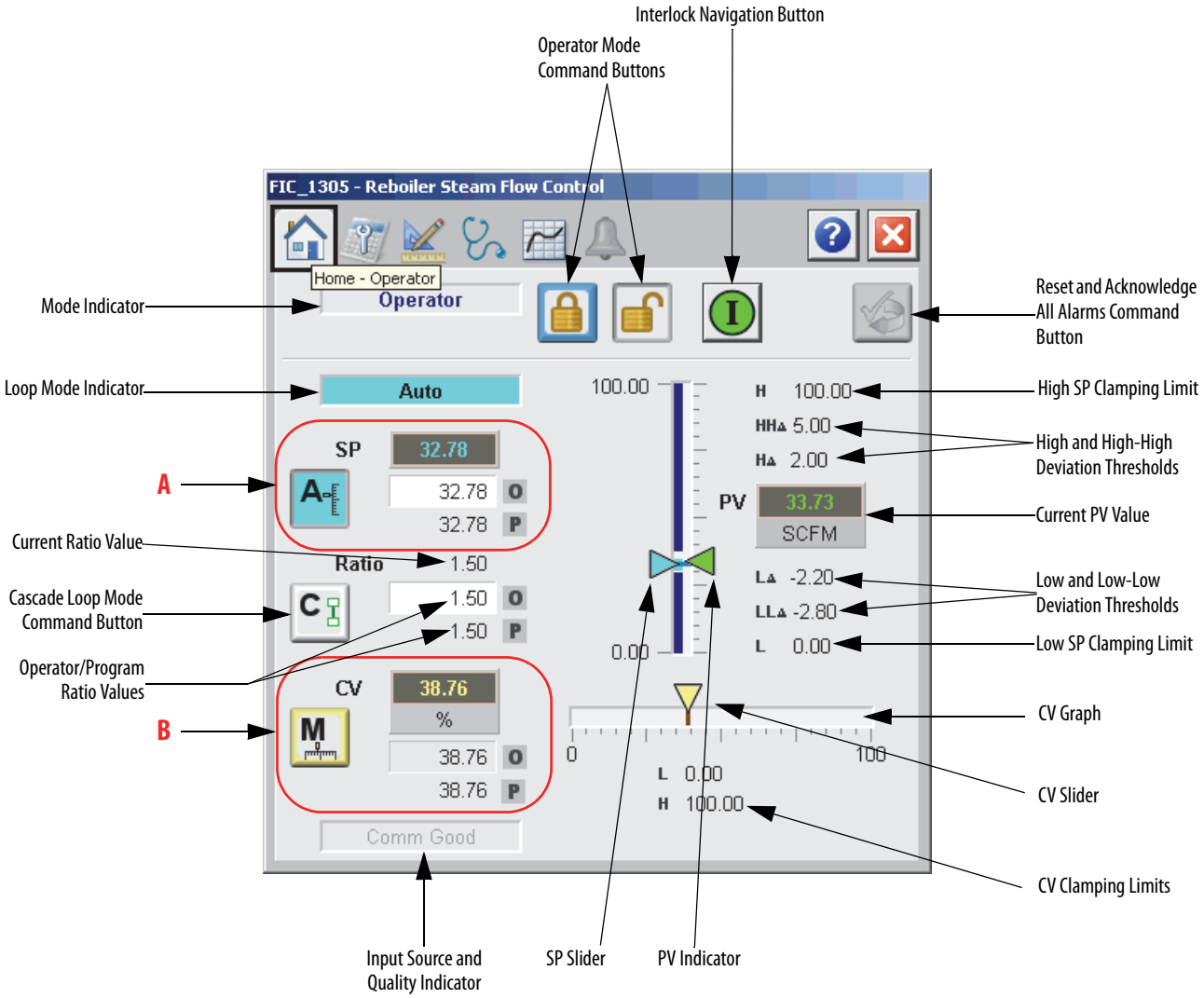
The faceplate provides the means for operators, maintenance personnel, engineers, and others to interact with the P_PIDE instruction instance. When a given input is restricted via Factory Talk View security, the required user Security Code letter is shown in the tables that follow.

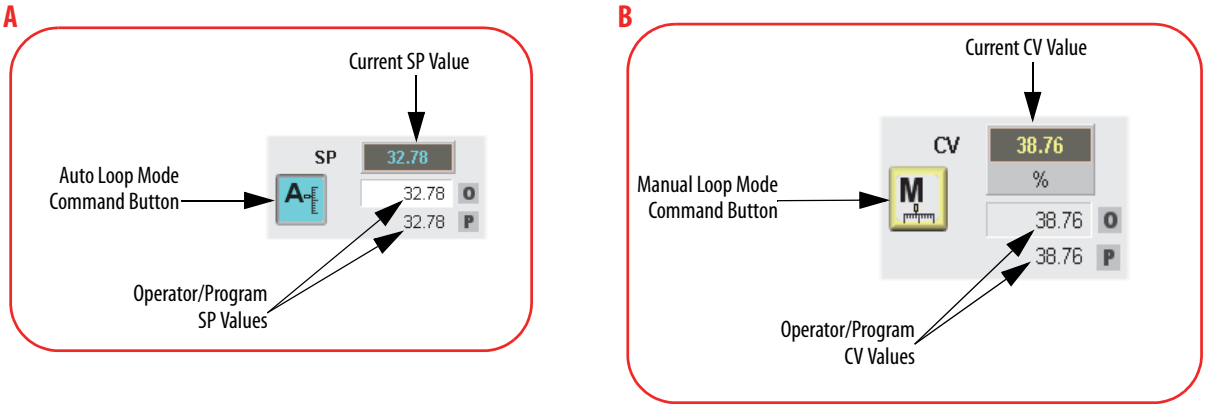
Operator Tab

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 instruction mode (Program, Operator, or Maintenance)
- Requested modes indicator (This appears only if the Operator or Program mode has been superseded by another mode.)
- Current Setpoint (SP)
- Current Process Variable (PV)
- Current Control Variable (CV)
- Bar graph for the current Process Variable
- Bar graph for the current Control Variable
- High (H) and Low (L) SP clamping limits
- High (H) and Low (L) CV clamping limits
- High-High (HH), High (H), Low (L), and Low-Low (LL) deviation values are displayed with a label background that turns yellow when exceeded
- Input Source and Quality indicator (See 'SrcQ' in the Output parameters table on page 19 for details).


Interlock Navigation Button
Operator Mode Command Buttons
FIC_1305 - Reboiler Steam Flow Control
Home - Operator
Mode Indicator
Operator
Reset and Acknowledge All Alarms Command Button
Loop Mode Indicator
Auto
100.00
H 100.00
High SP Clamping Limit
HH▲ 5.00
H▲ 2.00
High and High-High Deviation Thresholds
A
SP
32.78
32.78 O
32.78 P
PV
33.73
SCFM
Current PV Value
Current Ratio Value
Ratio
1.50
Cascade Loop Mode Command Button
1.50 O
1.50 P
L▲ -2.20
LL▲ -2.80
Low and Low-Low Deviation Thresholds
L 0.00
Low SP Clamping Limit
Operator/Program Ratio Values
0.00
B
CV
38.76
%
CV Graph
38.76 O
38.76 P
0
100
L 0.00
H 100.00
CV Slider
Comm Good
CV Clamping Limits
Input Source and Quality Indicator
SP Slider
PV Indicator


A
Current SP Value
SP
32.78
Auto Loop Mode Command Button
32.78 O
32.78 P
Operator/Program SP Values
B
Current CV Value
CV
38.76
%
Manual Loop Mode Command Button
38.76 O
38.76 P
Operator/Program CV Values

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

Table 8 - 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 open Interlocks faceplate.	None
	Click to reset and acknowledge all alarms.	Acknowledge Alarms (Code F)
	Click to request Automatic Loop mode.	Normal Operation of Devices (Code A)
	Click to request Cascade Loop mode.	
	Click to request Manual Loop mode.	
Operator Setpoint Value.	Type a value for the loop setpoint. **IMPORTANT:** This value can be entered only when the instruction mode is Operator and the Loop mode is Automatic or Manual.	
Operator Ratio Value.	Type a value for the ratio to be applied to the cascade setpoint input. **IMPORTANT:** This value can be entered only when the instruction mode is Operator.	
Operator CV Value.	Type a value for the loop CV output. **IMPORTANT:** This value can be entered only when the instruction mode is Operator and the Loop mode is Manual.	
CV Slider	Move this slider to adjust the loop CV output.	Equipment Maintenance (Code C)
SP Slider	Move this slider to adjust the loop setpoint.	
Current SP Value	Click to navigate to the SP object.	None
Current PV Value	Click to navigate to the PV object.	
Current CV Value	Click to navigate to the CV object.	

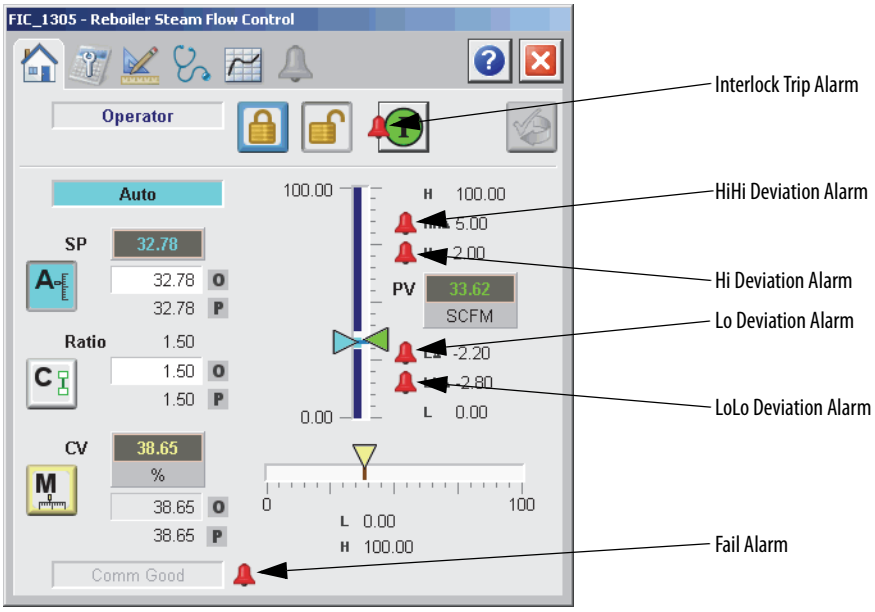
If the object is configured to have an interlock object (for example, Cfg_HasIntlkObj is true), the interlock indication becomes a button that opens the faceplate of the source object used as an interlock (often this is a P_Intlk interlock object). If the object is not configured in this way, the interlock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

Refer to Rockwell Automation Library of Process Objects: Interlock with First Out and Bypass (P_Intlk) Reference Manual, publication SYSLIB-RM004, for more information.

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

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

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



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

Table 9 - 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)

Maintenance Tab

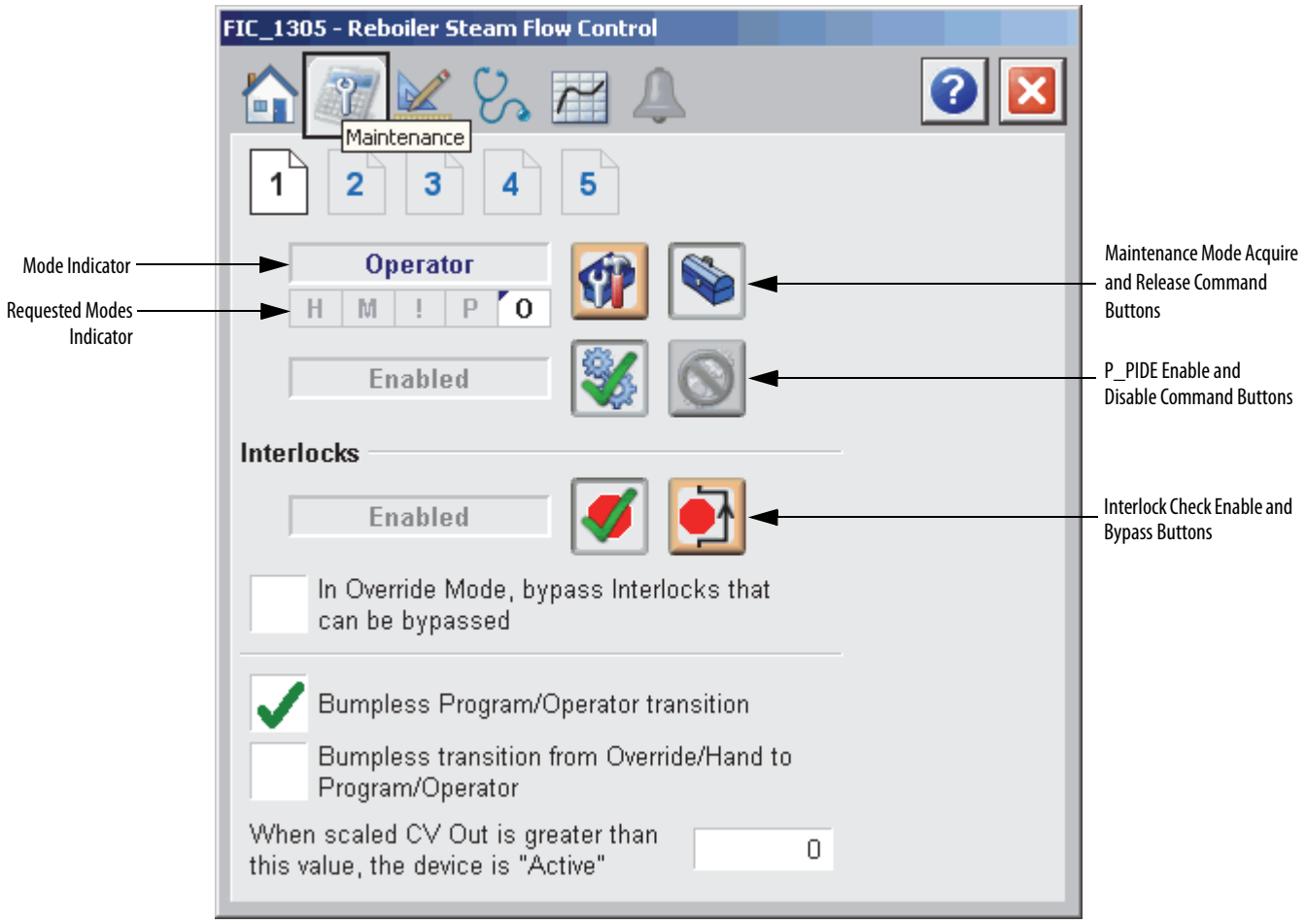
Maintenance personnel use the information and controls on the Maintenance tab to make adjustments to device parameters, troubleshoot and temporarily work around device problems, and disable the device for routine maintenance.

The Maintenance tab is divided into five pages.

Maintenance Tab Page 1

Page 1 of the Maintenance tab shows the following information:

- Current mode (Operator, Program, Override, Maintenance, or Hand).
- Requested modes indicator highlights all of the 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 10 - 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 Loop.		
	Click to disable Loop.		
	Click to Enable checking of all interlocks and permissives.		

Table 10 - Maintenance Tab Page 1 Description

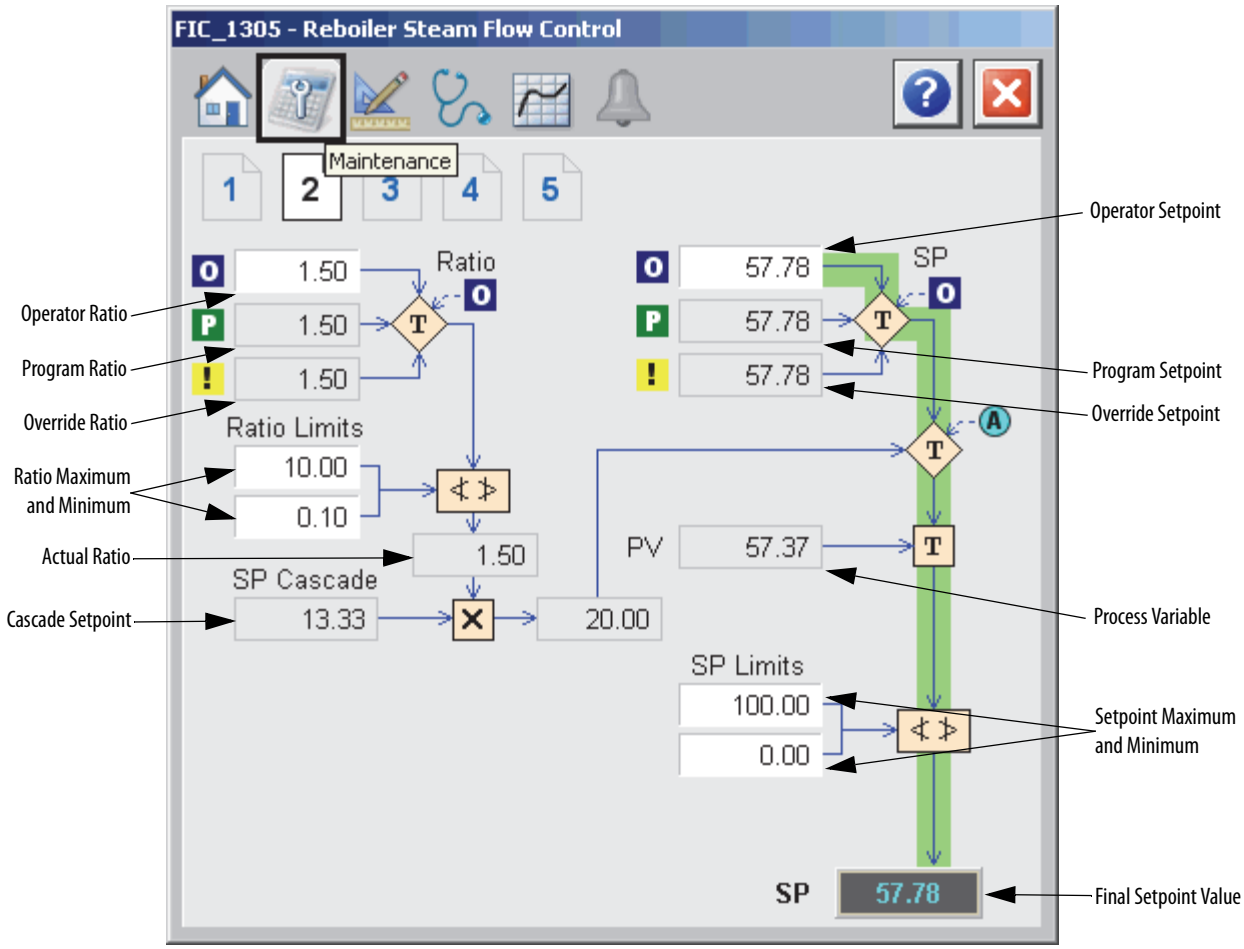
Function	Action	Security	Configuration Parameters
	Click to Bypass checking of bypassable interlocks and permissives.	Equipment Maintenance (Code C)	None
In Override Mode, bypass Interlocks that can be bypassed	Check to bypass Interlocks that can be bypassed while in Override mode.	Configuration and Tuning Maintenance (Code D)	Cfg_OvrdIntlk
Bumpless Program/Operator Transition	Check so that when this parameter is: • 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.		Cfg_SetTrack
Bumpless Transition from Override/Hand to Program/Operator	Check so that Program and operator settings track 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 that 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, and the HMI shows the graphic symbol in the inactive state (for example, control valve shown as Closed).		Cfg_MaxInactiveCV

Maintenance Tab Page 2

IMPORTANT Some items are not visible depending on the configuration of loop features. For example, if Cascade Loop mode is disabled, the Cascade and Ratio portions of the diagram are not shown.

Page 2 of the Maintenance tab shows the following information:

- The loop ratio being requested by Program and Override logic
- The loop setpoint (SP) being requested by Program and Override logic (in engineering units)
- The cascade setpoint as received at the input of the instruction (in engineering units)
- The loop process variable (PV) (in engineering units)
- The actual loop setpoint after selection and clamping (in engineering units)
- The source of the setpoint, by animation of the data path and transfer points



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

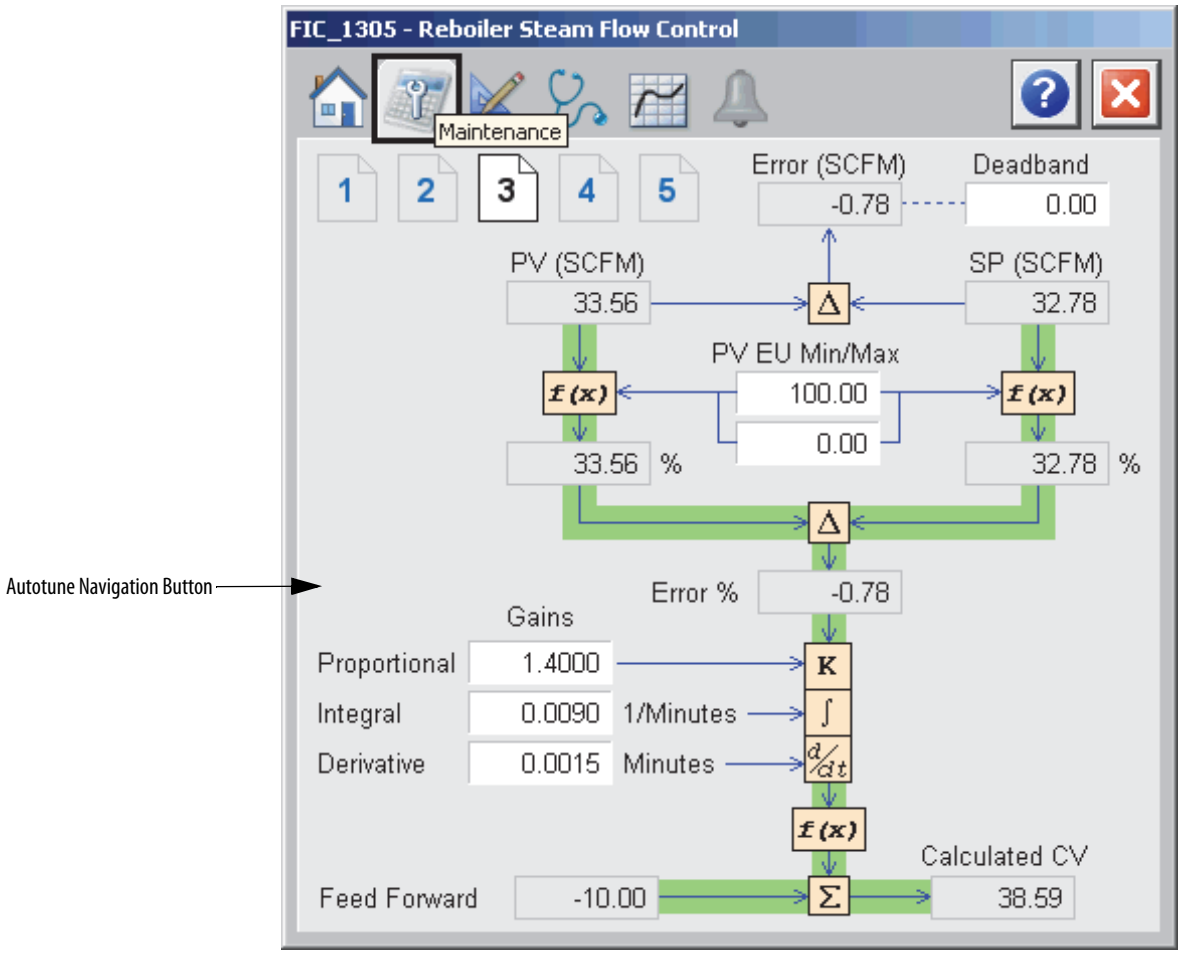
Table 11 - Maintenance Tab Page 2 Description

Function	Action	Security	Configuration Parameters
Operator Ratio	Type the Operator ratio.	Normal Operation of Devices (Code A)	None
Ratio Maximum/ Minimum Limits	Type the maximum and minimum limits for the ratio.	Configuration and Tuning Maintenance (Code D)	Cfg_MaxRatio Cfg_MinRatio
Operator Setpoint	Type the Operator Setpoint for the Operator Loop mode.	Normal Operation of Devices (Code A)	None
Setpoint Maximum/ Minimum Limits	Type the maximum and minimum limits for the setpoint.	Configuration and Tuning Maintenance (Code D)	Cfg_MaxSP Cfg_MinSP
SP	Click the SP value to navigate to the attached object. **IMPORTANT:** 'Cascade SP' on page 4 of the Engineering tab must be enabled and an object tag name provided for this value to be clickable. (See Engineering Tab Page 4 on page 62.)	None	None

Maintenance Tab Page 3

Page 3 of the Maintenance tab shows the following information:

- Entry field for Deadband
- Autotune navigation button (only visible if Autotune is defined)
- Loop PV (in engineering units and percent)
- Loop SP (in engineering units and percent)
- Feed Forward input value (CV percent)
- Entry fields for the PV Min/Max (in engineering units)
- Loop Error (in engineering units and percent)
- Entry fields for Proportional, Integral, and Derivative Gains
- Calculated CV



The following table shows the functions of page 3 of the Maintenance tab.

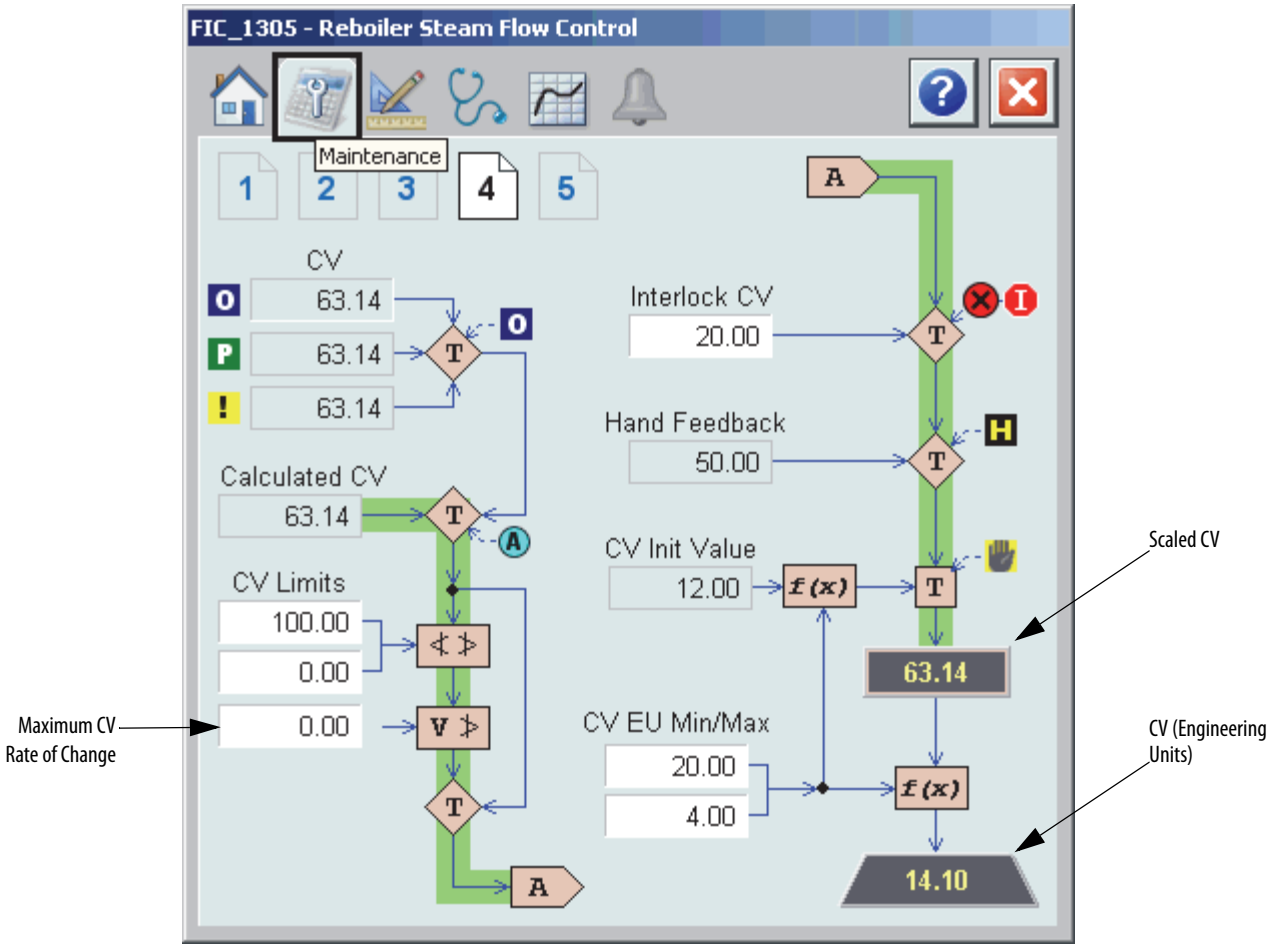
Table 12 - Maintenance Tab Page 3 Description

Function	Action	Security	Configuration Parameters
Deadband	Type the value for the zero-crossing deadband (in PV engineering units). When the loop error is less than the zero-crossing deadband, the loop output does not change. **IMPORTANT:** See the PIDE built-in instruction online help for more information.	Configuration and Tuning Maintenance (Code D)	Cfg_DevDB
PV EU Maximum/ Minimum	Type the maximum and minimum values of the PV range (span) (in PV engineering units). The maximum value must be greater than the minimum.	Configuration and Tuning Maintenance (Code D)	• Cfg_PVEUMin • Cfg_PVEUMax
Gains: Proportional	This value depends on the setting of Cfg_Depend. If Cfg_Depend = 1 (dependent gains, the default), type the Controller Gain (unitless). This gain is applied to the Proportional, Integral, and Derivative terms. If Cfg_Depend = 0 (independent gains), type the Proportional Gain (unitless). This gain is applied to the Proportional term only. A value of zero in either case disables the Proportional term of the controller. Negative values are not valid.		Cfg_PGain
Gains: Integral	This value depends on the setting of Cfg_Depend. If Cfg_Depend = 1 (dependent gains, the default), type the Integral Time Constant (minutes pre repeat). If Cfg_Depend = 0 (independent gains), type the Integral Gain (1/minutes). A value of zero in either case disables the Integral term of the controller. Negative values are not valid.		Cfg_IGain
Gains: Derivative	This value depends on the setting of Cfg_Depend. If Cfg_Depend = 1 (dependent gains, the default), type the Derivative Time Constant (minutes). If Cfg_Depend = 0 (independent gains), type the Derivative Gain (minutes). A value of zero in either case disables the Derivative term of the controller. Negative values are not valid.		Cfg_DGain

Maintenance Tab Page 4

Page 4 of the Maintenance tab shows the following information:

- Entry fields for High and Low CV limits
- Calculated CV from PID algorithm (page 3)
- Entry field for Maximum CV Rate of Change configuration
- Entry field for Interlock CV
- Hand feedback
- CV initialization value
- Entry fields for CV EU Minimum and Maximum
- CV (in perent and engineering units)



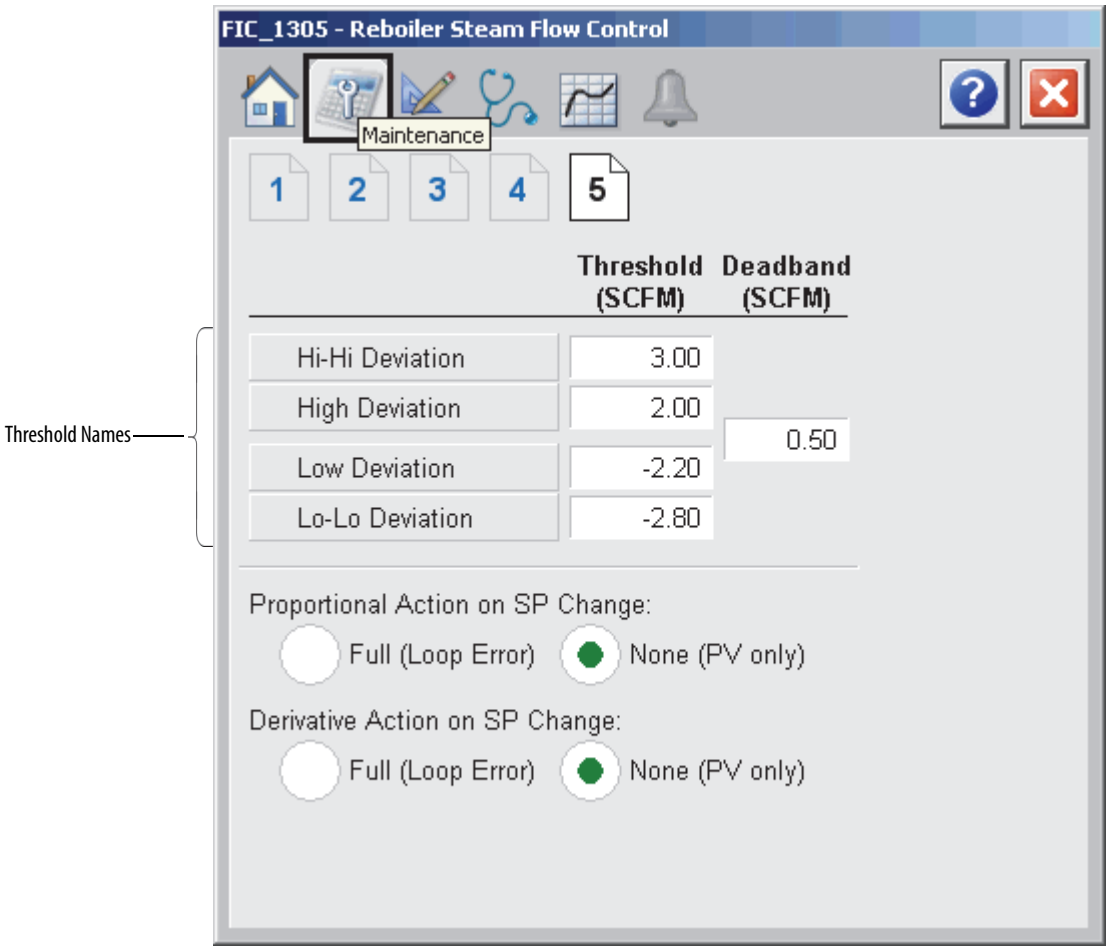
The following table shows the functions of page 4 of the Maintenance tab.

Table 13 - Maintenance Tab Page 4 Description

Function	Action	Security	Configuration Parameters
Operator CV	Type the CV (output) to apply in Operator mode in percent. This entry is a duplicate of the Operator CV entry field on the Home (Operator) tab.	Normal Operation of Devices (Code A)	None
CV Limits	Type the maximum allowed value of the CV in percent. The CV output is clamped to not exceed the entered value. This value must be less than or equal to 100.0 and greater than the CV Low Limit. Type the minimum allowed value of the CV in percent. The CV output is clamped to not go below the entered value. This value must be greater than or equal to 0.0 and less than the CV High Limit.	Configuration and Tuning maintenance (Code D)	Cfg_MaxCV Cfg_MinCV
Maximum CV Rate of Change	Type the maximum allowed CV rate of change in percent per second. A value of zero disables rate limiting. Negative values are not valid.		Cfg_CVRoCLim
Interlock CV	Type the value in percent to output as the CV when an Interlock input is not OK. The CV is held at this value until the interlock inputs are OK (subject to interlock bypassing).		Cfg_IntlkCV
CV EU Minimum	Type the value of the output (in CV engineering units) corresponding to a CV of 0.0%.	Engineering Configuration (Code E)	Cfg_CVEUMin
CV EU Maximum	Type the value of the output (in CV engineering units) corresponding to a CV of 100.0%. This value cannot equal the CV EU Minimum.		Cfg_CVEUMax
Scaled CV	Click the Scaled CV value to navigate to the attached object. **IMPORTANT:** 'CV Object' on page 4 of the Engineering tab must be enabled and an object tag name provided for this value to be clickable. (See Engineering Tab Page 4 on page 62.)	None	

Maintenance Tab Page 5

On page 5 of the Maintenance tab you can click a threshold name to open the corresponding 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 of page 5 of the Maintenance tab.

Table 14 - Maintenance Tab Page 5 Description

Function	Action	Security	Configuration Parameters
Threshold Names	Click a threshold name to open the corresponding P_Gate faceplate to modify the threshold gate time, on-delay time, and off-delay time.	None	None
Hi-Hi Deviation Threshold	Type the value of the PV High-High Deviation Threshold (in PV engineering units). When the PV exceeds the setpoint by this amount or more, a High-High deviation status is asserted, and the corresponding alarm is raised if it is so configured. This must be a positive number.	Disable Alarms Bypass Permissives and Interlocks (Code H)	

Table 14 - Maintenance Tab Page 5 Description

Function	Action	Security	Configuration Parameters
High Deviation Threshold	Type the value of the PV High Deviation Threshold (in PV engineering units). When the PV exceeds the setpoint by this amount or more, a High deviation status is asserted, and the corresponding alarm is raised if it is so configured. This must be a positive number.	Disable Alarms Bypass Permissives and Interlocks (Code H)	None
Low Deviation Threshold	Type the value of the PV Low Deviation Threshold (in PV engineering units). When the PV minus the setpoint is less than this value, a Low deviation status is asserted, and the corresponding alarm is raised if it is so configured. This must be a negative number.		
Low-Low Deviation Threshold	Type the value of the PV Low-Low Deviation Threshold (in PV engineering units). When the PV minus the setpoint is less than this value, a Low-Low deviation status is asserted, and the corresponding alarm is raised if it is so configured. This must be a negative number.		
Deadband	Type the value of the deadband applied to the Deviation Threshold. The loop error must return within the given threshold by this amount to clear the deviation status.		Cfg_DevDB
Proportional Action on SP Change - None (PV Only)	Click to have the Proportional action of the PID algorithm apply only to changes in the PV and ignore changes in setpoint.	Engineering Configuration (Code E)	Cfg_PropSPAct
Proportional Action on SP Change - Full (Loop Error)	Click to have the Proportional action of the PID algorithm apply to the loop error, which is affected by changes to the PV and to the setpoint.		
Derivative Action on SP Change - None (PV Only)	Click to have the Derivative action of the PID algorithm apply only to the rate of change of the PV and ignore changes in setpoint.		Cfg_DerivSPAct
Derivation Action on SP Change - Full (Loop Error)	Click to have the Derivative action of the PID algorithm apply to the rate of change of the loop error, which is affected by changes to the PV and to the setpoint.		

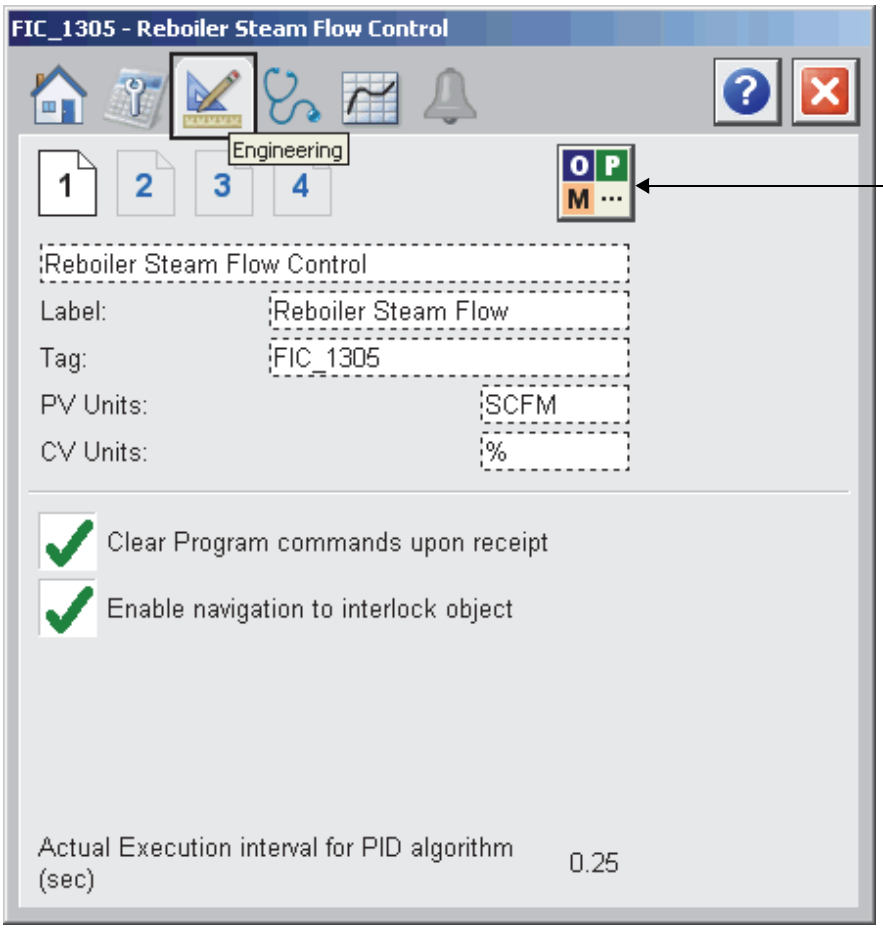
Engineering Tab

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 description, label, tag, and PV units for the device and monitor the algorithm execution interval.

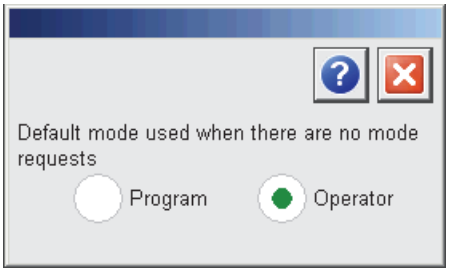


The following table lists the functions on page 1 of the Engineering tab.

Table 15 - Engineering Tab Page 1 Description

Function	Action	Security	Configuration Parameters
	Click to navigate to the mode configuration display.	None	See the Mode Configuration display on page 57.
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 in the Tooltip. **IMPORTANT:** Pausing the mouse over this field displays a tool tip with the configured Logix tag/path.		Cfg_Tag
PV Units	Type the PV engineering units for display on the HMI. Percent (%) is the default.		Cfg_PVEU
CV Units	Type the CV engineering units for display on the HMI. Percent (%) is the default.		Cfg_CVEU
Clear Program Commands upon receipt	Check to clear program commands on receipt.		Cfg_PCmdClear
Enable navigation to interlock object	Check to enable navigation to an interlock object (for example, P_Intlk). **IMPORTANT:** The name of the Interlock object in the controller must be this object's name with the suffix '_Intlk'. For example, if your P_PIDE object has the name 'PIDE123', then its Interlock object must be named 'PIDE123_Intlk'.		Cfg_HasIntlkObj

Mode Configuration Display

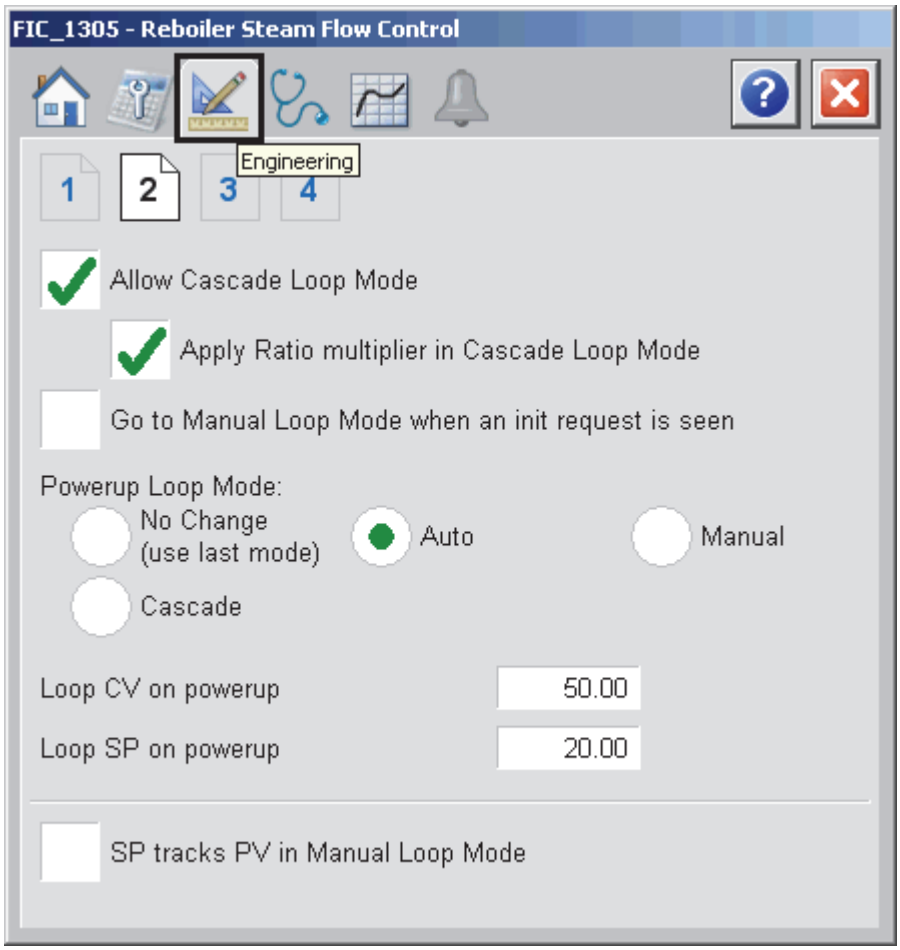


This display lets you select the default instruction mode for the object by selecting the appropriate mode.

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 16 - Engineering Tab Page 2 Description

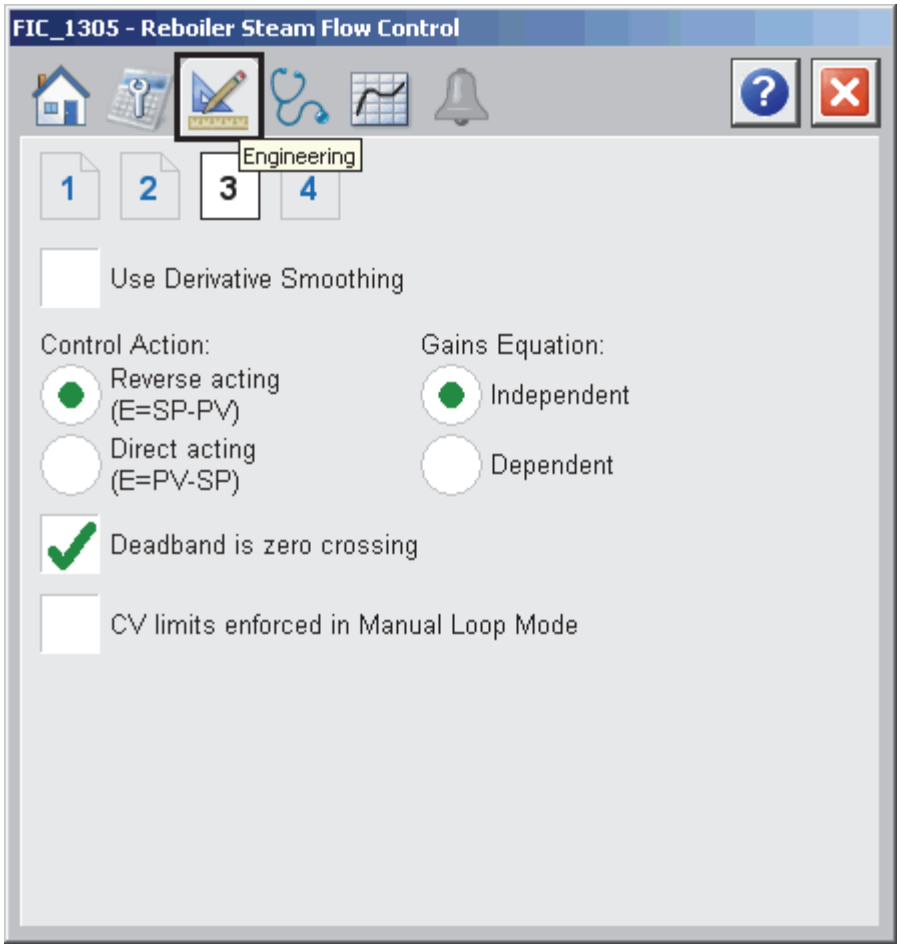
Function	Action	Security	Configuration Parameters
Allow Cascade Loop Mode	Check to let you select a Cascade Loop mode.	Engineering Configuration (Code E)	Cfg_HasCasc
Apply Ratio multiplier in Cascade Loop Mode	Check to multiply the Cascade SP input by the ratio value to get the loop setpoint. Clear the checkbox to use the Cascade SP input as the loop setpoint directly.		Cfg_HasRatio
Go to Manual Loop Mode when an init request is seen	Check to set the Loop mode to Manual when the Use CVInit Value input is true. This leaves the loop in manual with the CV at the initialization value when the initialization request clears. Clear this checkbox to leave the loop in its current mode on an initialization request. When the initialization request clears, the loop resumes controlling in its previous mode.		Cfg_InitToMan

Table 16 - Engineering Tab Page 2 Description

Function	Action	Security	Configuration Parameters
Powerup Loop Mode: No Change (use last mode)	Click to keep the Loop mode what it was at powerdown.	Engineering Configuration (Code E)	Cfg_PwrupLM
Powerup Loop: Auto	Click to set the Loop mode to Auto on powerup.		
Powerup Loop: Manual	Click to set the Loop mode to Manual on powerup.		
Powerup Loop: Cascade	Click to set the Loop mode to Cascade on powerup.		
Loop CV on powerup	Type a value to apply to the loop CV (in percent) on controller powerup. The CV is set to this value on controller powerup in Run mode and on controller transition from Program mode to Run mode.		Cfg_PwrupCV
Loop SP on powerup	Type a value to apply to the loop setpoint (in PV engineering units) on controller powerup. The setpoint is set to this value on controller powerup in Run mode and on controller transition from Program mode to Run mode.		Cfg_PwrupSP
SP tracks PV in Manual Loop Mode	Check to have the current PV copied to the SP (track) whenever the loop is in Manual mode.		Cfg_PVTrack

Engineering Tab Page 3

On page 3 of the Engineering tab, you can check to use derivative smoothing, select a Control Action, enforce CV limits in Manual Loop Mode, or set the Deadband for zero crossing.



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

Table 17 - Engineering Tab Page 3 Description

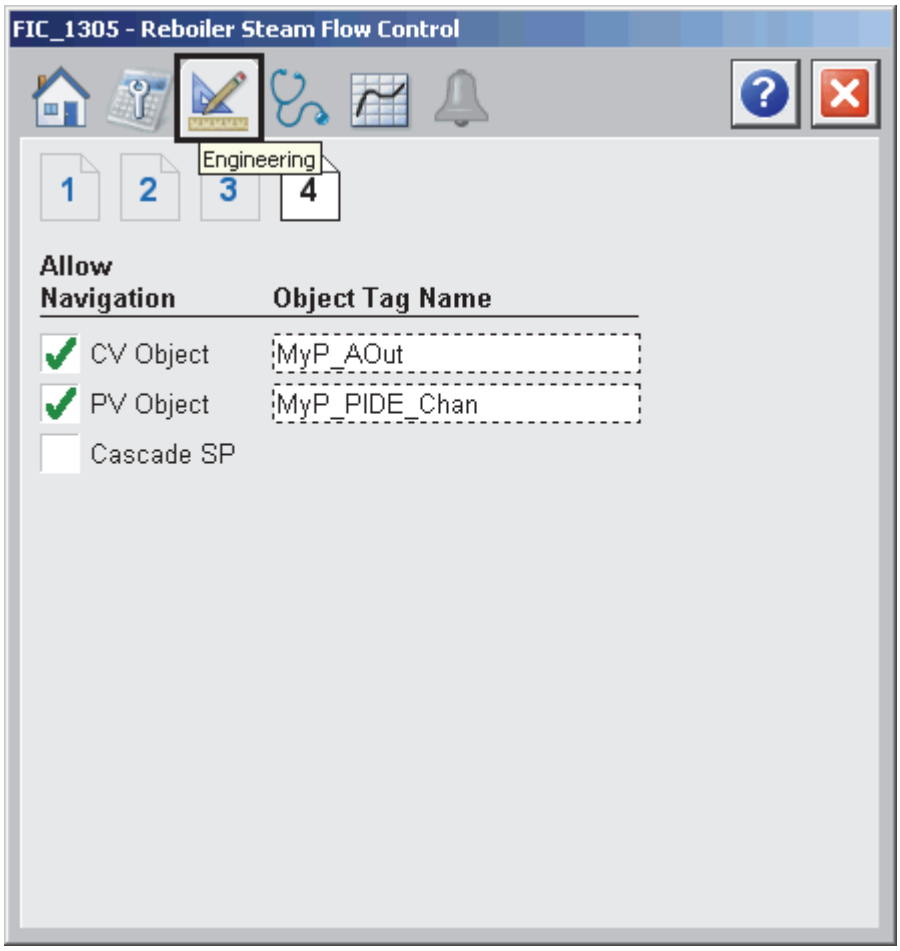
Function	Action	Security	Configuration Parameters
Use Derivative Smoothing	Check to enable derivative smoothing. This can help reduce output jitter due to noise on the PV signal. Clear this checkbox to disable derivative smoothing. This can result in quicker loop response at high derivative gain.	Engineering Configuration (Code E)	Cfg_DerivSmooth
Control Action: Reverse Acting (E=SP-PV)	Click for reverse-acting loop response (default). When the PV increases, the CV (output) decreases.		Cfg_CtrlAction
Control Action: Direct Acting (E=PV-SP)	Click for direct-acting loop response. When the PV increases, the CV (output) increases.		

Table 17 - Engineering Tab Page 3 Description

Function	Action	Security	Configuration Parameters
Gains Equation: Independent	Click to use the Independent Gains form of the PID algorithm. Changes to the proportional gain do not affect integral or derivative response.	Engineering Configuration (Code E)	Cfg_Depend
Gains Equation: Dependent	Click to use the Dependent Gains form of the PID algorithm (default). Changes to Cfg_PGain are applied as loop gain changes and affect proportional, integral, and derivative responses.		
Deadband is zero crossing	Check to use the zero-crossing deadband. The error must change sign (cross zero) for the deadband function to be activated and stop changes to loop output. Clear this checkbox to disable zero-crossing functionality. Once the error is within the deadband, the output does not change, even if the sign of the error has not changed (error has not crossed zero).		Cfg_ZCDB
CV limits enforced in Manual Loop Mode	Check to limit the CV to the range specified by Cfg_MinCV and Cfg_MaxCV when the Loop mode is Manual. Clear this checkbox to allow CV values anywhere in the 0.0%…100.0% range in Manual Loop mode.		Cfg_LimitManCV

Engineering Tab Page 4

On page 4 of the Engineering tab you can enable navigation and name the destination object for CV, PV, and Cascade SP navigation.



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

Table 18 - Engineering Tab Page 4 Description

Function	Action	Security	Configuration Parameters
Allow Navigation - CV Object	Check to enable navigation to the CV object.	Engineering Configuration (Code E)	Cfg_HasCVNav
Allow Navigation - PV Object	Check to enable navigation to the PV object.		Cfg_HasPVNav
Allow Navigation - Cascade SP	Check to enable navigation to Cascade SP object.		Cfg_HasCascSPNav
Object Tag Name - CV Object	Type the name of the CV Object to navigate to.		Cfg_CVNavTag
Object Tag Name - PV Object	Type the name of the PV Object to navigate to.		Cfg_PVNavTag
Object Tag Name - Cascade SP	Type the name of the Cascade SP object to navigate to.		Cfg_CascSPNavTag

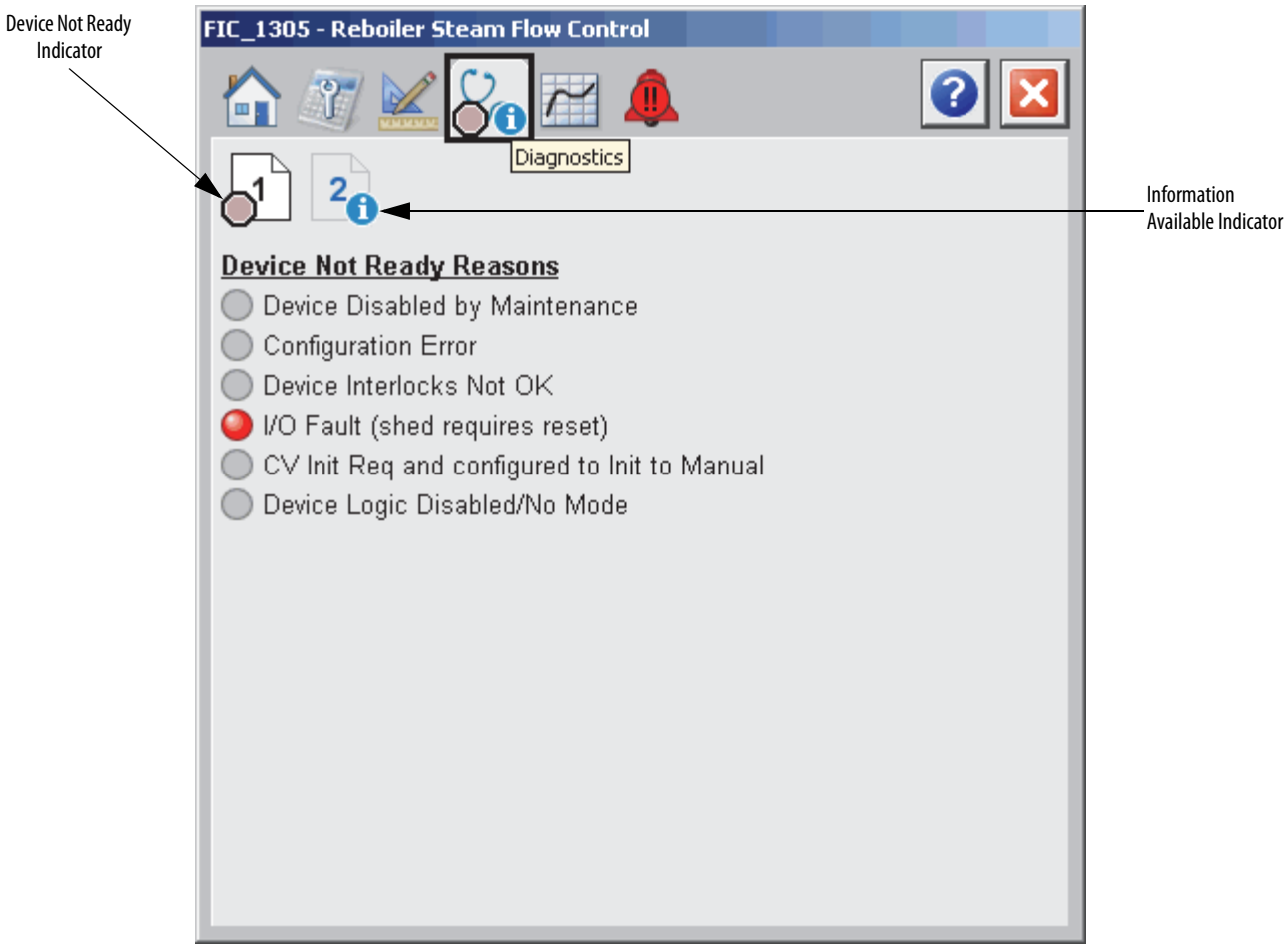
Diagnostics Tab

The Diagnostic tab provides indications that are helpful in diagnosing or preventing device problems, which 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 is divided into two pages.

Diagnostics Tab Page 1

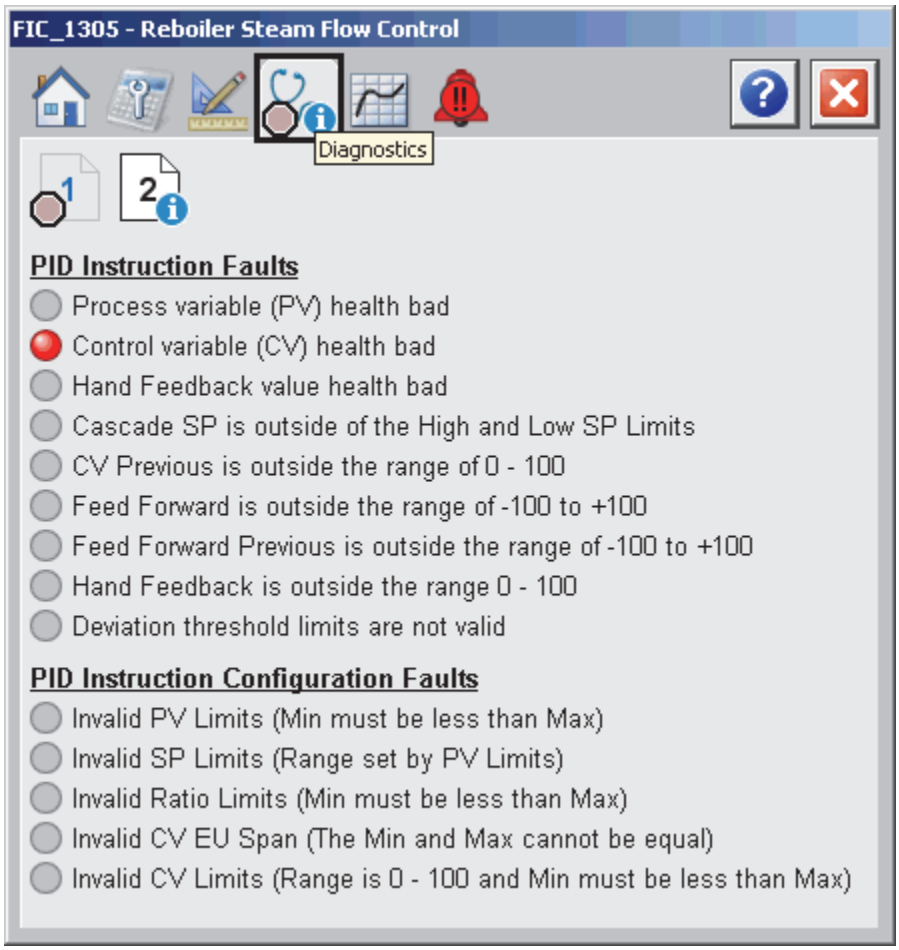
Page 1 of the Diagnostics tab displays Device Not Ready reasons.



The image shown above indicates that the device is not ready because of an I/O fault shed condition that requires reset.

Diagnostics Tab Page 2

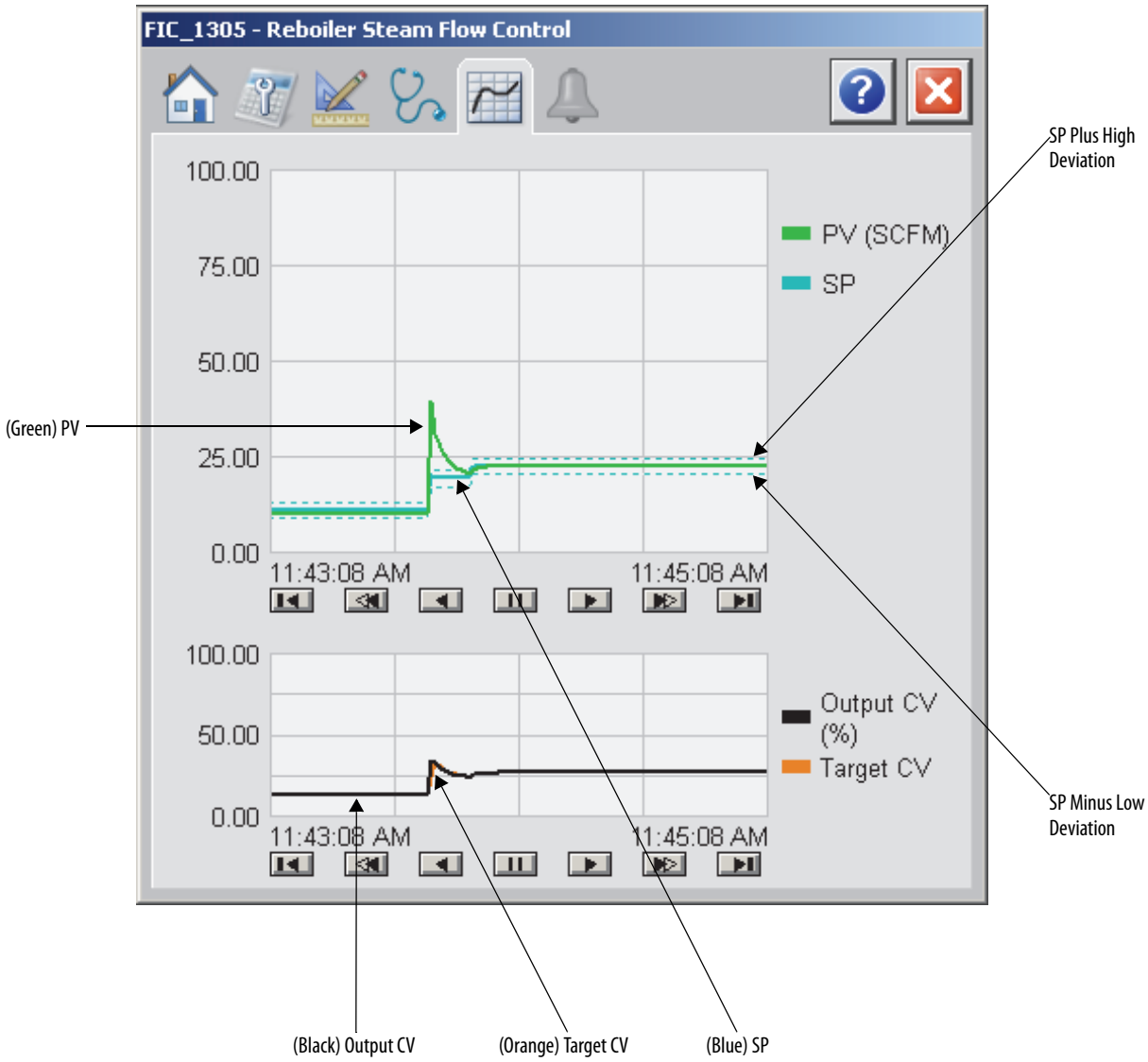
Page 2 of the Diagnostics tab displays PID Instruction faults and PID Instruction Configuration Faults.



The image shown above indicates that there is a problem with the Control Variable (CV).

Trends Tab

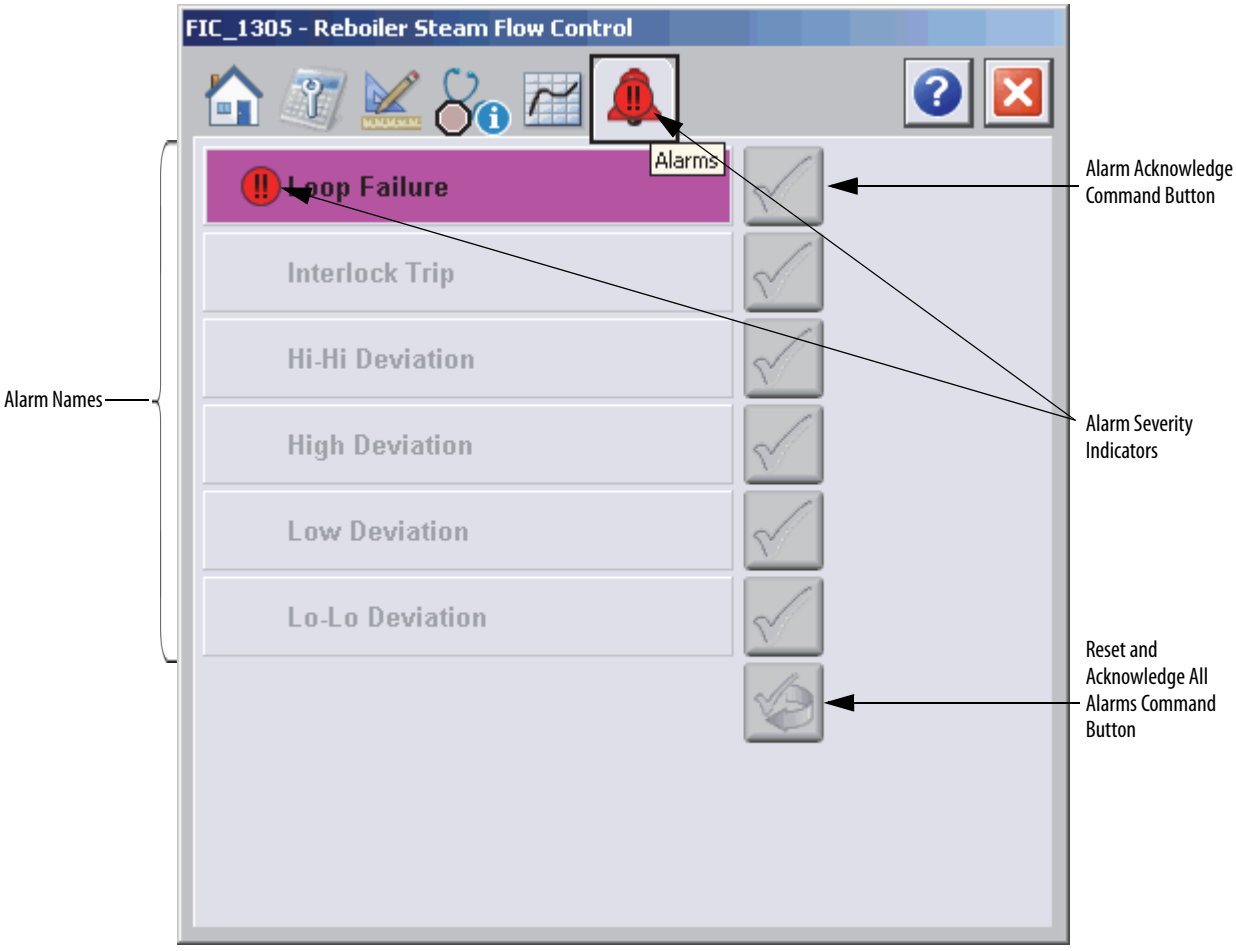
On the upper part of the Trends tab, you can view the SP (blue line) and PV (green line). The high and low deviation limits are indicated by dashed blue lines.



On the lower part of the Trends tab, you can view the Output CV (black line) and the Target CV (orange line).

Alarms Tab

The Alarms tab shows all of the available alarms for the loop and their current status. From here, Alarms can be acknowledged and reset. Click an alarm name to open the alarm detail faceplate for that alarm, where the alarm can be shelved by the operator, disabled by maintenance personnel, or configured by engineering.



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 highest active alarm's severity, and the icon blinks if any alarm is unacknowledged or requires reset.

The Alarms tab displays each alarm for this device. If the alarm is active, the panel behind the alarm changes color to match the severity of the alarm.

Table 19 - Alarm Severity Colors

Color	Definition
Magenta	Urgent
Red	High
Yellow	Medium
Blue	Low
Background (Light Gray)	No alarm

The following table shows the functions on the Alarms tab.

Table 20 - Alarms Tab Description

Function	Action	Security
Alarm Names	Click an alarm name to open the corresponding P_Alarm faceplate.	Normal Operation of Devices (Code A)
	Click to acknowledge the alarm.	Acknowledge Alarms (Code F)
	Click to reset and acknowledge all alarms.	

The Reset and Acknowledge All Alarms button is enabled, and the panel behind the alarm blinks, and the Alarm Acknowledge button is enabled if the alarm requires acknowledgment. Click the button with the checkmark to acknowledge the alarm.

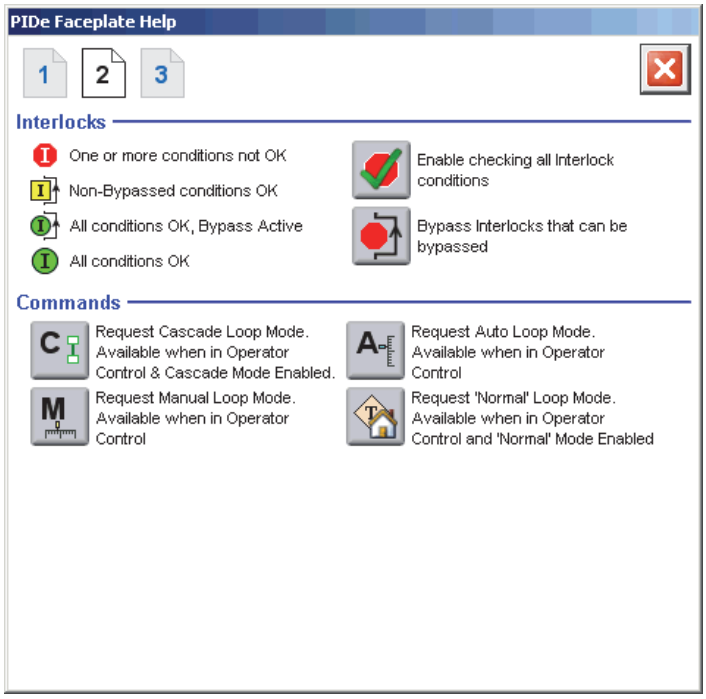
Refer to the Rockwell Automation Library of Process Objects: Common Alarm Mode (P_Alarm) Reference Manual, publication SYSLIB-RM002, for more information.

Proportional + Integral + Derivative Enhanced Faceplate Help

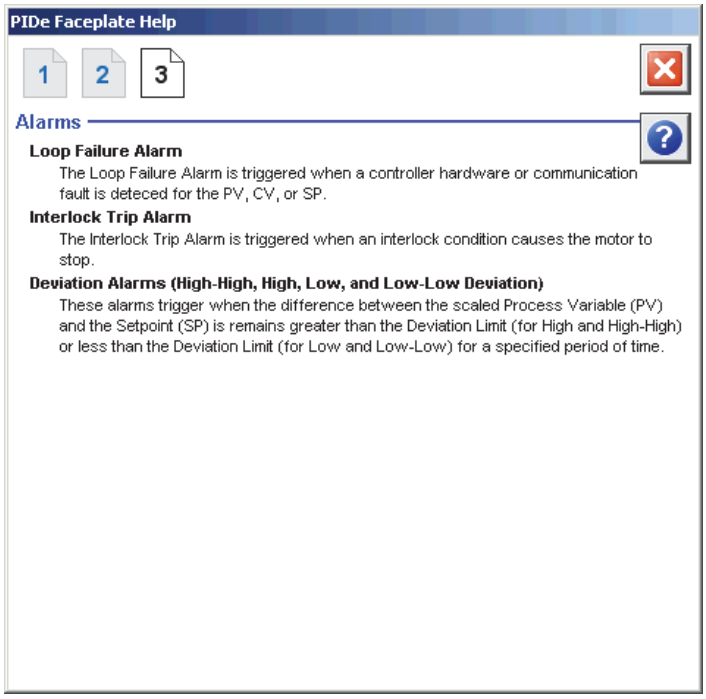
The Faceplate Help is divided into three pages.

Faceplate Help Page 1

Faceplate Help Page 2



Faceplate Help Page 3



Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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Publication SYSLIB-RM045B-EN-P - August 2014

Supersedes Publication SYSLIB-RM045A-EN-P - December 2013