Human-Machine Interfaces

FactoryTalk View

Process Automation

User Guide



Festo Didactic
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Document Preliminaries

About this document

This user guide is designed to familiarize you with the human-machine interfaces (HMIs) developed by Festo Didactic under the Rockwell Automation (FactoryTalk View ME) architecture. It explains how to use the PanelView Plus 600, PanelView Plus 1000, or PC version of the interface with any of the four supported controllers: ControlLogix, CompactLogix, MicroLogix, or Foxboro. The document is divided into nine sections:

- Section 1 is a presentation of the hardware and software.
- Section 2 is an overview of the screen types that you will encounter.
- Section 3 describes the interfaces for the MicroLogix PLC.
- Section 4 describes the interfaces for the CompactLogix PLC.
- Section 5 describes the interfaces for the ControlLogix PLC.
- Section 6 describes the PC interface for Foxboro controllers.
- Section 7 shows how to set your interface and controller for ON-OFF control.
- Section 8 shows how to set your interface and controller for PID control.
- Section 9 shows how to set your interface and controller for cascade control.

This user guide is intended for both instructors and students.

Required software

Refer to Appendix A for information about the software that you are required to install on your PC, depending on your configuration and needs. Specific instructions about the Foxboro controller, OPC server, and the corresponding PC-based HMI are provided in Appendix C.

Resource kits

The resource files for this course can be downloaded below. They include:

- The PLC resource kit, provided with every new Rockwell PLC in the 353X series, contains controller programs (stand-alone and HMI-ready versions) and documentation from Rockwell Automation.
- If you purchased a license for FactoryTalk View Studio or FactoryTalk View ME Station, two additional resource kits (one including OPC server files) provide the HMI and PLC programs as well as documentation.



PLC resource kit.

https://lx.festo.com/media/5ac55c3af4c840fa80b7b58e68b47395



FactoryTalk HMI resource kit.

https://lx.festo.com/media/92e3945727d0473282adb7cfe374dcaf



FactoryTalk HMI & OPC resource kit.

https://lx.festo.com/media/d104430c1a894cdb89367f7a5e92d1cd

Appendices

Appendix A, Rockwell Software Installation and Network Configuration, provides details on how to set up your touch screen or PC running FactoryTalk View ME Station to work with one of the Rockwell's PLCs.

Appendix B, Common Operations with FactoryTalk View Studio, explains how to perform some basic operations for modification of your HMI.

Appendix C, Foxboro Controllers Configuration and OPC Server Installation, provides details on how to connect the Foxboro controllers and set up the OPC server for use with a FactoryTalk View ME HMI on a PC.

Appendix D, Changing the Serial Port of the OPC Server, explains how to match the OPC server communication setting to the communication port used by the RS232 to RS485 Converter of your system.

Introduction to the learning system

Automated process control offers so many advantages over manual control that most of today's industrial processes use it to some extent. Breweries, wastewater treatment plants, mining facilities, and the automotive industry are just a few industries that benefit from automated process control systems.

Maintaining process variables such as pressure, flow, level, temperature, and pH within a desired operating range is of the utmost importance when manufacturing products with a predictable composition and quality.

The Instrumentation and Process Control Training System is a state-of-the-art system that faithfully reproduces an industrial environment. Throughout this course, students develop skills in the installation and operation of equipment used in the process control field. The use of modern, industrial-grade equipment is instrumental in teaching theoretical and hands-on knowledge required to work in the process control industry.

The modularity of the system allows the instructor to select the equipment required to meet the objectives of a specific course. Two mobile workstations, on which all the equipment is installed, form the basis of the system. Several optional components used in pressure, flow, level, temperature, and pH control loops are available, as well as various valves, calibration equipment, and software. These add-ons can replace basic components having the same functionality, depending on the context. During control exercises, a variety of controllers can be used interchangeably depending on the instructor's preference.

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We hope that your learning experience with the Instrumentation and Process Control Training System will be the first step toward a successful career in the process control industry.

LVProSim, a software that can be used in the system's courses, can be downloaded here:

LVProSim

http://bit.ly/LVPROSIM32600

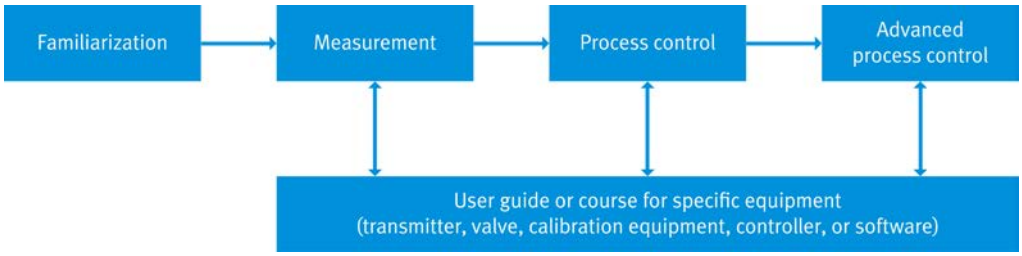


Figure 1: Standard learning path for the Instrumentation and Process Control Learning System.

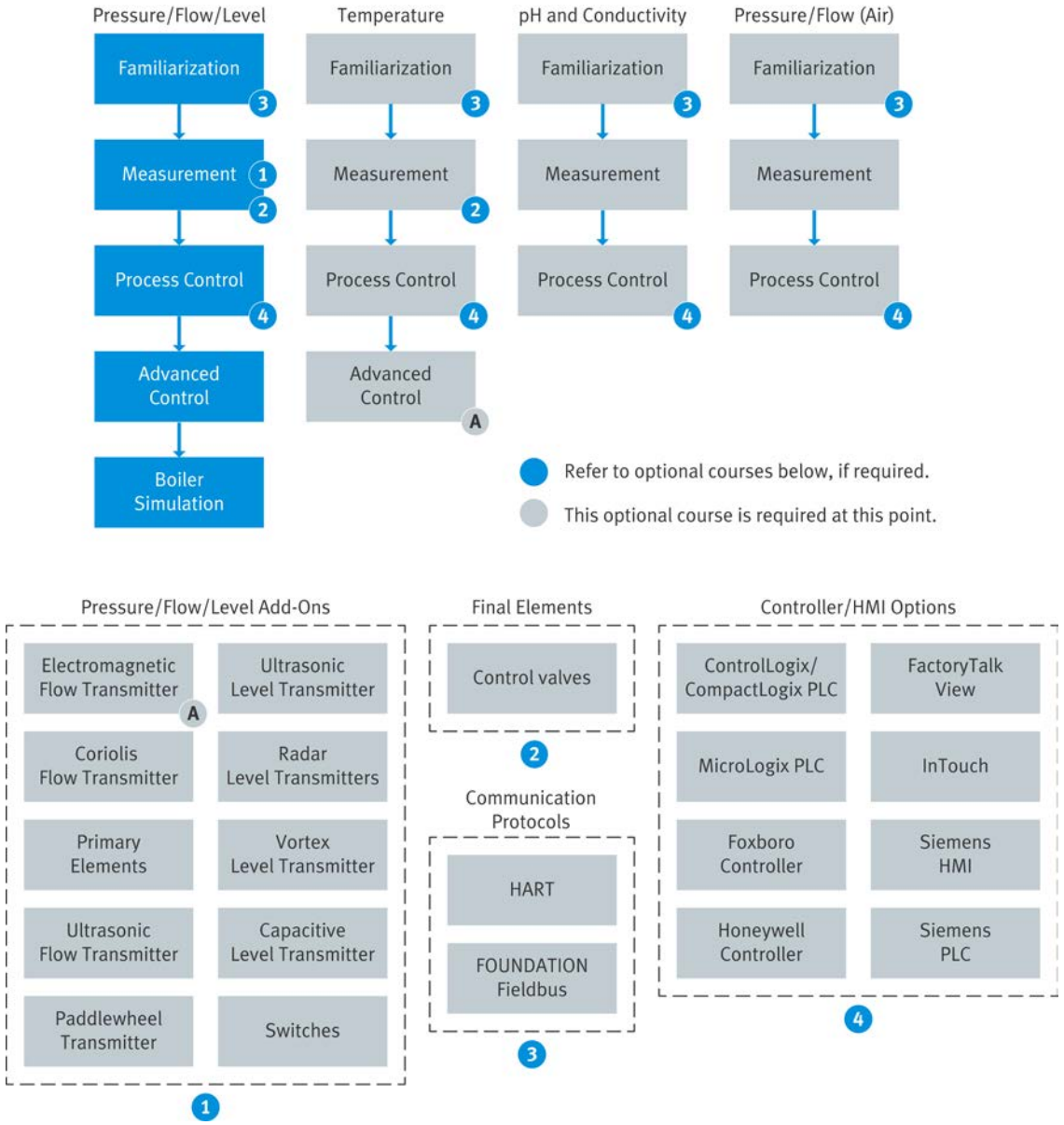


Figure 2: Instrumentation and Process Control Learning System.

Safety Symbols and Procedures

The following table lists the safety and common symbols that may be used in this document and on the equipment. Before performing procedures with the equipment, you should read all sections regarding safety in the User Guide accompanying the equipment. Additional safety procedures are given before any task requiring specific safety precautions.

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Symbol	Description
	**DANGER** indicates a hazard with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** indicates a hazard with a medium level of risk, which, if not avoided, could result in death or serious injury.
	**CAUTION** indicates a hazard with a low level of risk, which, if not avoided, could result in minor or moderate injury.
	**NOTICE** indicates a hazard with a potentially hazardous situation, which, if not avoided, may result in property damage.
	Caution, risk of danger. Consult the relevant user documentation.
	Caution, risk of electric shock.
	Caution, lifting hazard.
	Caution, hot surface.
	Caution, risk of fire.
	Caution, risk of explosion.

Symbol	Description
	Caution, belt drive entanglement hazard.
	Caution, chain drive entanglement hazard.
	Caution, gear entanglement hazard.
	Caution, hand crushing hazard.
	Static sensitive contents. Observe precautions for handling electrostatic discharge sensitive devices.
	Notice, non-ionizing radiation.
	Consult the relevant user documentation.
	Radio Equipment Directive (RED) geographical restrictions – consult the relevant user documentation.
	Direct current.
	Alternating current.

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Symbol	Description
	Both direct and alternating current.
	Three-phase alternating current.
	Earth (ground) terminal.
	Protective conductor terminal.
	Frame or chassis terminal.
	Equipotentiality.
	On (supply).
	Off (supply).
	Equipment protected throughout by double insulation or reinforced insulation.
	In position of a bi-stable push control.

Symbol	Description
	Out position of a bi-stable push control.

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Getting Started with your HMI

12 min.

First things first

This section explains how to get started with the human-machine interfaces (HMI) provided with the Instrumentation and Process Control Training System, series 353X. Before proceeding with this section, be sure that:

- the PLC is properly connected and running a program suited to work with an HMI (MLX_3530_HMI.RSS, CMPLX_3530_HMI.ACD, or CLX_3530_HMI.ACD). Refer to the ControlLogix and CompactLogix Programmable Logic Controllers (P/N 86030-E0) or MicroLogix 1100 Programmable Logic Controller (P/N 86032) manual if necessary.



If you are using the Foxboro controller, go to Appendix C for setup information.

- the Ethernet communication between the HMI device and the PLC is functional (refer to Appendix A for details).
- the HMI runtime file for the appropriate PLC and interface configuration is loaded into the touch screen or PC memory. If the IP configuration of your system is different than the one suggested in Appendix A, you need to create a new HMI runtime file pointing to the new address of your PLC using FactoryTalk View Studio. This procedure is detailed in Appendix B.



Allen-Bradley uses a terminology to identify process variables that is slightly different from what is found in most textbooks. They use PV (process variable) in place of controlled variable and CV (control variable) in place of manipulated variable. Using the Allen-Bradley terminology, the level in a level process control application is the process variable (PV) and the opening of the control valve is the control variable (CV).

The need for graphic terminals

Industrial processes can require the use of hundreds of components. Each of these components requires the attention of a technician at one time or another, especially when the system is started up or shut down. Even if most industrial systems are designed to be autonomous when everything goes well, they still need to be closely monitored in case something does not. The monitoring of a system does not only include displaying the raw data coming from the components, but it also includes extracting the information that can be worked out from these raw data. For example, the pressure inside a tank containing a gas can be used to deduce the temperature of the gas and vice versa.

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Even for small systems, it is not a viable solution to monitor components using only lights and buttons. The user has to be able to assess the status of the system rapidly and apply changes using a main control panel. Graphic terminals such as the ones provided with the Instrumentation and Process Control Training System are an excellent solution to interact with the components of a system.

Hardware and software components provided

The Instrumentation and Process Control Training System can accommodate three different kinds of terminals. Two touch screens, described below, can be fitted to the Instrumentation Workstation. Alternately, a PC-based interface can be used to control the system locally or from a remote location.

PanelView Plus 600

The PanelView Plus 600 touch screen, shown in the following figure, is manufactured by Rockwell under the Allen-Bradley label. Its 140-mm (5.5-in) display offers a 320 x 240 resolution. This color touch screen interface allows the user to monitor and control many devices of the Instrumentation and Process Control Training System.

The Touch Screen Graphic Terminal is pre-programmed with control interfaces developed with the various components of the system in mind. The terminal also features an integrated EtherNet/IP communication port and an RS-232 serial port located under the device.



Figure 3: PanelView Plus 600, model 5922.

PanelView Plus 1000

The PanelView Plus 1000 touch screen, shown in the following figure, is manufactured by Rockwell under the Allen-Bradley label. Its 264-mm (10.4-in) display offers a 640 x 480 resolution. This color touch screen interface allows monitoring and control of some of the Instrumentation and Process Control Training System features. The Touch Screen Graphic Terminal is pre-programmed with control interfaces developed with the various components of the system in mind.

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The device is energized when the power input connectors at the back are connected to a 24 V dc source. The integrated EtherNet/IP communication port, two USB ports and an RS-232 serial port are accessible from underneath.



Figure 4: PanelView Plus 1000, model 46973.

HMI files

Ten distinct HMIs are available (see the following table) to operate with different combinations of interface and controller. In all cases, the software running the HMI is FactoryTalk View ME Station. This software comes preinstalled on the touch screens, but must be purchased separately for use on a PC.

To avoid confusion, remember that the FactoryTalk View Machine Edition (ME) software suite from Rockwell is made out of two components: FactoryTalk View Studio is used to create and test HMIs, while FactoryTalk View ME Station runs HMIs on a touch screen or PC.

Table 1: HMI files provided.

File name (runtime)	Controller	Terminal
3530MLXPVP600C.mer	MicroLogix	PanelView Plus 600
3530MLXPVP1000.mer	MicroLogix	PanelView Plus 1000
3530MLXPC.mer	MicroLogix	PC
3530CTLXPVP600C.mer	ControlLogix	PanelView Plus 600
3530CTLXPVP1000.mer	ControlLogix	PanelView Plus 1000
3530CTLXPC.mer	ControlLogix	PC
3530CMPLXPVP600C.mer	CompactLogix	PanelView Plus 600
3530CMPLXPVP1000.mer	CompactLogix	PanelView Plus 1000
3530CMPLXPC.mer	CompactLogix	PC
3530FOX762_OPC.mer	Foxboro	PC

All the HMIs above are customizable. That is, using the FactoryTalk View Studio[1] HMI design software, the user can modify the interface to address a particular need or reflect a change in the system configuration (e.g. new IP addresses). Using that same design software, a particularly motivated user could also create and test an entirely new HMI from scratch.



[1] FactoryTalk View Studio is an optional software.

Starting an HMI

1. Turn on the touch screen (launch FactoryTalk View ME Station if you are using the PC version). Select the Load Application [F1] button on the Start window (The following figure).

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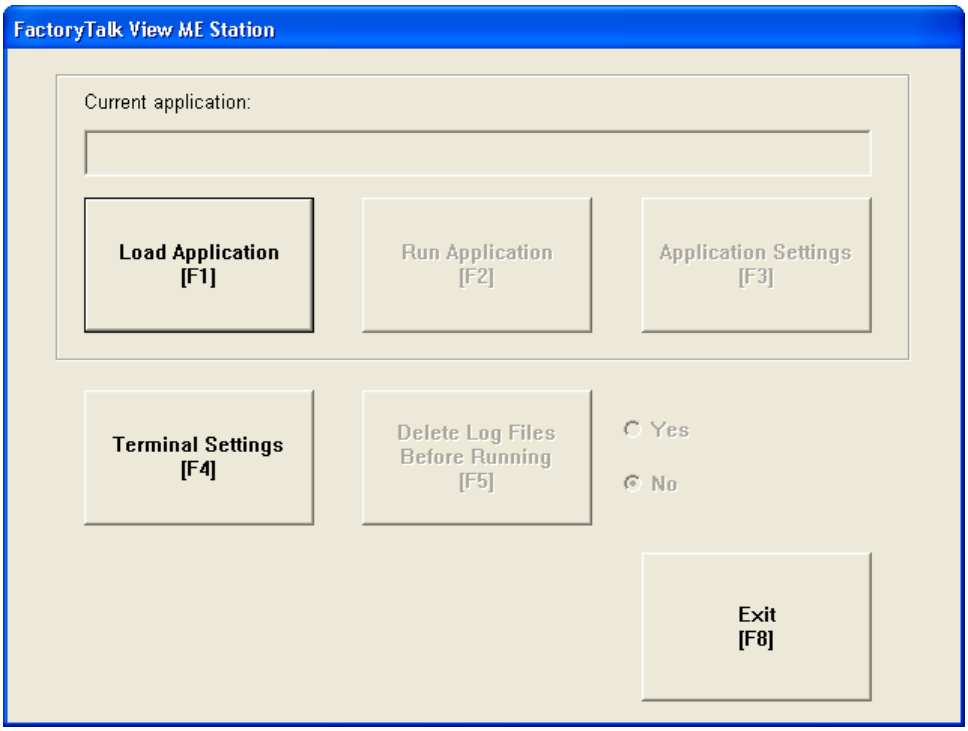


Figure 5: Start window.

2. Choose the HMI application pertaining to your configuration and select the Load [F2] button (click on the Open button if you are using the PC version). Select YES [F7] when prompted if you want to replace the current communication configuration (The following figure).

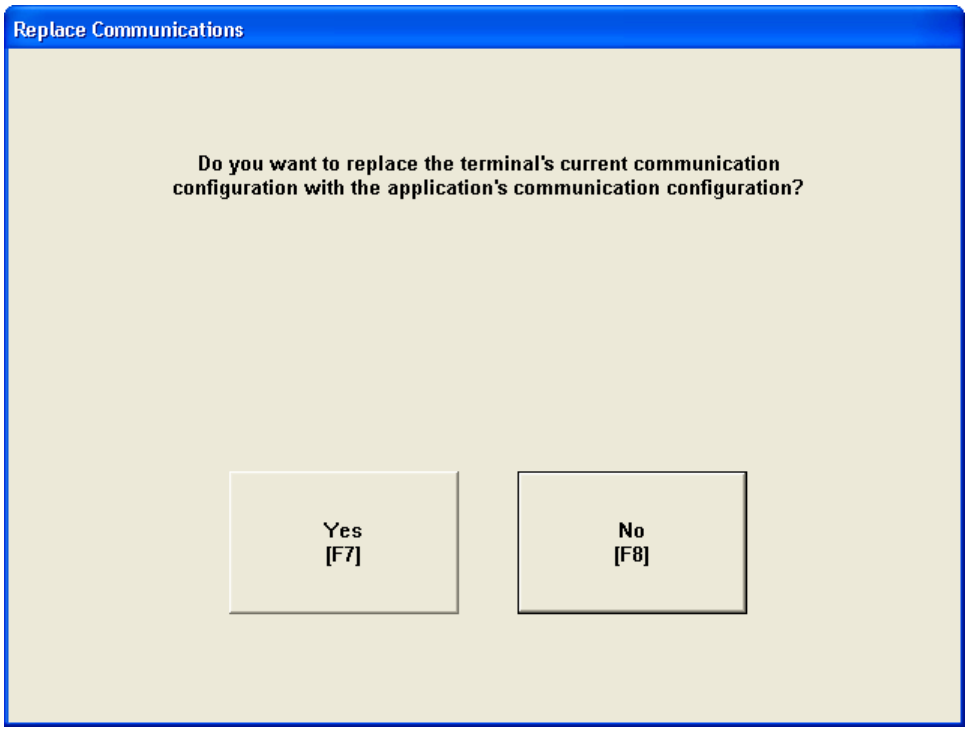


Figure 6: Replace Communications.

3. Select Run Application [F2] on the Start window to launch the HMI.

Sharing controllers between teams

A single PLC may have to be shared between two teams for simultaneous work on both sides of a workstation. Under these circumstances, if the Micrologix PLC is used, the PID loop #1 can be assigned to team 1 and the PID loop #2 can be assigned to team 2 for single-loop control.

If you are using the CompactLogix or the ControlLogix PLC, up to 8 loops can be shared between the two teams, consequently expanding the number of achievable control schemes — and the likelihood of having at least one variable wrongly assigned! So please be extremely careful on how you assign the inputs and outputs of the PLC to the different PID loops.

Finally, the Foxboro HMI allows management of up to eight PID loops via the server PC if four devices are connected simultaneously.

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Screen Type Overview

15 min.

This section presents the different window types present through the entire range of human-machine interfaces developed by Festo Didactic. You will find that many screens very similar, if not identical, across HMI versions.

Main screen

Every interface has a main screen that is the first screen that appears when you start the interface. The following figure shows the simplest main screen: the MicroLogix PVP600 interface.

Common to every main screen is a red button that takes you out of the application. Touch screen versions display a "QUIT" button, whereas PC versions have the standard "X" button in the top-left corner. Besides the exit button, each screen has a series of buttons to access sub-menus. Some buttons are linked to a specific loop and therefore, are often located on the PID Loop panel. For example, the Configuration button above gives access to a configuration window for loop #1. Other buttons are generic and are therefore located outside the loop panels. This is the case with the Access PLC I/O button above that opens a window with information about all inputs and outputs.

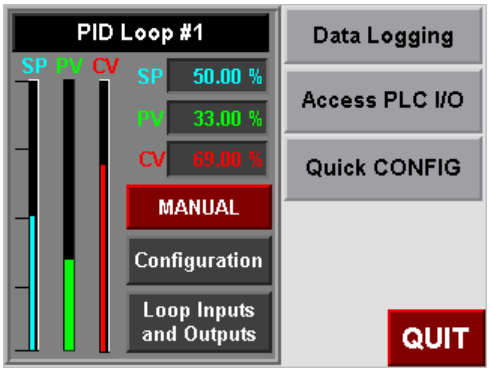


Figure 7: Main screen (MLX&PVP600).

One or two PID Loop panels can be displayed per main screen. In the preceding figure, the panel for the loop #1 is on the left side of the screen and users are required to press on the black rectangle to access the loop #2. With other HMIs however, the choice can be given between multiple loops. This is the case in the following figure where two panels can be selected between eight choices (green rectangles).

Finally, the PVP1000 and PC HMIs can display selected trends and process views. As shown in the preceding figure, you just have to make a selection using the ▲ and ▼ arrows and confirm your choice by pressing on the ⏎ icon.

The following sections describe the various windows that can be accessed from the main screen.

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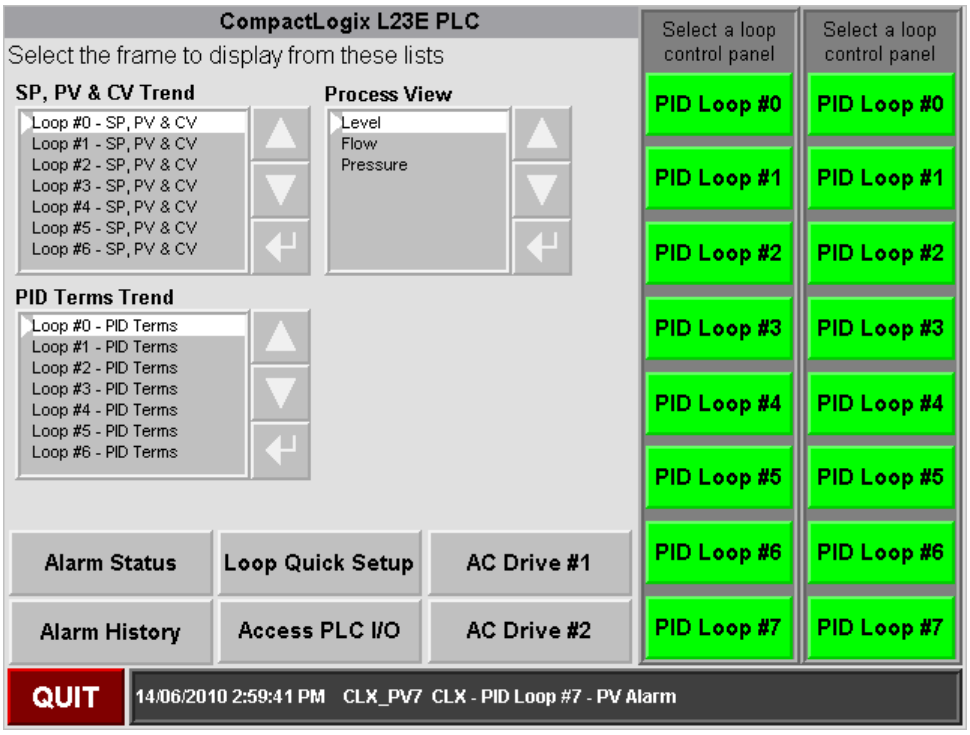


Figure 8: Choosing the PID loop (CMPLX&PVP1000).

Access PLC I/O

As its name suggests, the Access PLC I/O window informs you about the controller inputs and outputs. These I/O's can be digital, analog, HART, or FOUNDATION Fieldbus depending on your controller. the following figure shows the window for the ControlLogix and PVP1000. Digital I/O's, in green, are actuated (logic 1), whereas I/O's in red are not active (logic 0). Digital outputs can be triggered by pressing the corresponding button. In this case, FOUNDATION Fieldbus I/O's can be accessed by pressing the FIELDBUS button.

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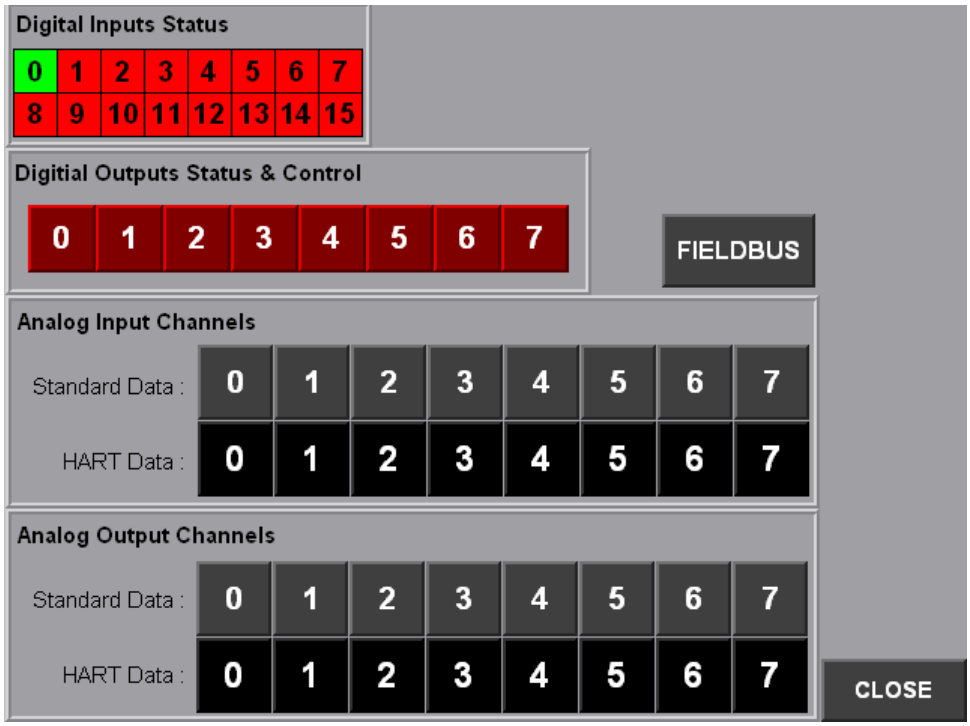


Figure 9: Access PLC I/O (CTLX&PVP1000).

Each standard (analog), HART, and FOUDATION Fieldbus data channel has a dedicated sub-window that can be accessed by clicking on the matching button. For example, The following figure illustrates a sub-window for an analog output with status and scaling information accompanying the raw data.

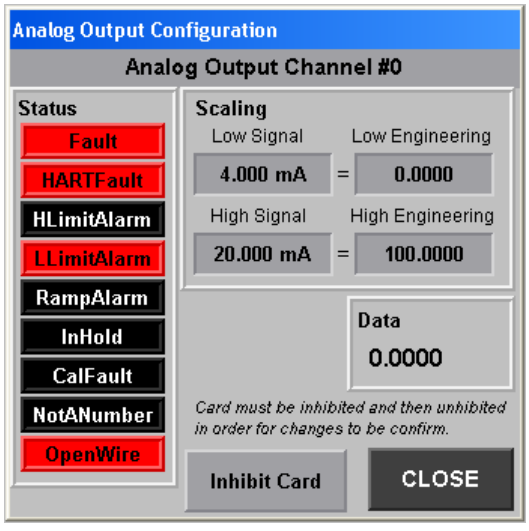


Figure 10: Dedicated window for analog output #0 (CTLX&PVP1000).

Configuration

Configuration of each PID loop is accomplished through one or multiple windows. The following figure shows an example where most of the features are found on the same window. But, regardless of the number of windows, the following elements must be considered:

- Algorithm selection (e.g., velocity or position, derivative of PV or E, control action)
- PID Gains
- PV, FF, and SP input assignment
- CV output assignment

Other controller-specific features and alarms can be accessed from the configuration window(s). Refer to the user guide from the controller manufacturer for specific information about particular parameters.

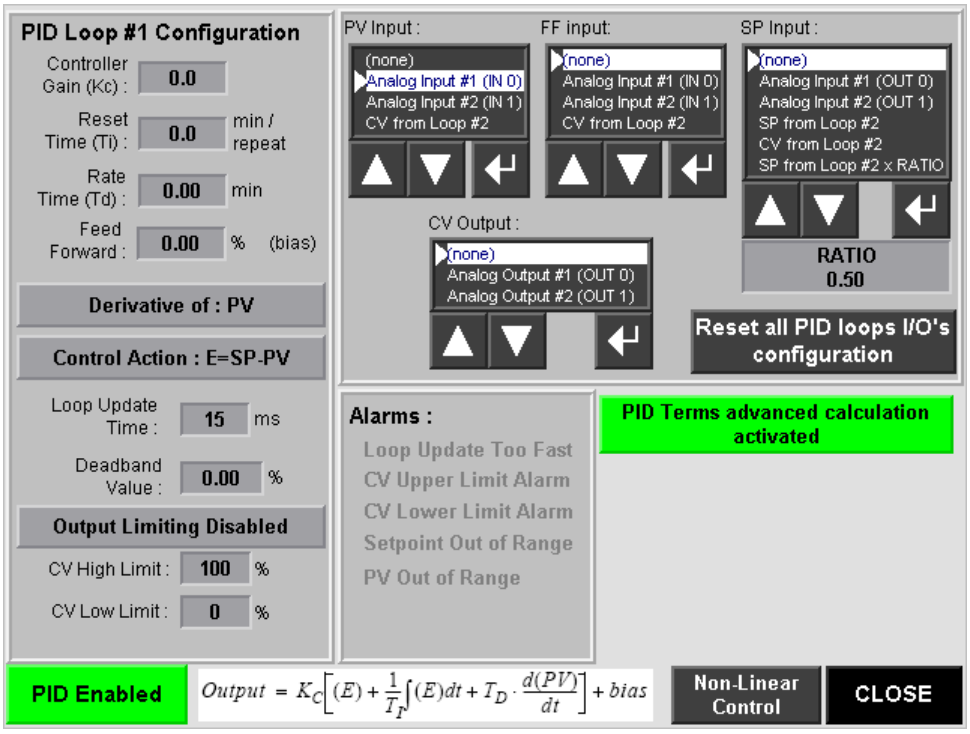


Figure 11: Configuration of a loop (MLX&PVP1000).

The Advanced Calculation button, when enabled, permits calculation of the individual P, I, and D terms for display in a trend. You may choose to disable this function to increase the PLC performance, if necessary.

Configuration windows for the ControlLogix and CompactLogix permit users to visualize the entirety of the assigned I/Os through a screen called Monitor all connections as shown in the following figure. This tool is helpful in avoiding confusion when multiple PID loops are configured simultaneously. Additionally, all I/O's assignments can be reset simultaneously using the RESET ALL button.

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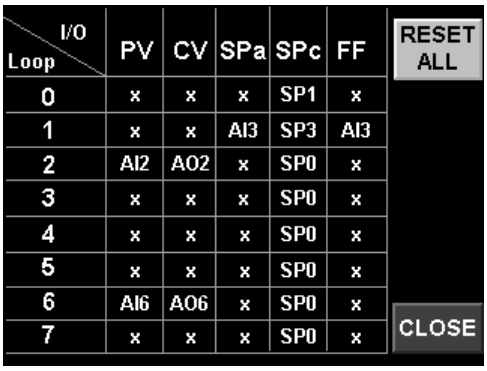


Figure 12: Monitor all connections (CMPLX&PVP600.

Quick CONFIG

The Quick CONFIG window shown in the following figure is found on all PLC interfaces. It is a simple alternative to opening a configuration window when only a change to the setpoint or PID gains is required. The current setpoint and PID parameters can be loaded, modified, and applied from this screen, all at once.

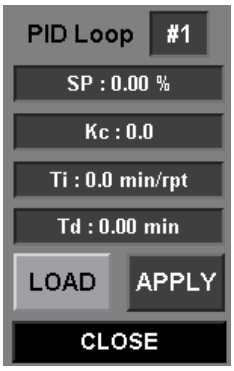


Figure 13: Quick CONFIG.

Split-Range

The HMIs enable easy split-range configuration and visualization. With this function, two or three different analog outputs are used to control a single process variable. Each analog output operates on a different CV range of their respective PID loop.

In the example of the following figure, analog input#0 is the process variable (PV) and the setpoint was manually set to 50%. The analog output 0 (AO0) of PID Loop#1 varies from 0% to 100% (Split-Point Range) when CV1 is between 0% and 50% (CV Effective Range). Since CV1 is currently over 50%, AO0 is topped at 100%. The analog output 1 (AO1) of PID Loop#2 varies between 0% and 100% when CV2 is between 50% and 100% like now. Take note that the two loops need to be enabled, in automatic mode, and configured to work properly.

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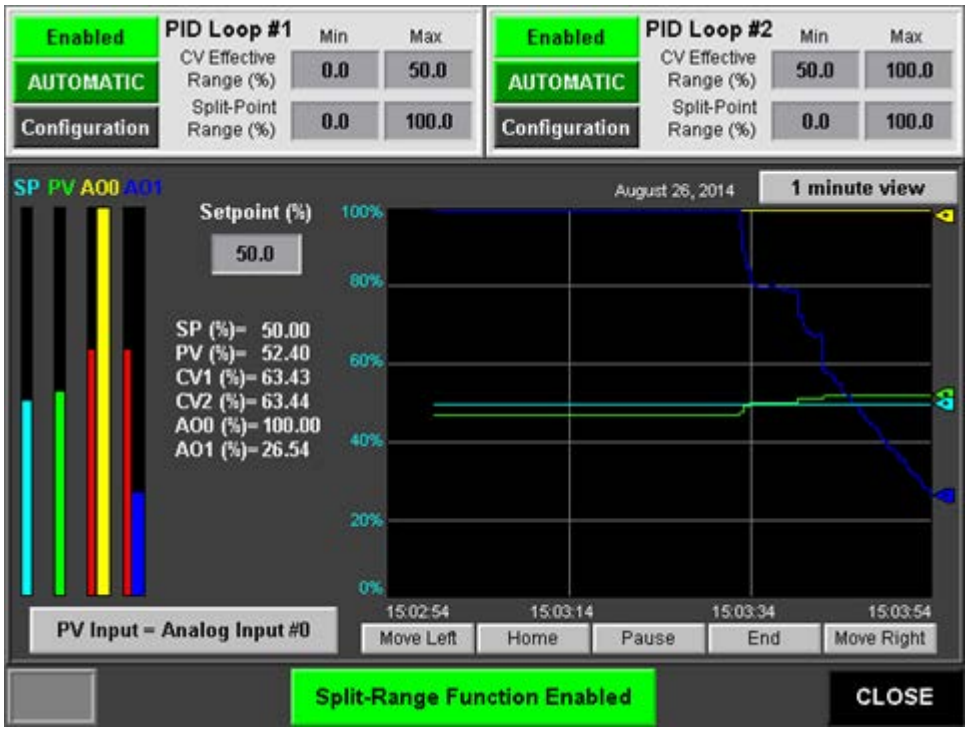


Figure 14: Split-range (MLX&PVP1000).

Trends / Process View

The PVP1000 and PC HMIs have enough space to permit visualization of one (PVP1000) or four (PC) trends or process views. The SP, PV & CV trend is depicted in the following figure and the PID terms trend is shown in the second figure. In both cases, you can change the time span by clicking on the 1 minute view button. Buttons at the bottom permit navigation through the saved trend data. The third figure shows the level process view.

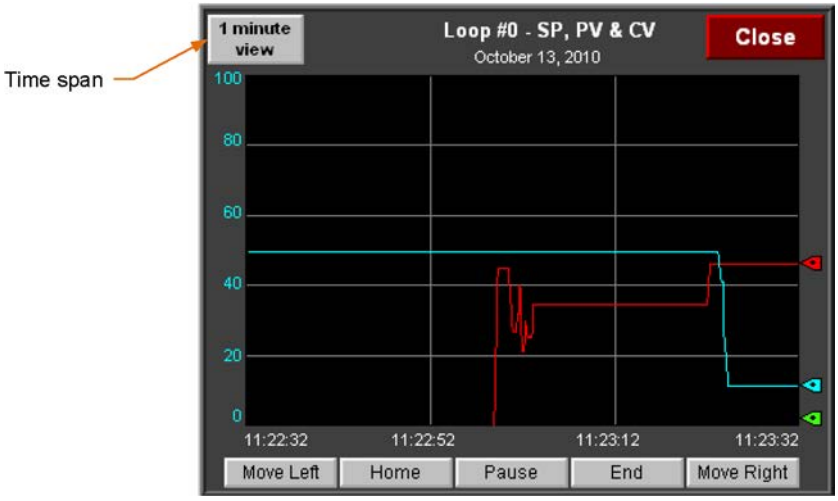


Figure 15: SP, PV, and CV trend.

© Festo Didactic

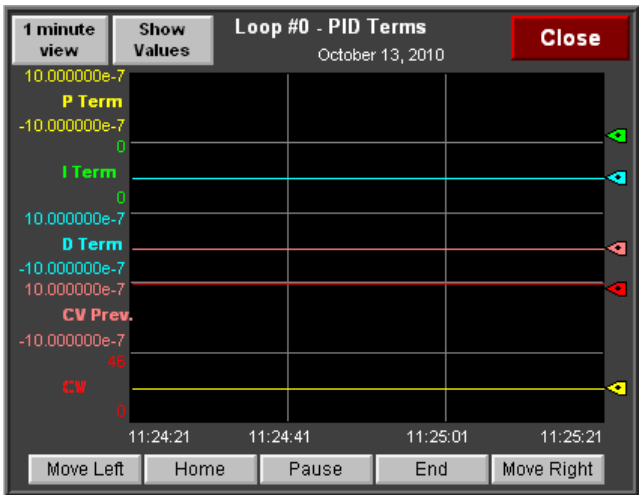


Figure 16: PID terms trend.

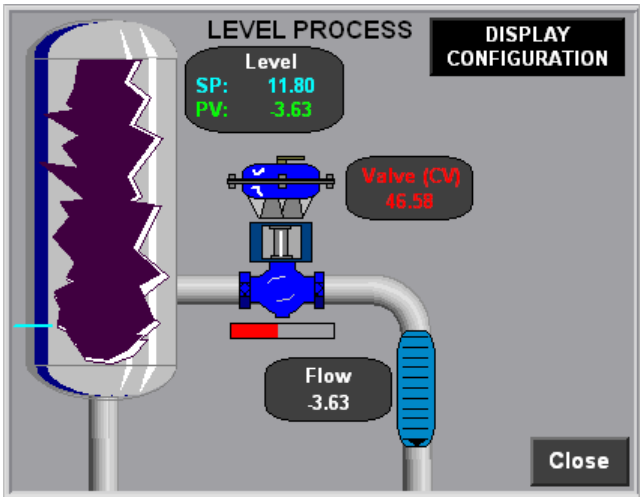


Figure 17: Level process view.

Alarm Status / Alarm History

PVP1000 and PC HMIs contain alarm-management windows. Active alarms are displayed on the Alarm Status window in the following figure. The Alarm History window in the second figure presents both actual and past alarms.

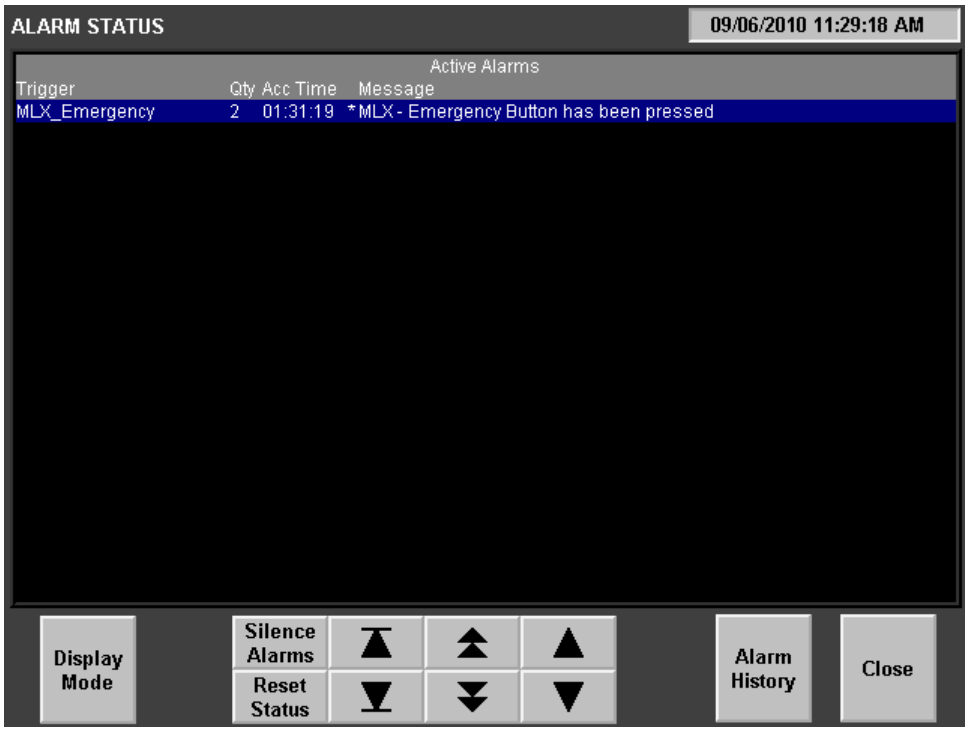


Figure 18: Alarm status (MLX&PVP1000).

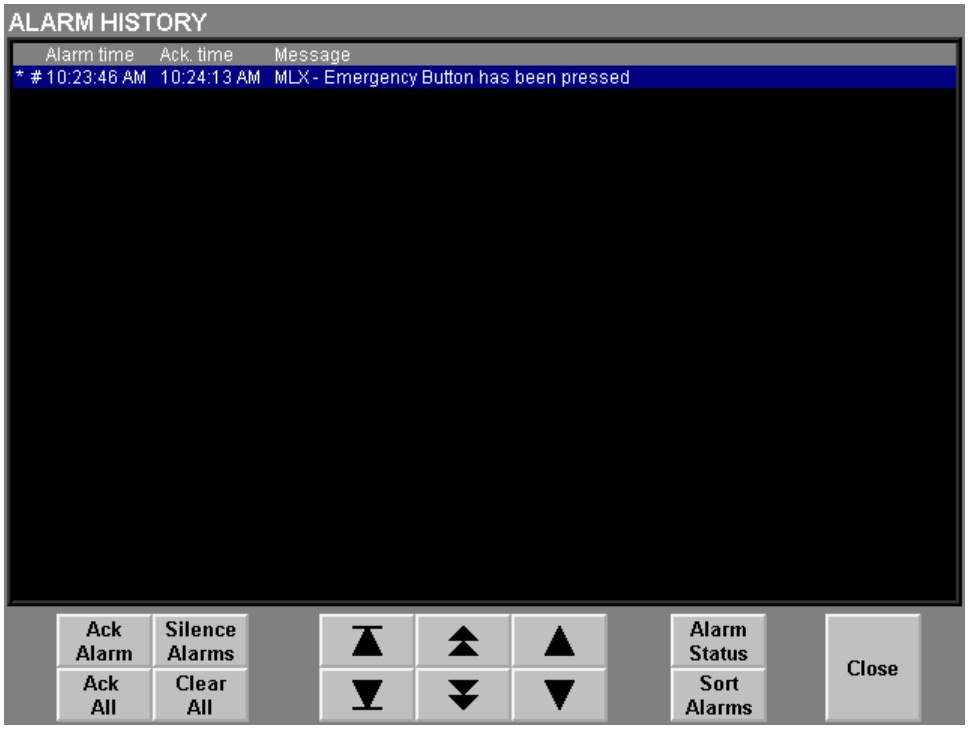


Figure 19: Alarm history (MLX&PVP1000).

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AC Drive Control

Some ac drives provided with the training system can be controlled through Ethernet and the interfaces take advantage of this fact as shown in the following figure.

For remote drive control to work properly, the drive must be set to the right IP address (refer to Appendix A) and be parameterized accordingly.



Figure 20: AC Drive control.

Data Logging (MicroLogix only)

The MicroLogix Data Log Extract Utility (GetDataLog.exe), available for free on Rockwell's website, makes it possible to extract the data collected on the MicroLogix PLC with the help of the HMI window shown in the following figure.

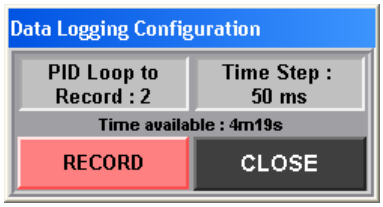


Figure 21: Data logging (MLX&PVP600).

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Familiarization with your MicroLogix Interface

14 min.

MicroLogix and PVP 600

The MicroLogix PLC interfaces are simpler than their CompactLogix and ControlLogix counterparts. This is explained in part by the fact that this PLC offers only two PID loops, one type of algorithm (PID instruction), and no HART or FOUNDATION Fieldbus connectivity.

Refer to Rockwell Automation's Instruction Set Reference Manual for the Micro-Logix PLC (1763-rm001) for further explanations on the different instructions and parameters for MicroLogix PLCs.

The following figure shows the HMI structure for the PVP 600.

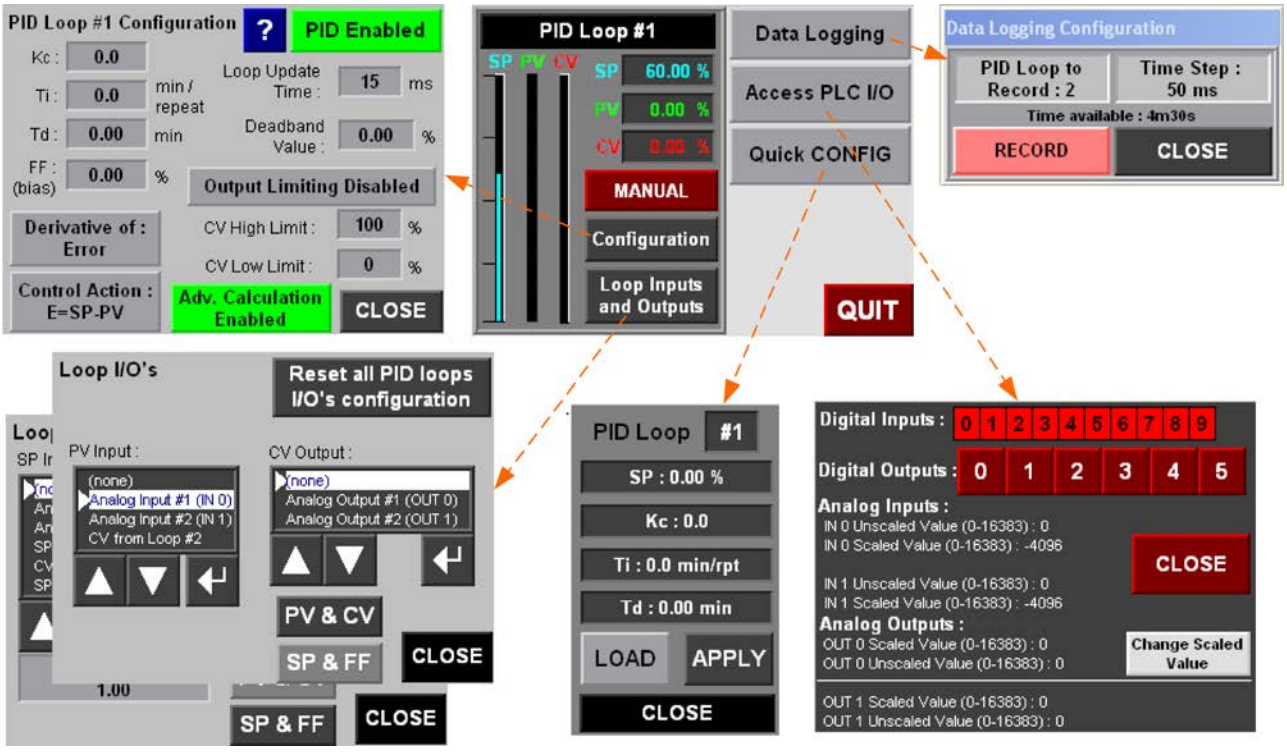


Figure 22: HMI structure (MLX&PVP600).

The main window of this interface is shown in the following figure. It permits selection of the PID Loop number (#1 or #2), SP, PV, CV, and mode (MANUAL/AUTOMATIC) parameters by the touch of the corresponding rectangle. Selecting the QUIT button closes the HMI program.

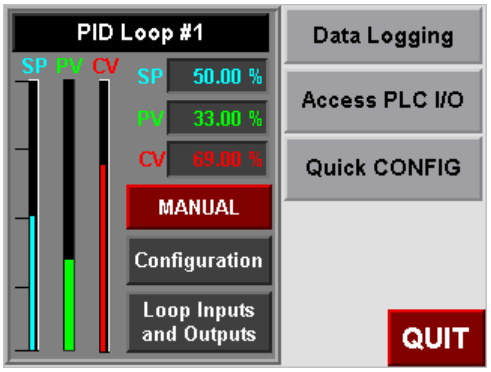


Figure 23: Main window (MLX&PVP 600).

The following windows can be accessed by selecting the corresponding button on the main window.

Configuration

The control algorithm of the PID loop (#1 or #2) can be selected and the PID variables and loop update time can be entered. A deadband or limits to the CV value can be added here.

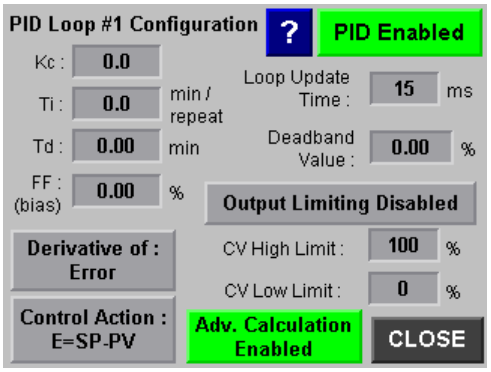


Figure 24: Configuration window (MLX&PVP 600).

Loop Inputs and Outputs

The source or destination of the process variable (PV), control variable (CV), setpoint (SP), and feedforward (FF) parameters for each loop are configurable. Select the PV & CV or the SP & FF button to access the desired parameter list. Move up (▲) or down (▼) to browse through each list and press when your choice is made. Press CLOSE to return to the main window. Pressing Reset all PID loops I/O's configuration sets PV Input, CV Output, SP Input and FF Input of loop #1 and loop #2 to (none). A parameter set to (none) is not assigned. PV and SP values set to (none) can be modified individually from the main window.

© Festo Didactic

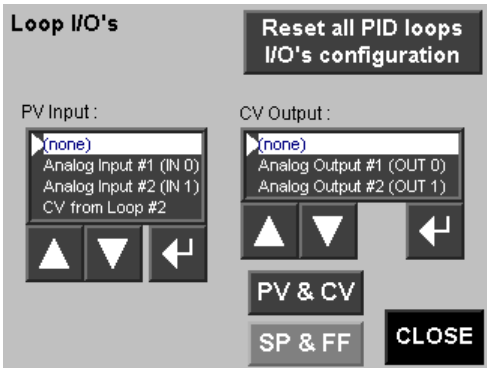


Figure 25: Inputs and Outputs window - PV & CV (MLX&PVP 600).

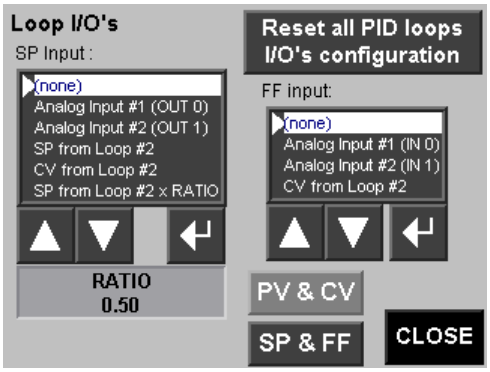


Figure 26: Inputs and Outputs window - SP & FF (MLX&PVP 600).

Data Logging

The MicroLogix Data Log Extract Utility (GetDataLog.exe), available for free on Rockwell's website, makes it possible to extract the data collected on the MicroLogix PLC through this configuration window.

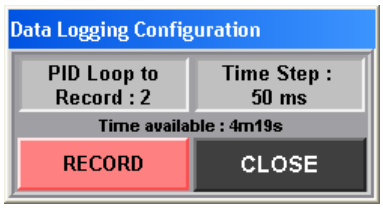


Figure 27: Data Logging window (ML&PVP 600).

Access PLC I/O

Red rectangles indicate digital inputs and outputs in the off (0) state, while green rectangles indicate I/Os in the on (1) state. Analog input and output values are also displayed in this window in their scaled and unscaled form. Outputs can be modified if they are not assigned in the PLC Program.

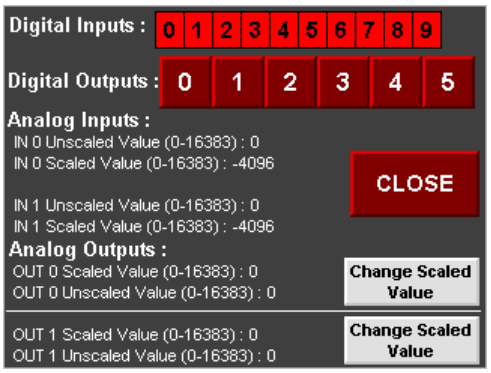


Figure 28: Access PLC I/O window (MLX&PVP 600).

Quick CONFIG

The current setpoint and PID parameters can be loaded, modified, and applied from the Quick CONFIG window, all at once.

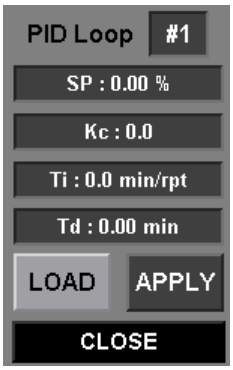


Figure 29: Quick CONFIG window (MLX&PVP 600).

Drive PowerFlex 40

One pump drive can be controlled by the HMI if its IP address is 192.168.2.50 and it is set for Ethernet control.

Split-Range Fct

The Split-Range Function is divided into three windows. Two analog outputs are used to control a single process variable. Each analog output operates on a different CV range.

MicroLogix and PVP 1000

The following figure shows the HMI structure for the PVP 1000.

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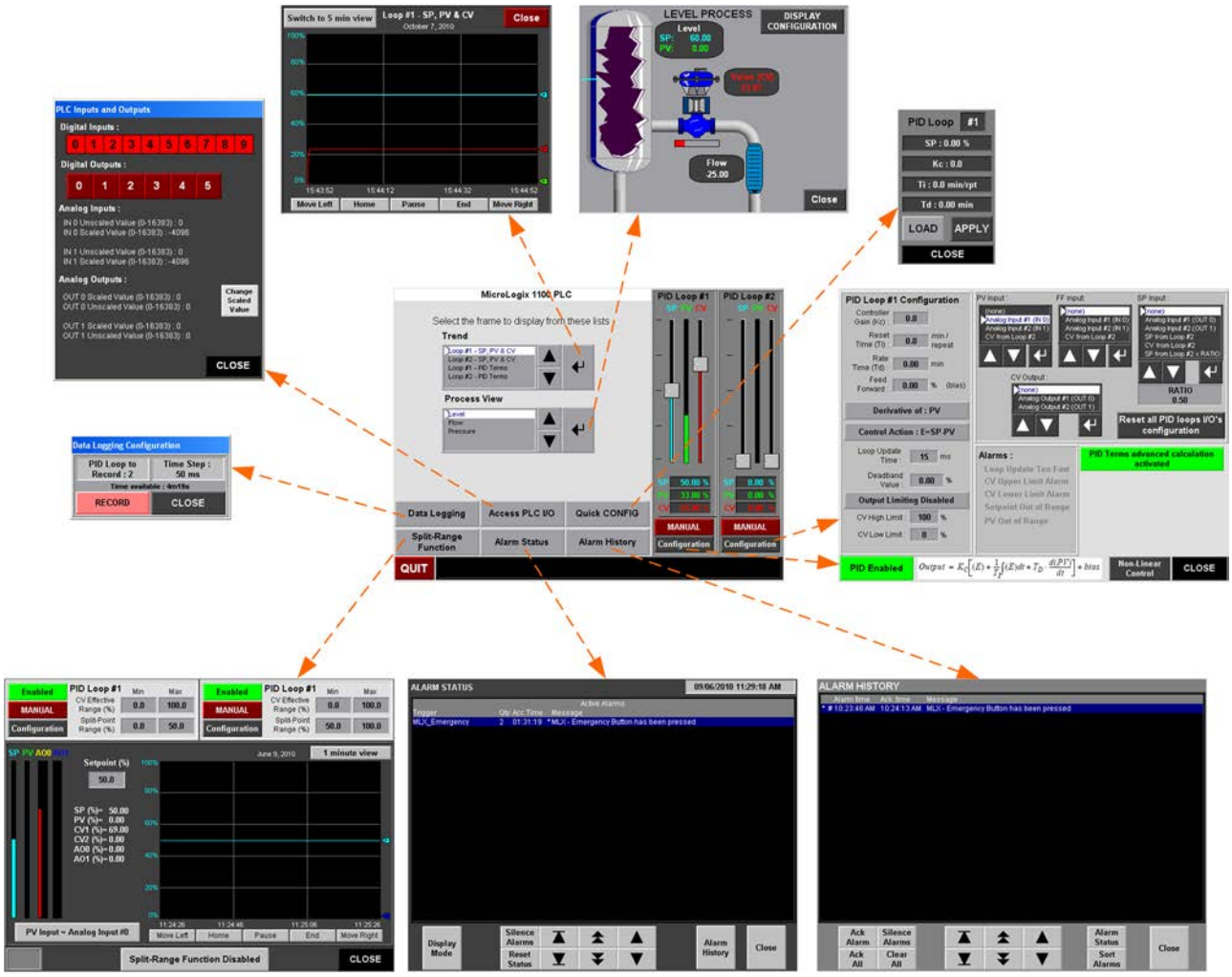


Figure 30: HMI structure (MLX&PVP1000).

The main window of this interface is shown in the following figure. The first thing we notice is that the two loop control panels are displayed simultaneously. The Data Logging, Access PLC I/O, and Quick CONFIG windows are identical to the PanelView Plus 600 version. However, the Configuration and Split-Range Function windows are somewhat different. In addition, two new windows are accessible: Alarm Status, and Alarm History.

© Festo Didactic

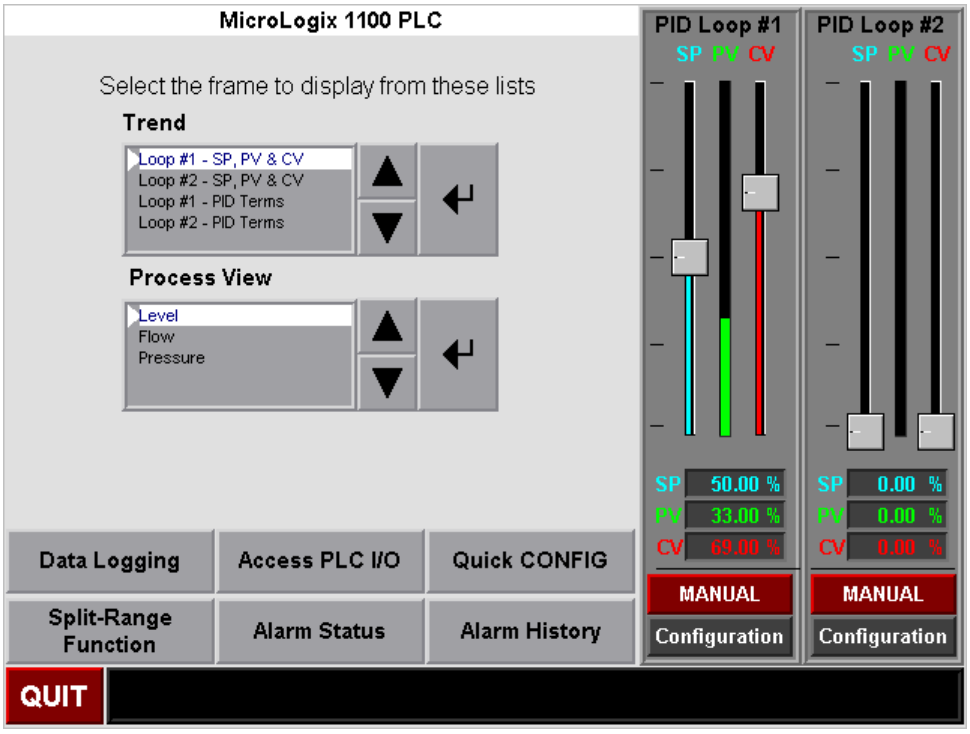


Figure 31: Main window (MLX&PVP 1000).

Configuration

The Configuration window shown in the following figure combines the Configuration, Loop Inputs and Outputs windows from the PVP 600 interface and shows the status of five alarms.

PID Terms advanced calculation in the Configuration window must be activated to display the PID Terms trends correctly.

© Festo Didactic

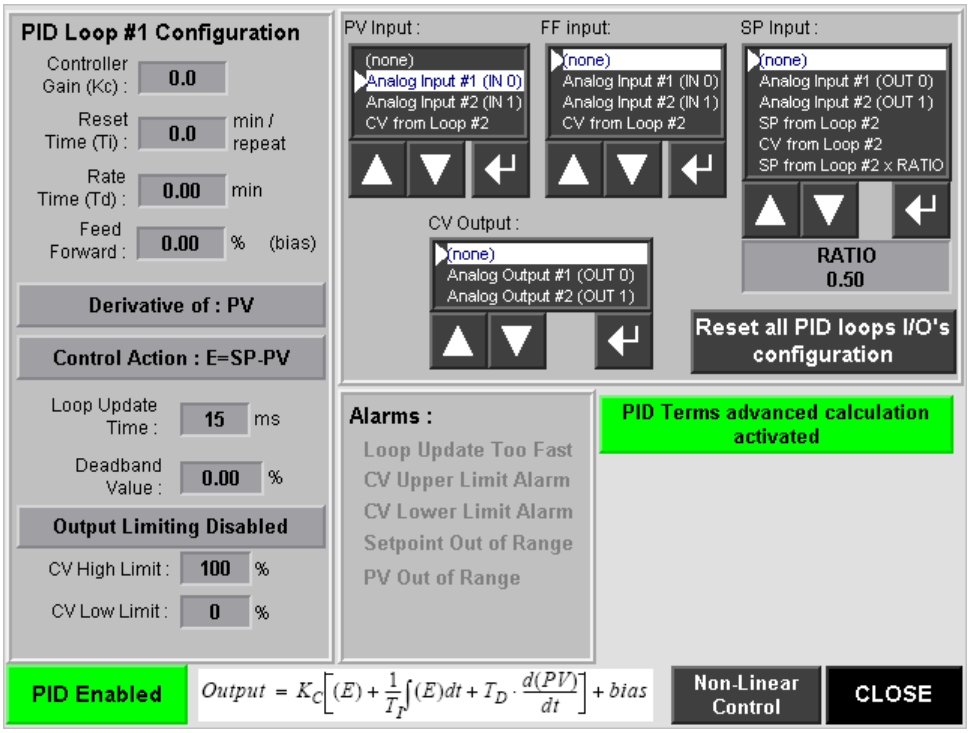


Figure 32: Configuration window (MLX&PVP 1000).

Split-Range Function

The following figure shows a Split-Range Function window where two analog outputs are used to control a single process variable. Each analog output operates on a different CV range.

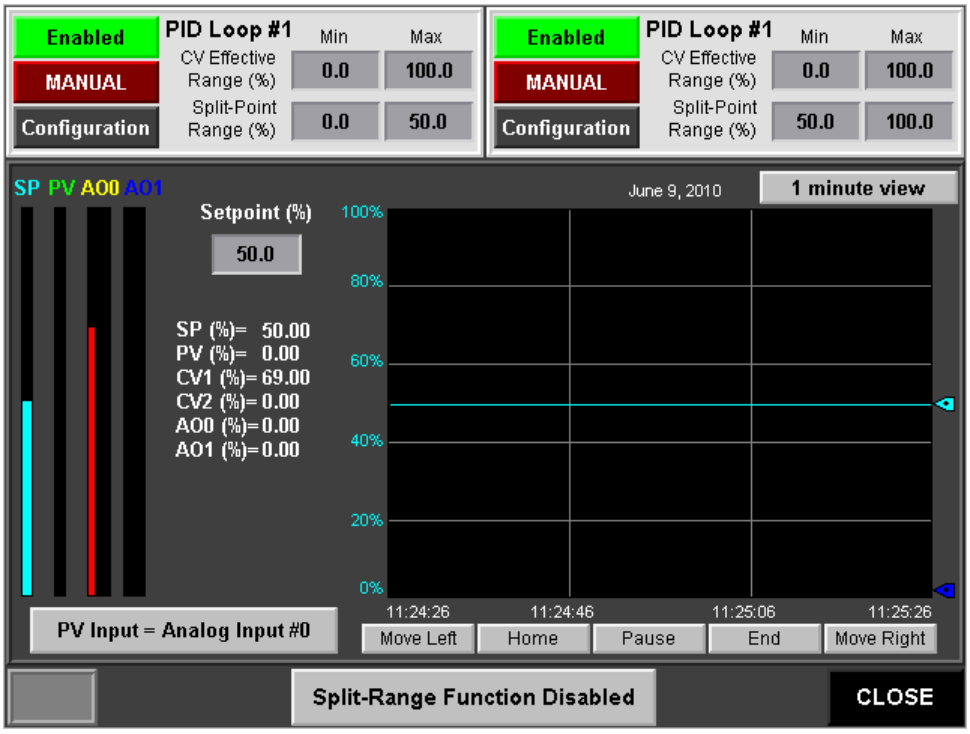


Figure 33: Split-Range Function window (MLX&PVP 1000).

Alarm Status / Alarm History

Active and past alarms are managed from the Alarm Status and Alarm History windows shown in the following two figures.

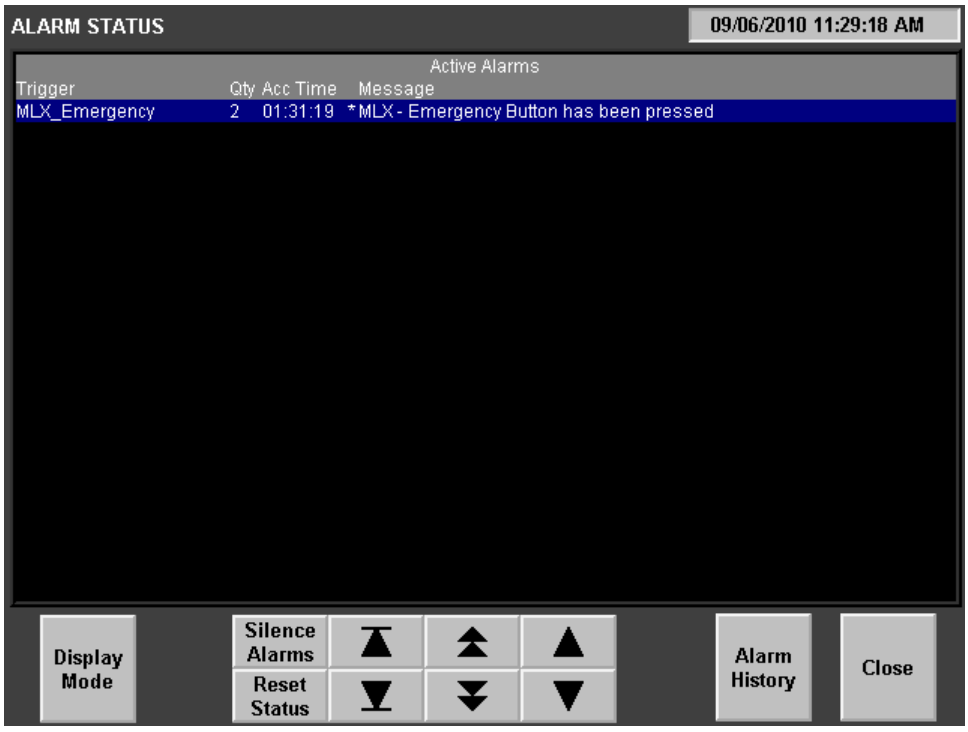


Figure 34: Alarm Status (MLX&PVP 1000).

© Festo Didactic

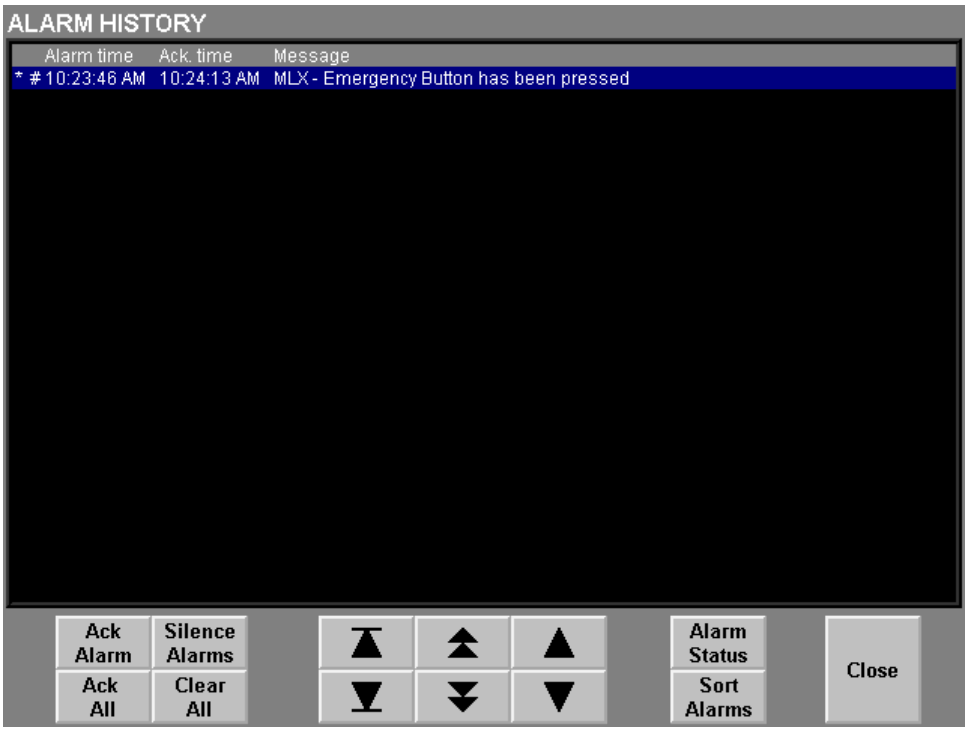


Figure 35: Alarm History (MLX&PVP 1000).

Micrologix and PC

The PC version, shown in the following figure, is quite similar to that of the PVP 1000; however, in this version, four displays (trends and process views) can be shown simultaneously.

If you don't see the whole window as shown in the preceding figure, the resolution of your monitor needs to be adjusted. The HMI is designed for 1280 X 1024 screens. You can also use the interface for the PanelView Plus 1000 on your PC instead, if you prefer.

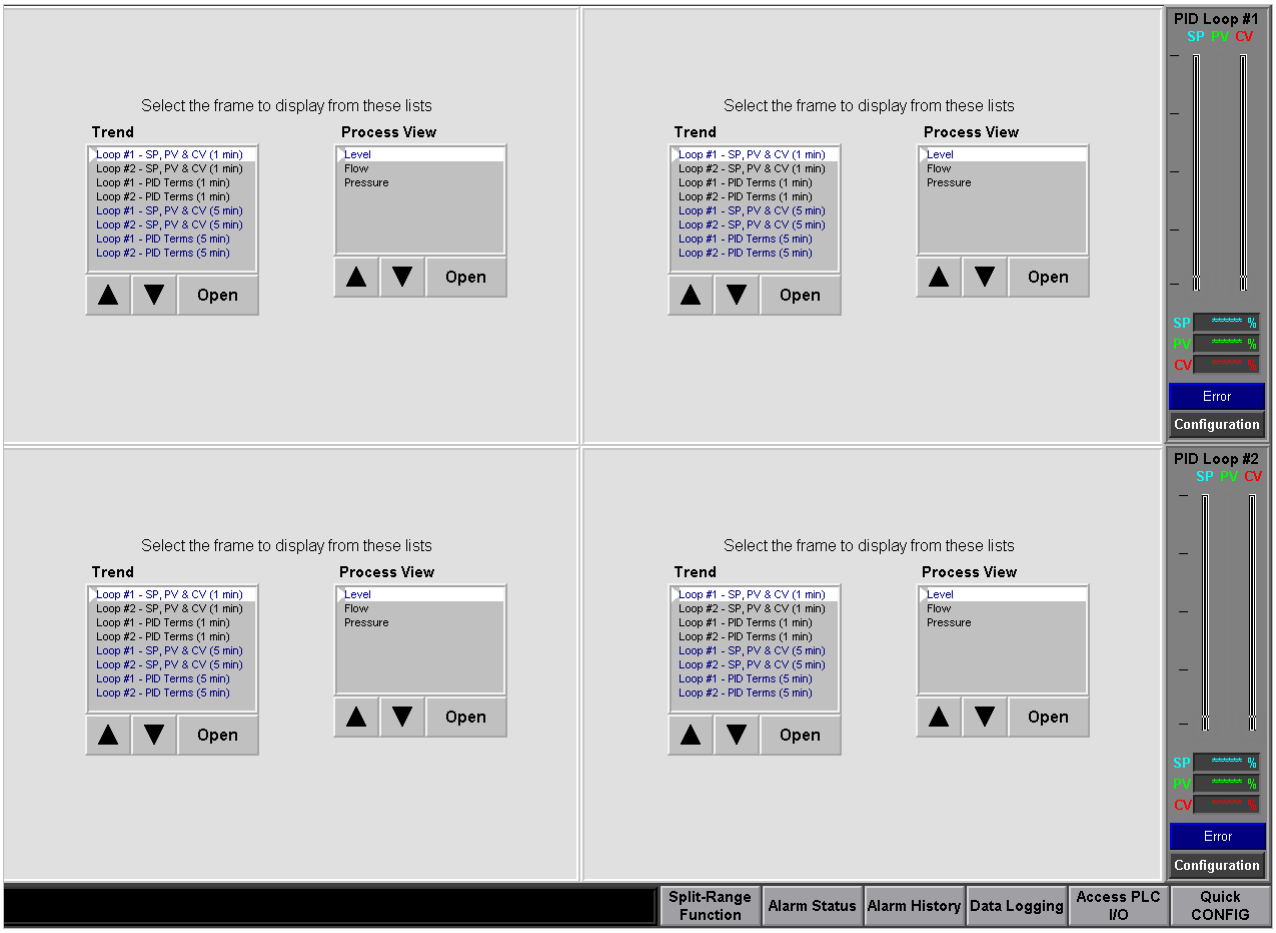


Figure 36: HMI main screen (MLX&PC).

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Familiarization with your CompactLogix Interface

14 min.

CompactLogix and PVP 600

The CompactLogix is more powerful than the MicroLogix PLC. Among other things, it permits

- control of up to eight loops
- velocity and position PID algorithms
- ac drive control
- FOUNDATION Fieldbus connectivity

However, the CompactLogix lacks HART I/Os. For this reason, a ControlLogix must be used if you absolutely need HART connectivity.

Refer to Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003) and Logix5000 Controllers Process Control and Drives Instructions (1756-rm006) for further explanations on the different instructions and parameters for CompactLogix and ControlLogix PLCs.

The following figure shows the HMI structure for the PVP 600.

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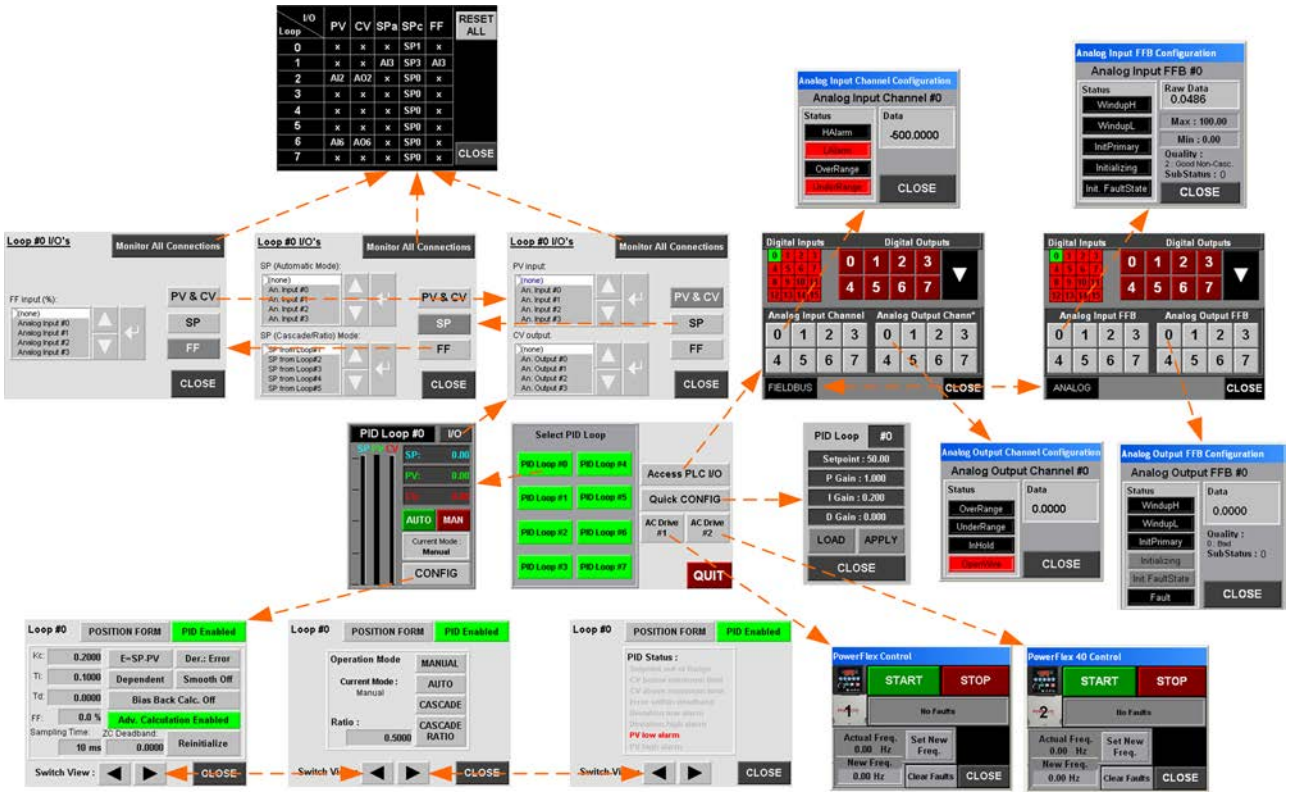


Figure 37: HMI structure (CMPLX&PVP600).

The CompactLogix PLC has eight analog inputs and eight analog outputs and therefore, eight PID loops as shown in the following figure. But since the space on the PVP 600 is limited only one of the eight loops can be viewed at once (the second figure).

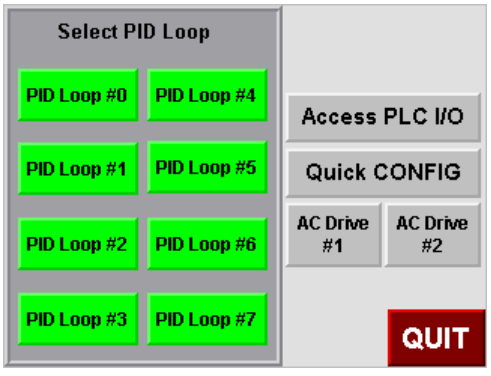


Figure 38: Select PID Loop (CMPLX&PVP 600).

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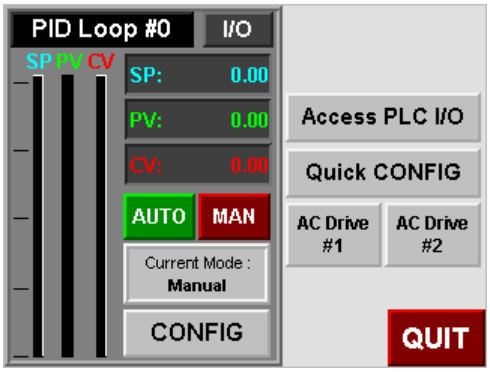


Figure 39: Main window – PID Loop #0 (CMPLX&PVP 600).

To return to PID loop selection, select the PID Loop #_ rectangle on top.

The following windows can be accessed directly by selecting the corresponding button on the main window.

Configuration

The control algorithm of the PID loop can be selected and the PID variables and sampling time can be entered on the first configuration window shown in the following figure. Use the arrows at the bottom to switch to the second (the second figure) and third (the third figure) configuration windows. Select the top middle button in any of the three windows to switch between POSITION FORM and VELOCITY FORM.

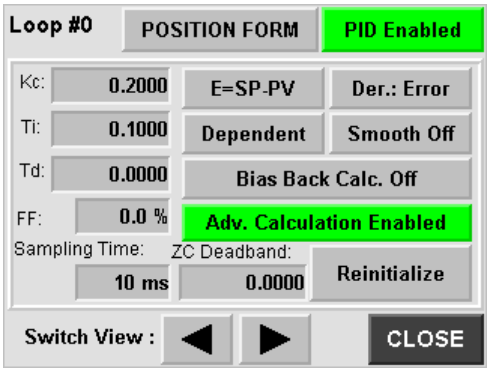


Figure 40: Configuration window – part 1 (CMPLX&PVP 600).

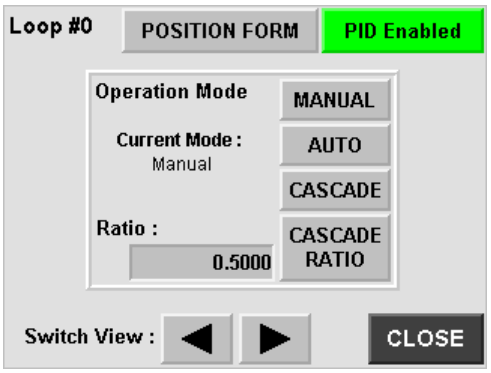


Figure 41: Configuration window – part 2 (CMPLX&PVP 600).

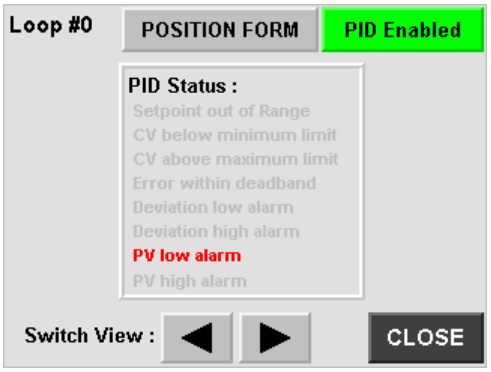


Figure 42: Configuration window – part 3 (CMPLX&PVP 600).

Loop Inputs and Outputs

The source or destination of the process variable (PV), control variable (CV), setpoint (SP) and feedforward (FF) parameters can be chosen for each loop by clicking on the small I/O button of the selected PID loop control panel on the main window. Select the PV & CV, the SP, or the FF button to access the desired parameter list (see the following three figures). Move up (▲) or down (▼) to browse through the list and press ⏎ when your choice is made. Press CLOSE to return to the main window. Press Monitor All Connections to access a table where all loop links are shown (fourth figure). Pressing RESET ALL sets PV, CV, SPa, SPc and FF of all loops to (none). A parameter set to (none) is not assigned.

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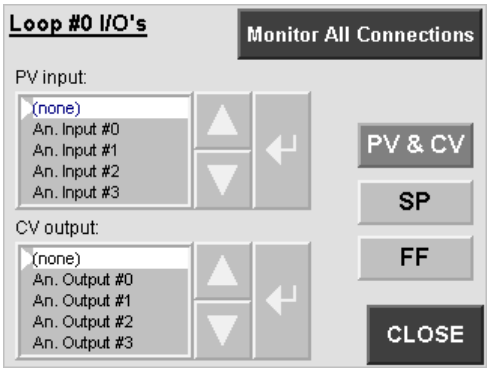


Figure 43: Inputs and Outputs window - PV & CV (CMPLX&PVP 600).

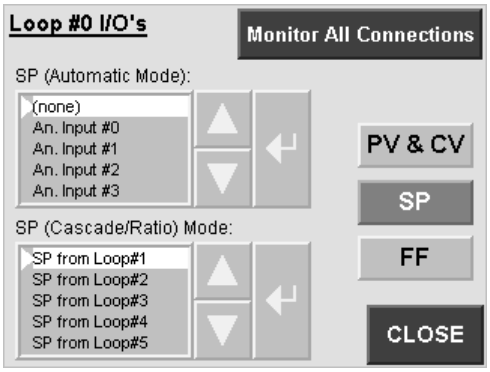


Figure 44: Inputs and Outputs window - SP (CMPLX&PVP 600).

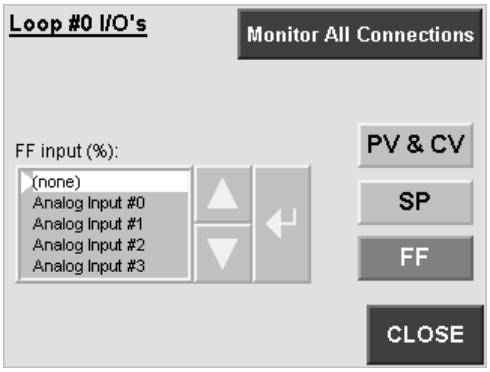


Figure 45: Inputs and Outputs window - FF (CMPLX&PVP 600).

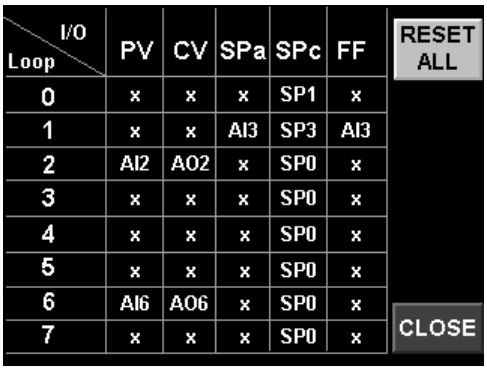


Figure 46: Monitor All Connections (CMPLX&PVP 600).

Access PLC I/O

Red rectangles indicate digital inputs and outputs in the off (0) state, while green rectangles indicate I/Os in the on (1) state. Analog (see the following figure) and FOUNDATION Fieldbus (see the second following figure) IO status and data can be accessed by clicking on the corresponding grey rectangle.

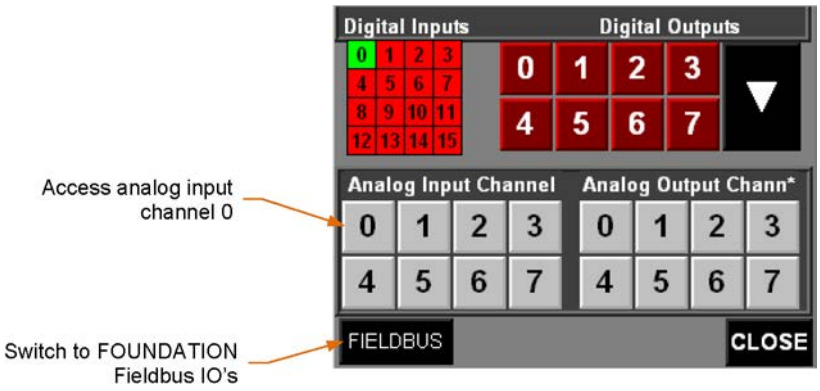


Figure 47: Access PLC I/O window (CMPLX&PVP 600).

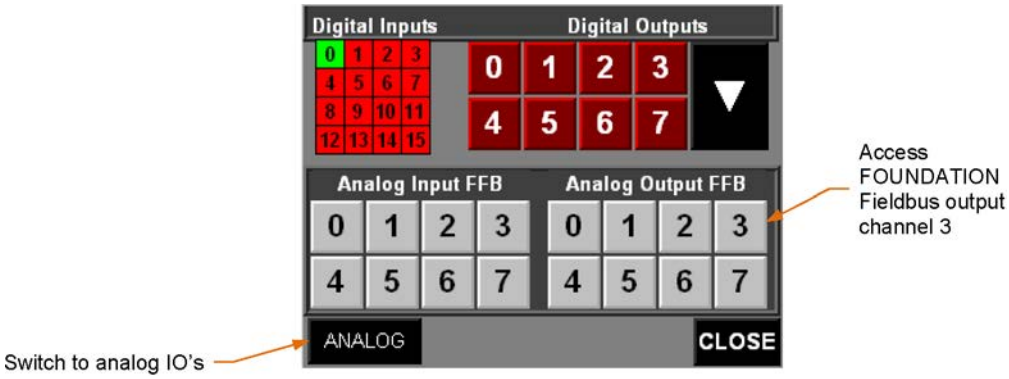


Figure 48: FF Access PLC I/O window (CMPLX&PVP 600).

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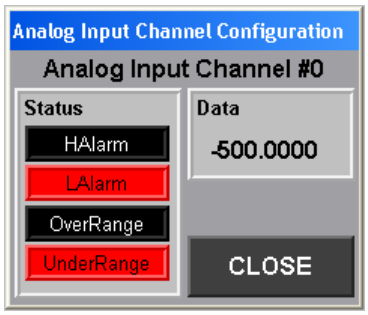


Figure 49: Analog Input Channel Configuration (CMPLX&PVP 600).

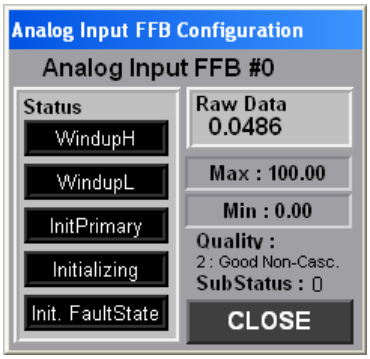


Figure 50: FF Input Channel Configuration (CMPLX&PVP 600).

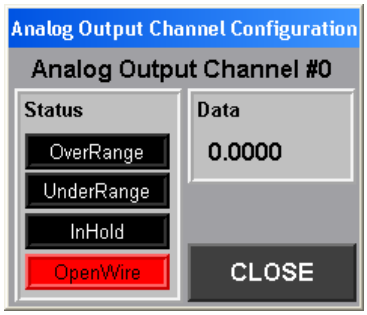


Figure 51: Analog Output Channel Configuration (CMPLX&PVP 600).

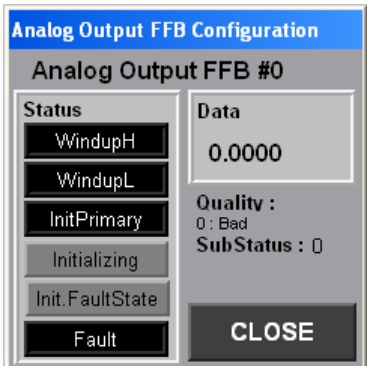


Figure 52: FF Output Channel Configuration (CMPLX&PVP 600).

Quick CONFIG

The current setpoint and PID parameters can be loaded, modified, and applied from the Quick CONFIG window, all at once.



Figure 53: Quick CONFIG window (CMPLX&PVP 600).

AC Drive #1 and #2

Two pump drives can be controlled by the HMI if they have the right IP address and are set for Ethernet control.



Figure 54: AC Drive #1 (CMPLX&PVP 600).

CompactLogix and PVP 1000

The following figure shows the HMI structure for the PVP 1000.

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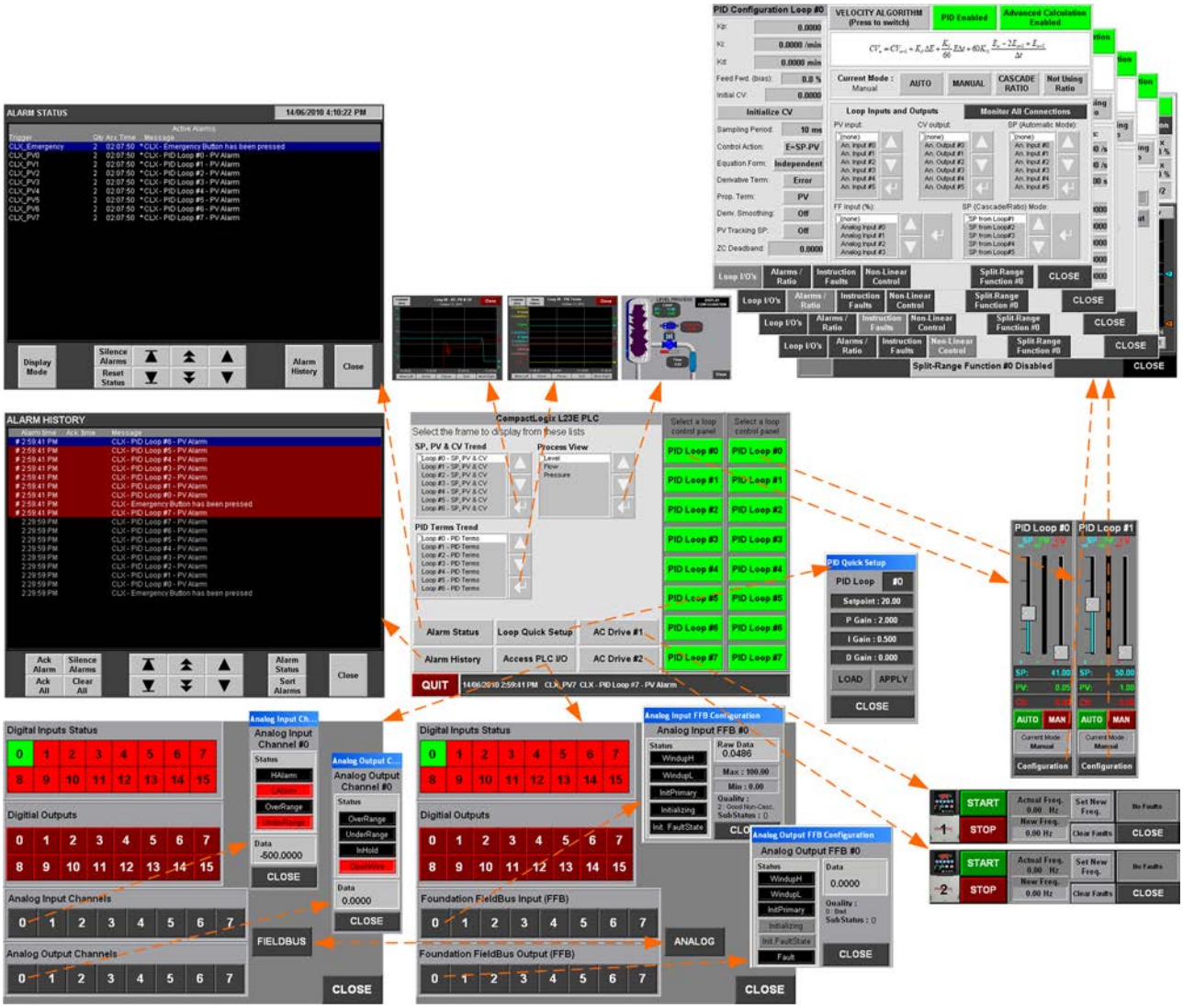


Figure 55: HMI structure (CMPLX&PVP1000).

The main window of this interface is shown in the following figure. The first difference with the PVP 600 interface we notice is that two loop control panels are displayed simultaneously. Loop Quick Setup is identical to the PanelView Plus 600 Quick CONFIG version. Access PLC I/O, AC Drive #1, and AC Drive #2 remain similar. On the other hand, the Configuration window is more complex. Finally, Alarm Status and Alarm History are new windows available with this version.

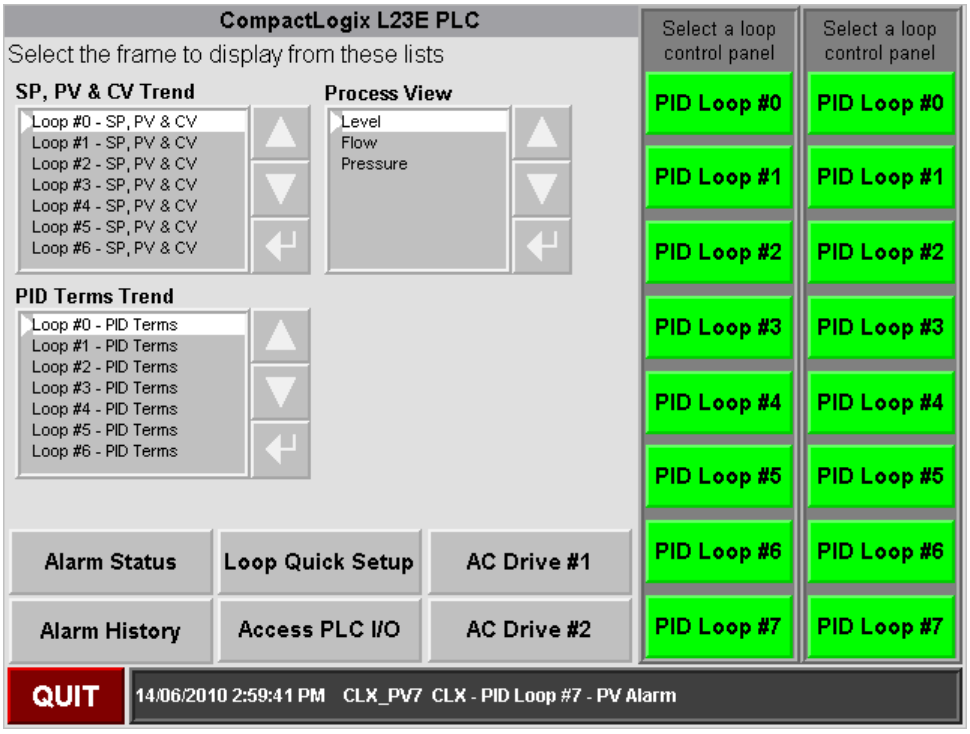


Figure 56: Main window (CMPLX&PVP 1000).

Configuration

The window shown in the following figure combines the Configuration, Loop Inputs and Outputs windows from the PVP 600 interface. The sub-windows in the following four figures are accessed via the buttons at the bottom. They permit loop alarms management as well as ratio, non-linear, and split-range control configuration.

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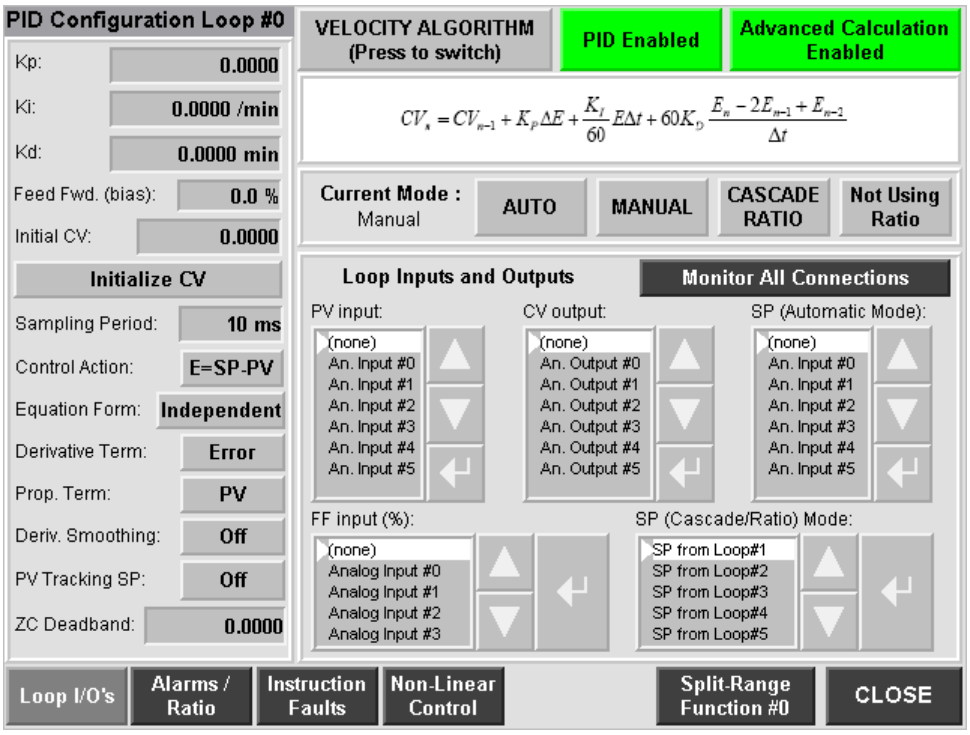


Figure 57: Configuration window – Loop I/O (CMPLX&PVP 1000).

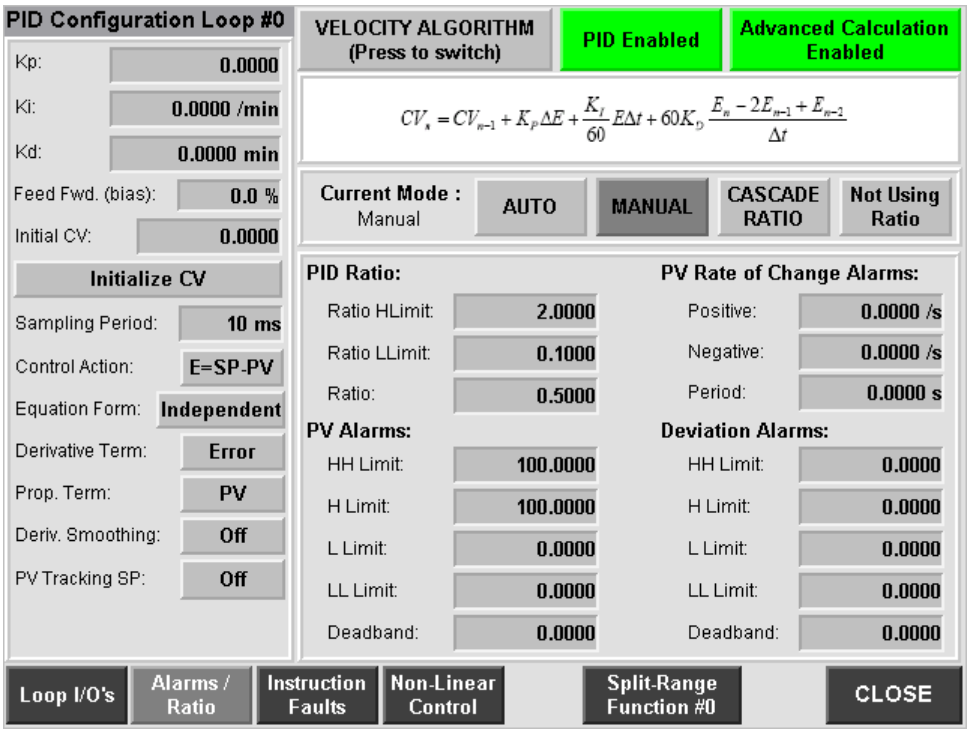


Figure 58: Configuration window – Alarms/Ratio (CMPLX&PVP 1000).

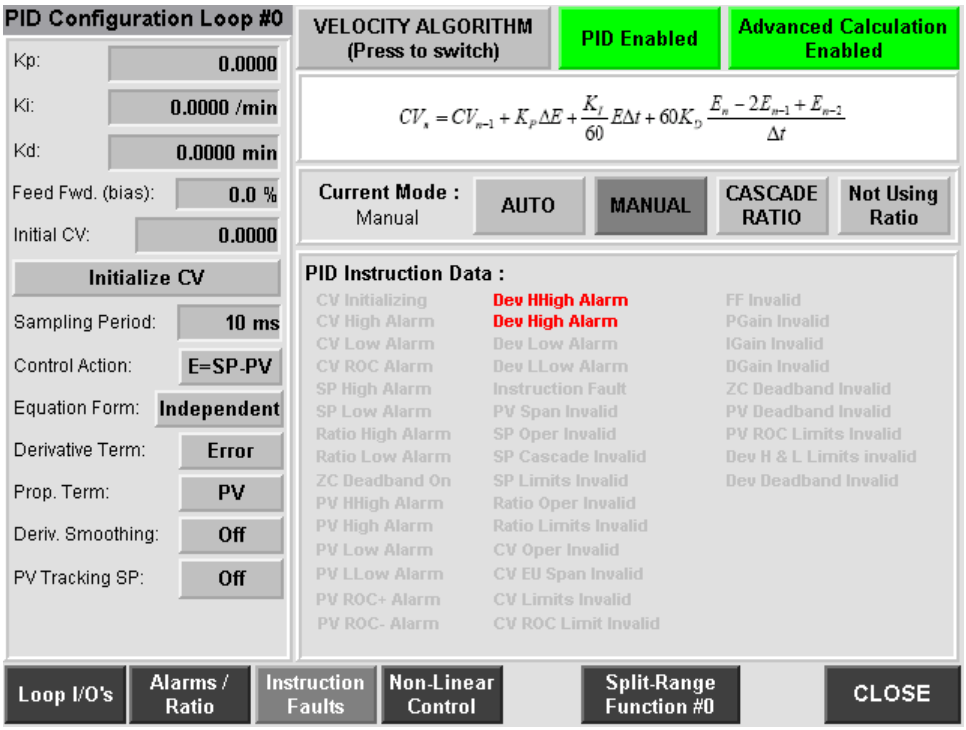


Figure 59: Configuration window –Instruction Faults (CMPLX&PVP 1000).

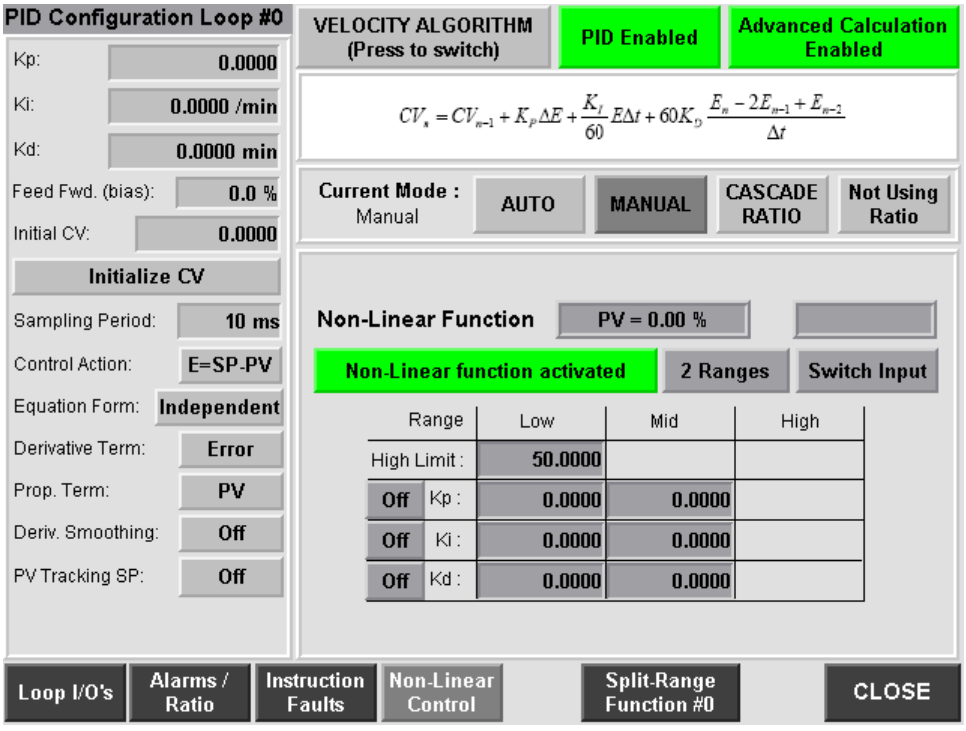


Figure 60: Configuration window – Non-Linear Control (CMPLX&PVP 1000).

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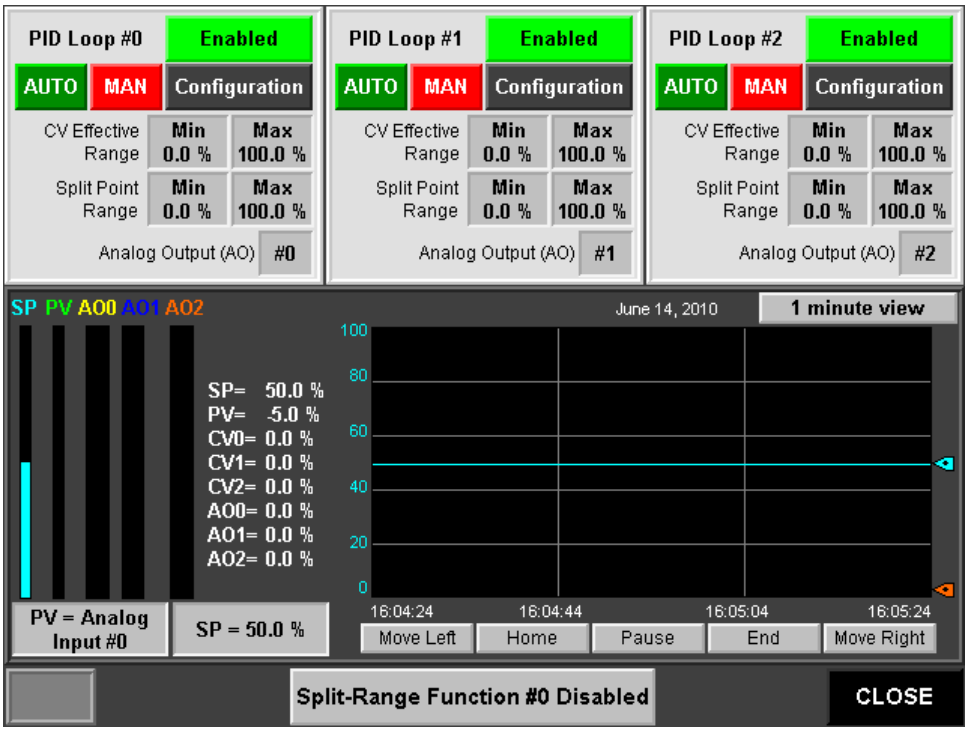


Figure 61: Configuration window – Split-Range Function (CMPLX&PVP 1000).

Alarm Status / Alarm History

Active and past alarms are managed from the windows in the following two figures.

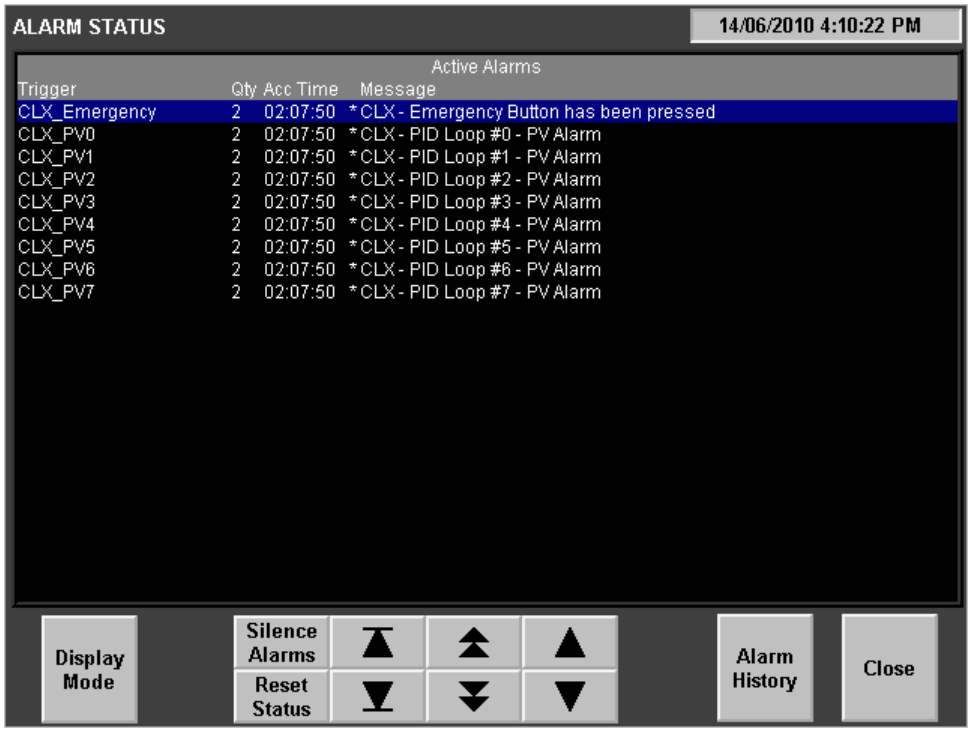


Figure 62: Alarm Status (CMPLX&PVP 1000).

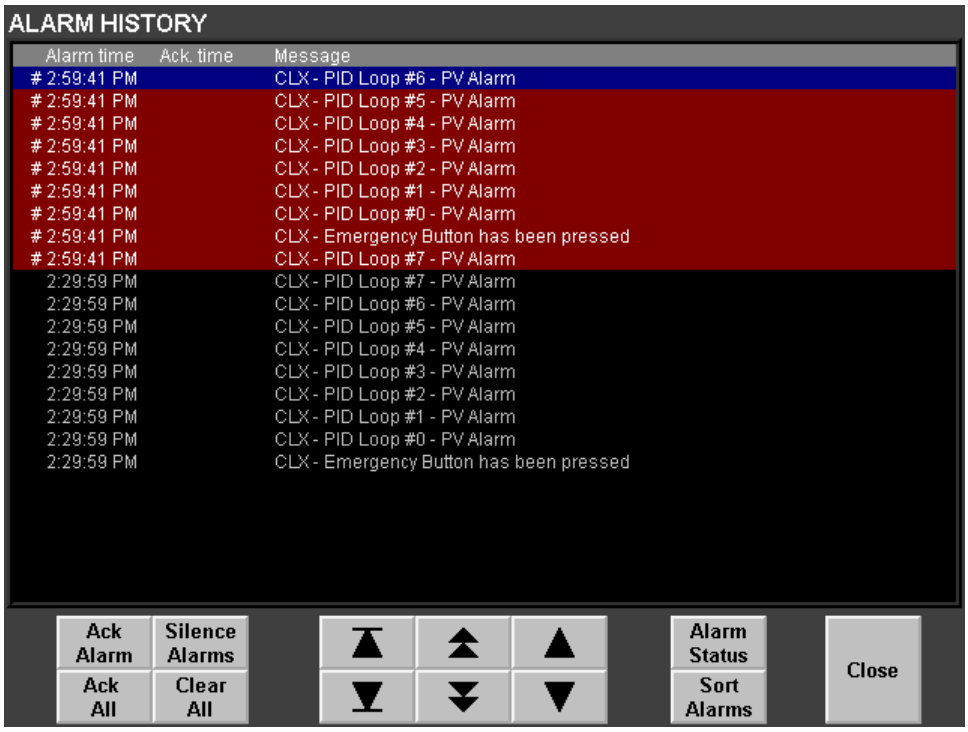


Figure 63: Alarm History (CMPLX&PVP 1000).

Access PLC I/O.

Red rectangles indicate digital inputs and outputs in the off (0) state, while green rectangles indicate I/Os in the on (1) state. Analog (the following figure) and FOUNDATION Fieldbus (the second following figure) IO status and data can also be accessed by clicking on the corresponding grey rectangle.

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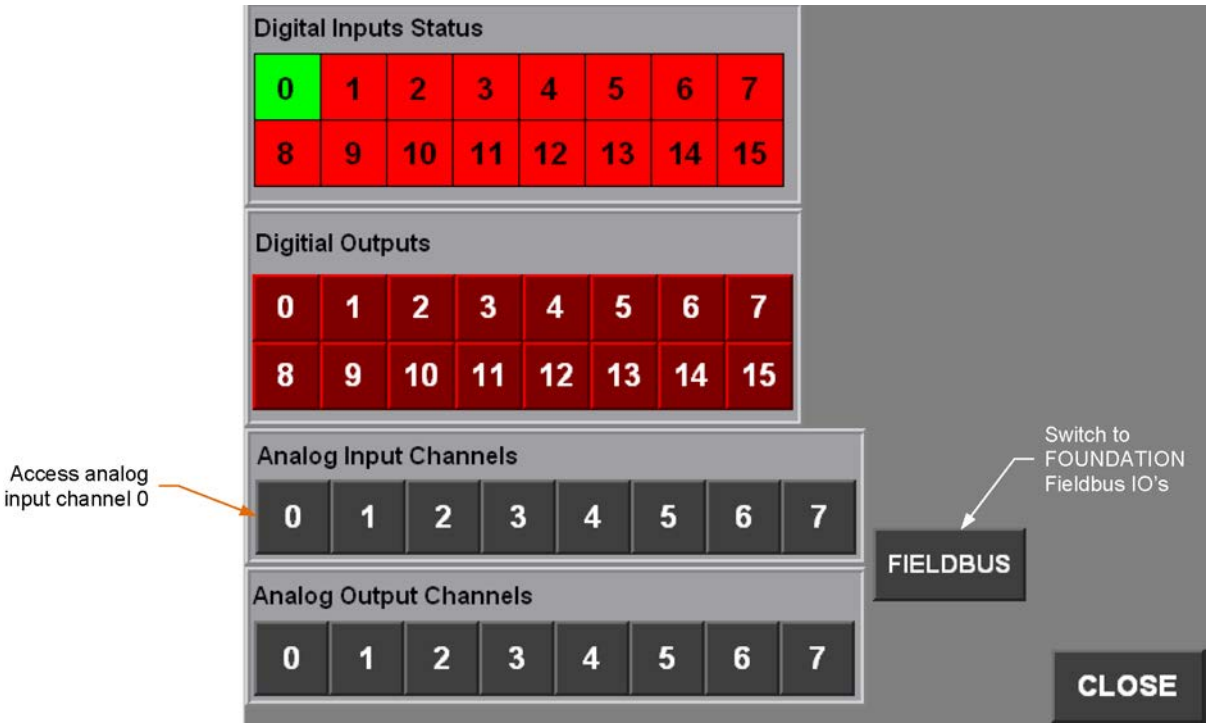


Figure 64: Access PLC I/O window (CMPLX&PVP 1000).

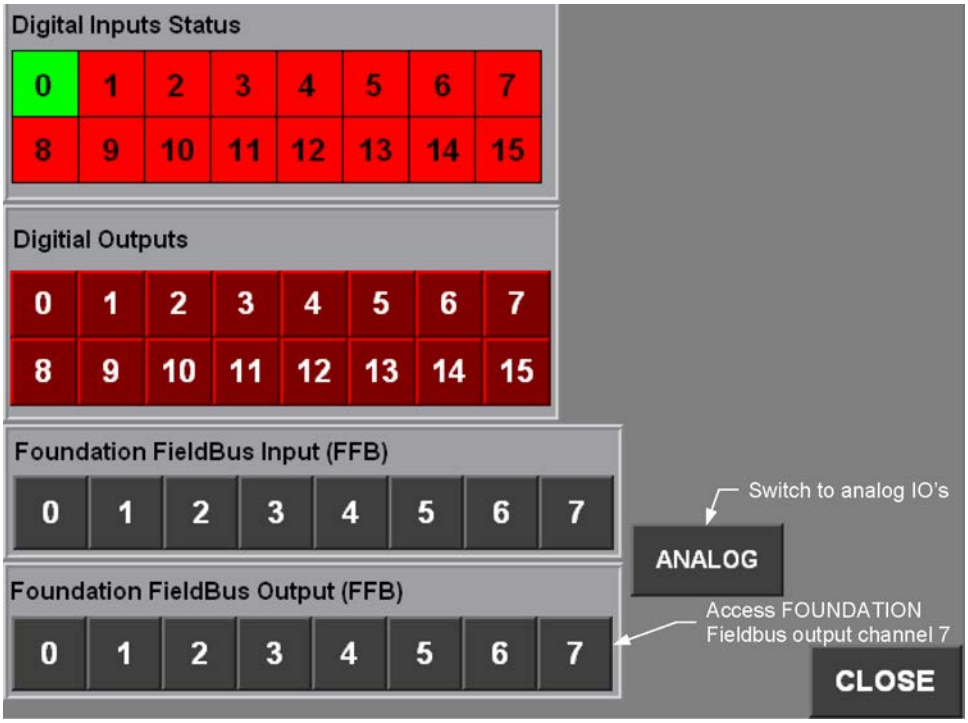


Figure 65: FF Access PLC I/O window (CMPLX&PVP 1000).

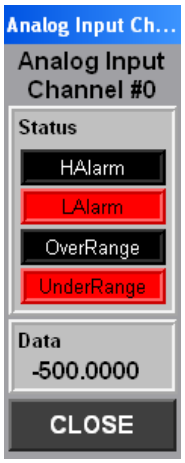


Figure 66: Analog Input Channel Configuration (CMPLX&PVP 1000).

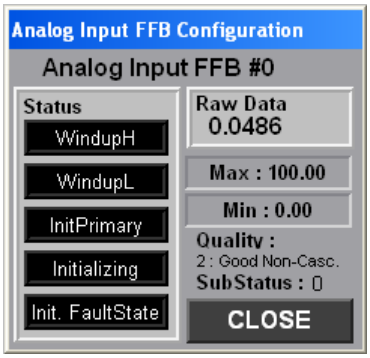


Figure 67: FF Input Channel Configuration (CMPLX&PVP 1000).

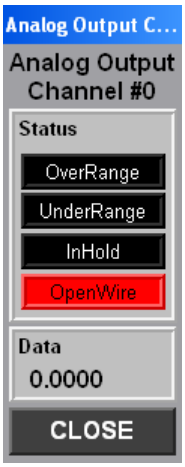


Figure 68: Analog Output Channel Configuration (CMPLX&PVP 1000).

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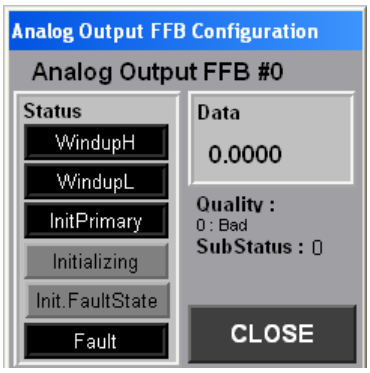


Figure 69: FF Output Channel Configuration (CMPLX&PVP 1000).

CompactLogix and PC

The PC version, shown in the following figure, is quite similar to that of the PVP 1000; however, in this version, four displays (trends and process views) can be shown simultaneously.

If you don't see the whole window as shown in the following figure, the resolution of your monitor needs to be adjusted. The HMI is designed for 1280 X 1024 screens. You can also use the interface for the PanelView Plus 1000 on your PC instead, if you prefer.

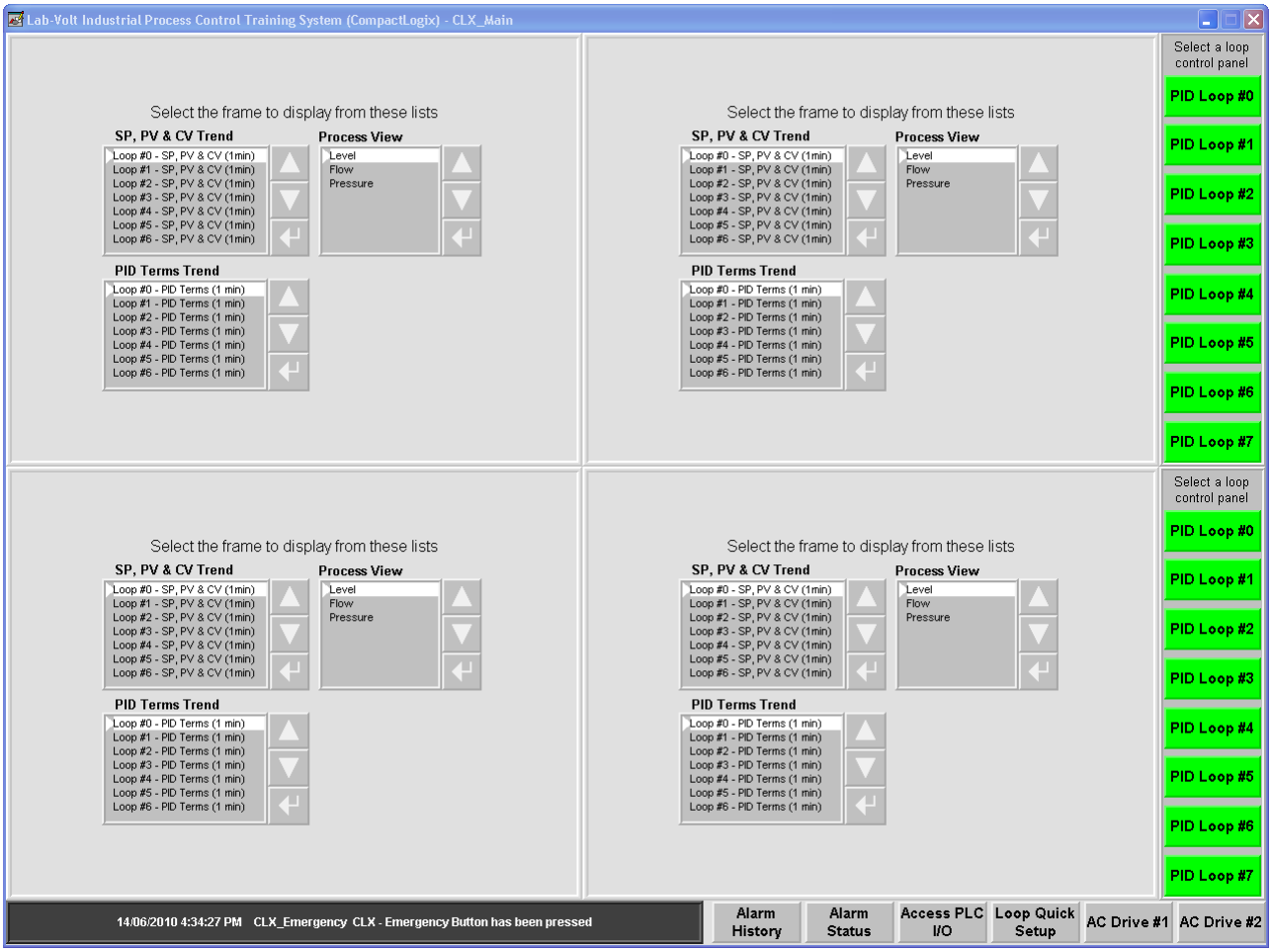


Figure 70: HMI main screen (CMPLX&PC).

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Familiarization with your ControlLogix Interface

7 min.

ControlLogix interfaces resemble those for CompactLogix because both PLCs offer 8 PID loops. However, the two PLCs have dissimilar digital outputs (16 dc outputs for the CompactLogix, 8 relay outputs for the ControlLogix). The ControlLogix is also the only one to use HART. These differences are reflected in the HMIs Access PLC I/O menus discussed in this section. Refer to this section on the CompactLogix for information about the other HMI menus.

For details about the HART protocol and how to connect your field devices, please refer to the HART Device Configuration manual (P/N 86050-00).

ControlLogix and PVP 600

The following figure shows the HMI structure for the PVP 600.

Refer to Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003) and Logix5000 Controllers Process Control and Drives Instructions (1756-rm006) for further explanations on the different instructions and parameters for CompactLogix and ControlLogix PLCs.

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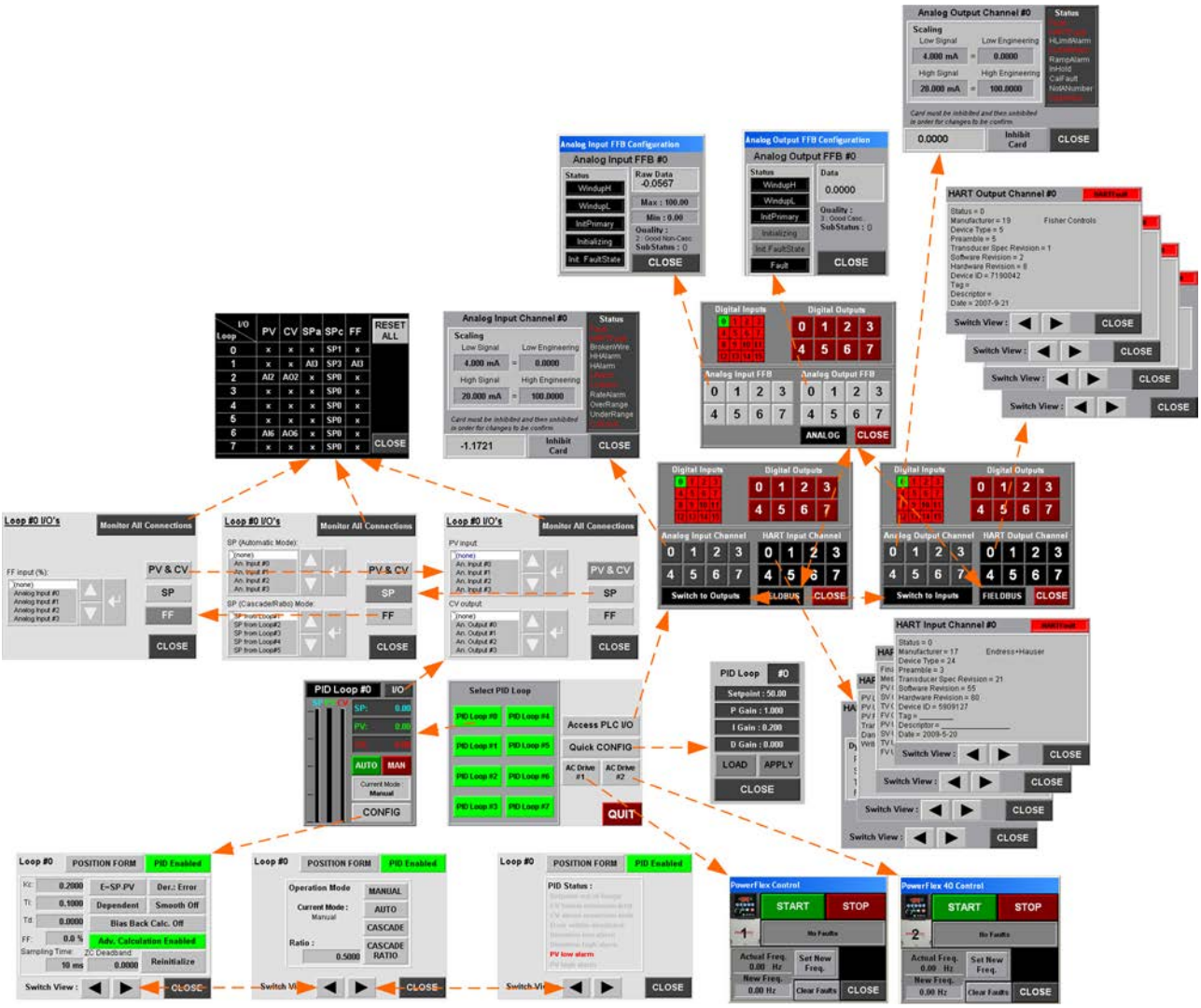


Figure 71: HMI structure (CTLX&PVP600).

The following two figures show the menu displayed when the Access PLC I/O button is selected on the main menu of the PVP 600 HMI. To switch between analog input and analog output, select the black button in the lower left corner. Press the FIELDBUS button to access FOUNDATION Fieldbus input and output channels.

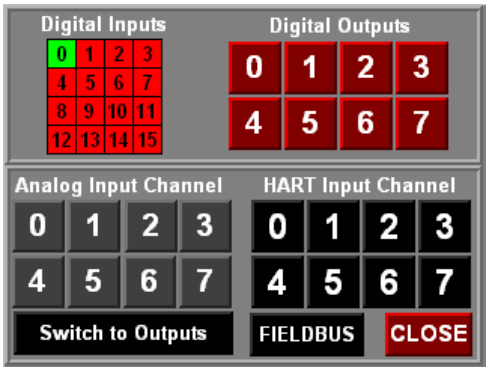


Figure 72: PLC I/O window, analog inputs (CTLX&PVP 600).

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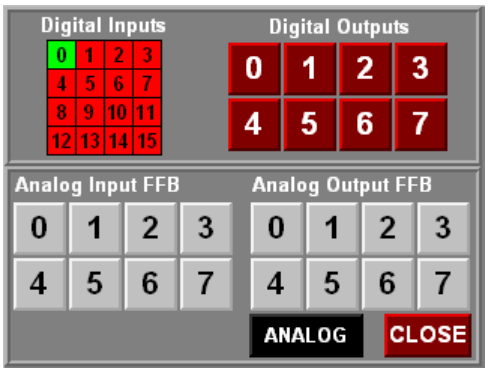


Figure 73: PLC I/O window, analog outputs (CTLX&PVP 600).

Each Analog Input Channel window displays scaling options, faults status, and the actual value for the given channel as shown in the following figure.

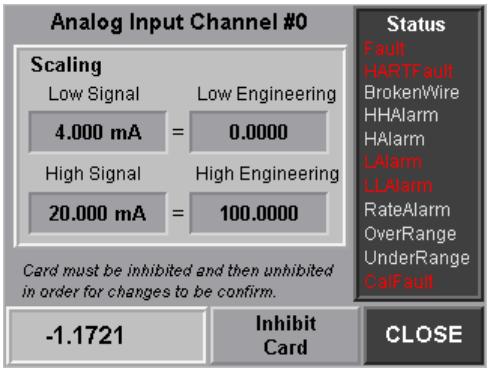


Figure 74: Analog Input Channel window (CTLX&PVP 600).

Additional information obtained through HART communication and pertaining to each analog input is displayed on four different windows (see the following four figures). Use the arrows to switch between windows.

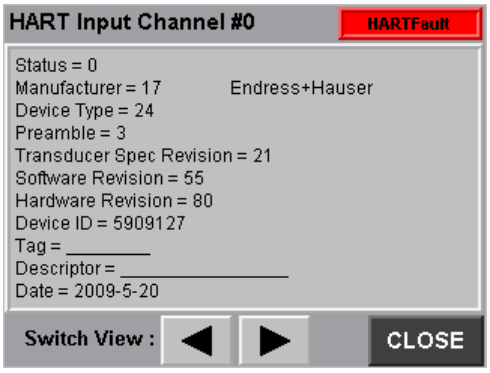


Figure 75: HART Input Channel window – part 1 (CTLX&PVP 600).

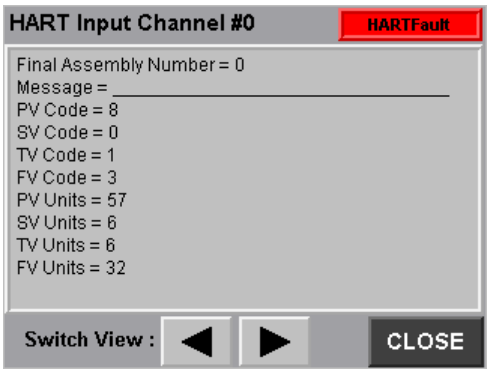


Figure 76: ControlLogix and PVP 600.

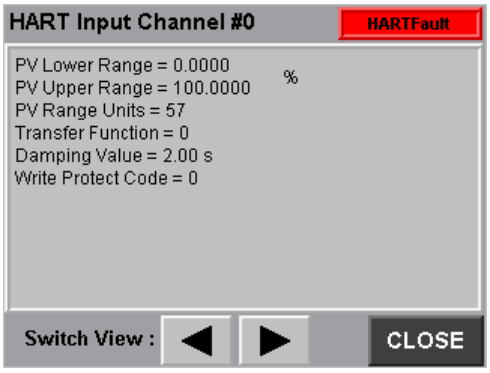


Figure 77: HART Input Channel window – part 3 (CTLX&PVP 600).

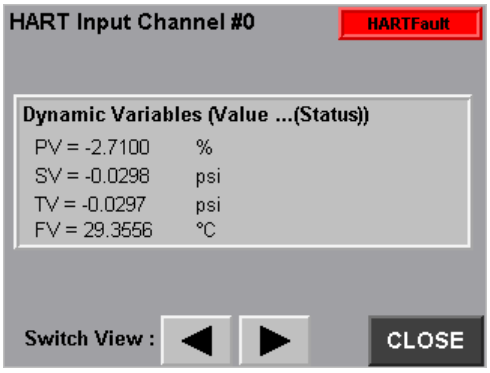


Figure 78: HART Input Channel window – part 4 (CTLX&PVP 600).

Equivalent information (analog and HART data) can be accessed for each analog output as shown in the following five figures.

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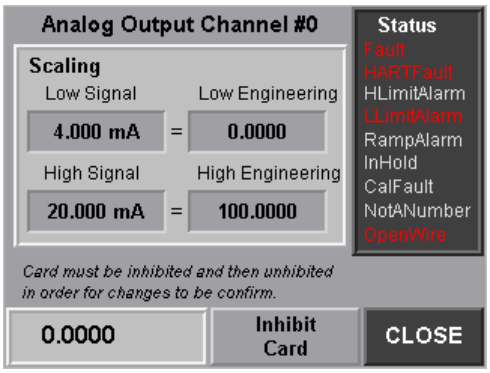


Figure 79: Analog Output Channel window (CTLX&PVP 600).

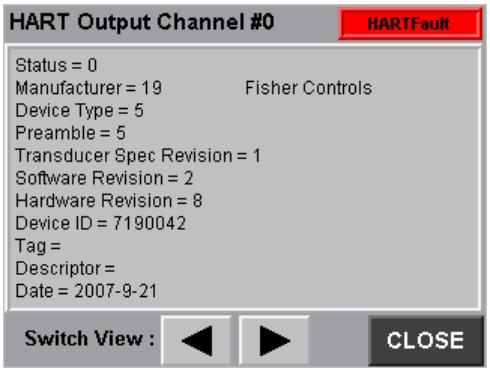


Figure 80: HART Output Channel window – part 1 (CTLX&PVP 600).

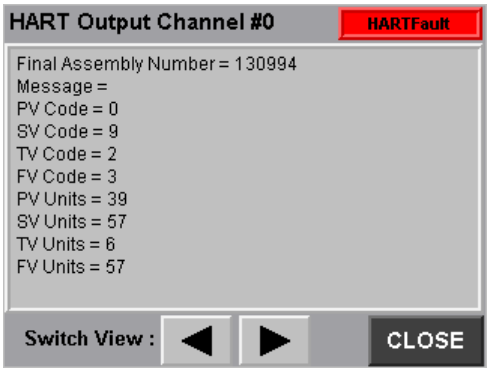


Figure 81: HART Output Channel window – part 1 (CTLX&PVP 600).

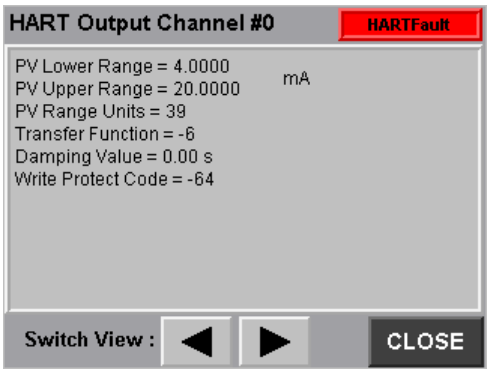


Figure 82: HART Output Channel window – part 3 (CTLX&PVP 600).

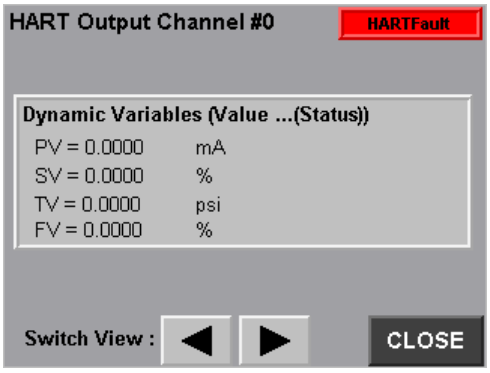


Figure 83: HART Output Channel window – part 4 (CTLX&PVP 600).

FOUNDATION Fieldbus inputs and outputs configuration windows are shown in the following two figures.

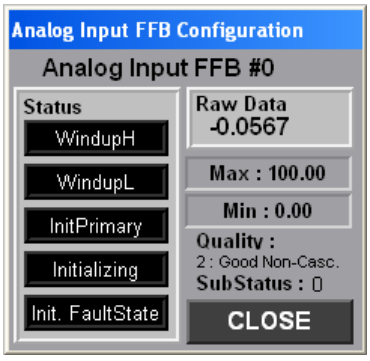


Figure 84: FF input Channel window (CTLX&PVP 600).

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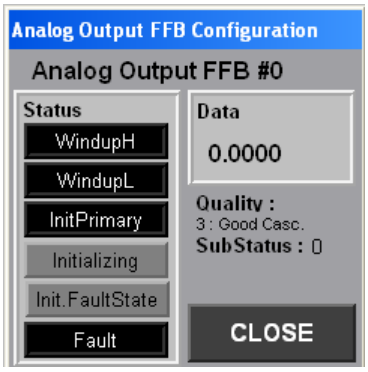


Figure 85: FF output Channel window (CTLX&PVP 600).

ControlLogix and PVP 1000

The following figure shows the HMI structure for the PVP 1000.

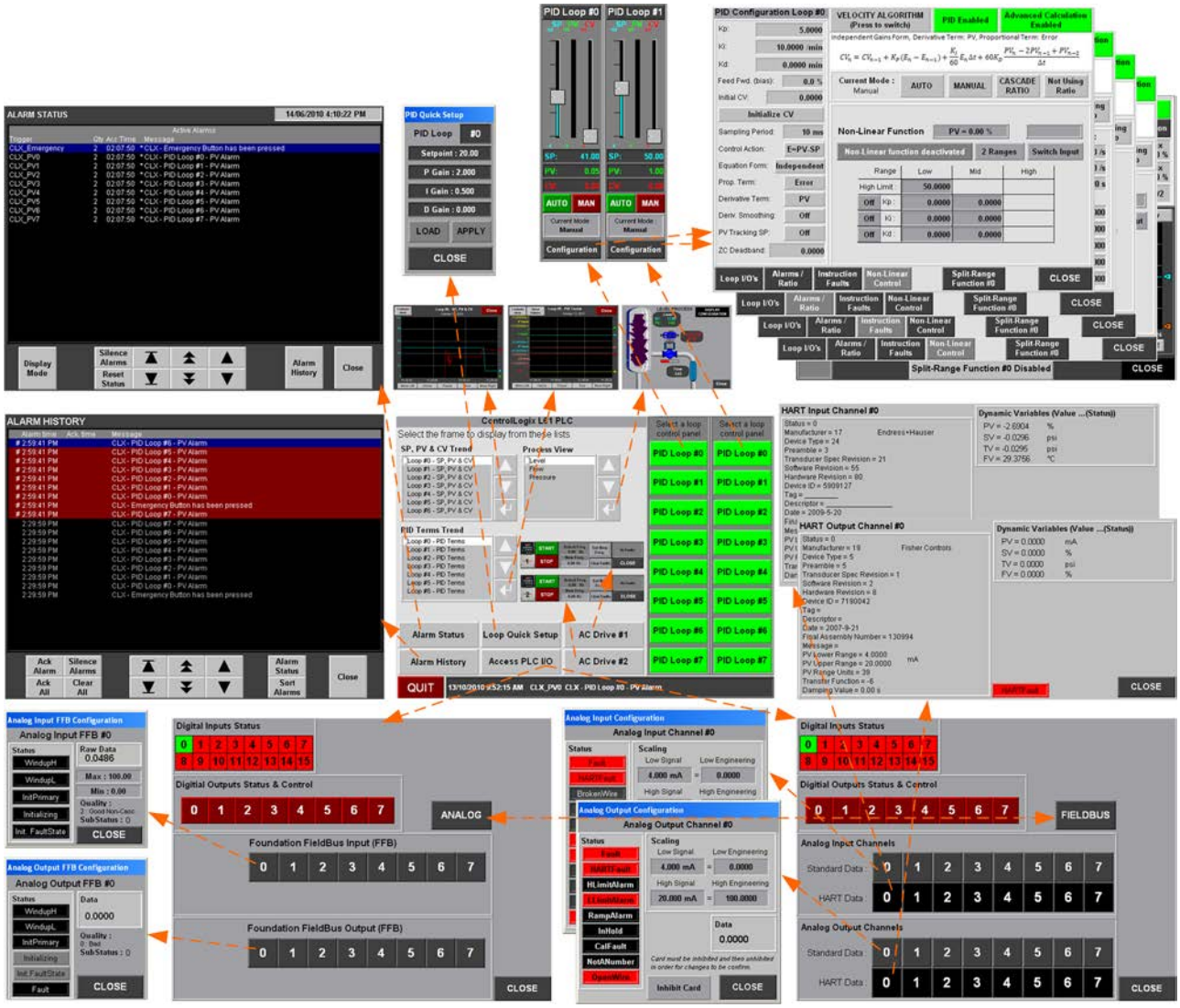


Figure 86: HMI structure (CTLX&PVP1000).

The following figure shows the menu displayed when the Access PLC I/O button is selected on the main menu of the PVP 1000 HMI. The greater window area permits the display of all analog input and analog output access buttons and the use of only one window per HART channel. The menu for FOUNDATION Fieldbus is shown in the second figure.

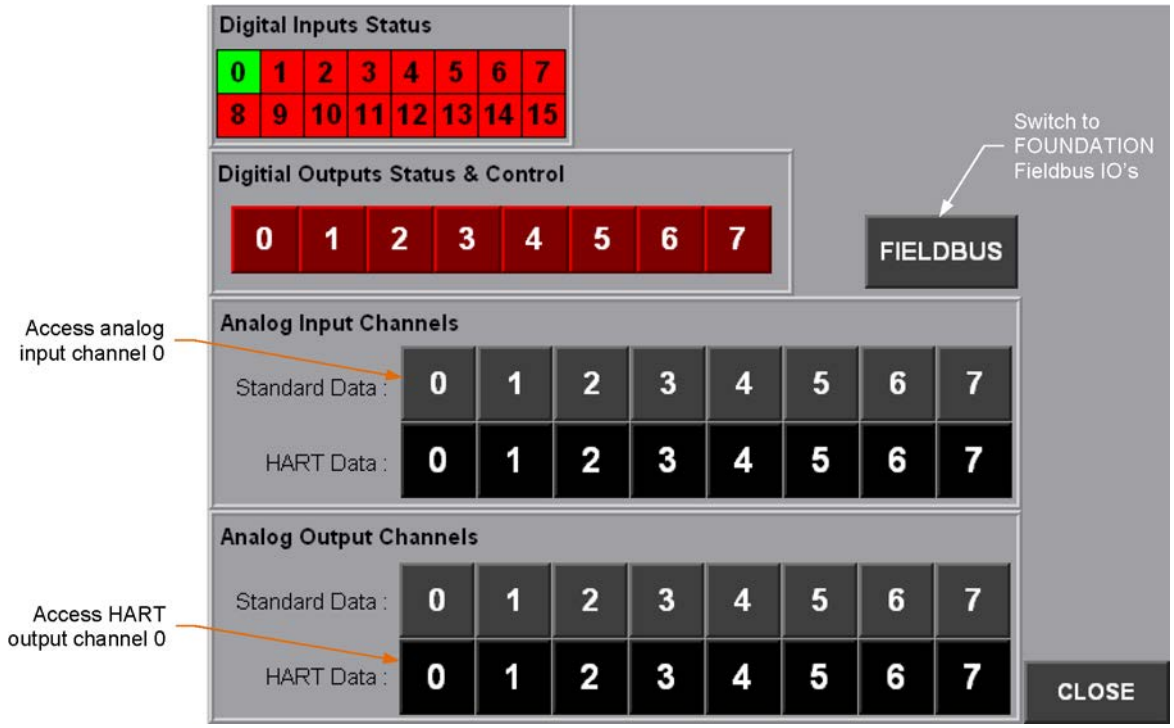


Figure 87: PLC I/O window (CTLX&PVP 1000).

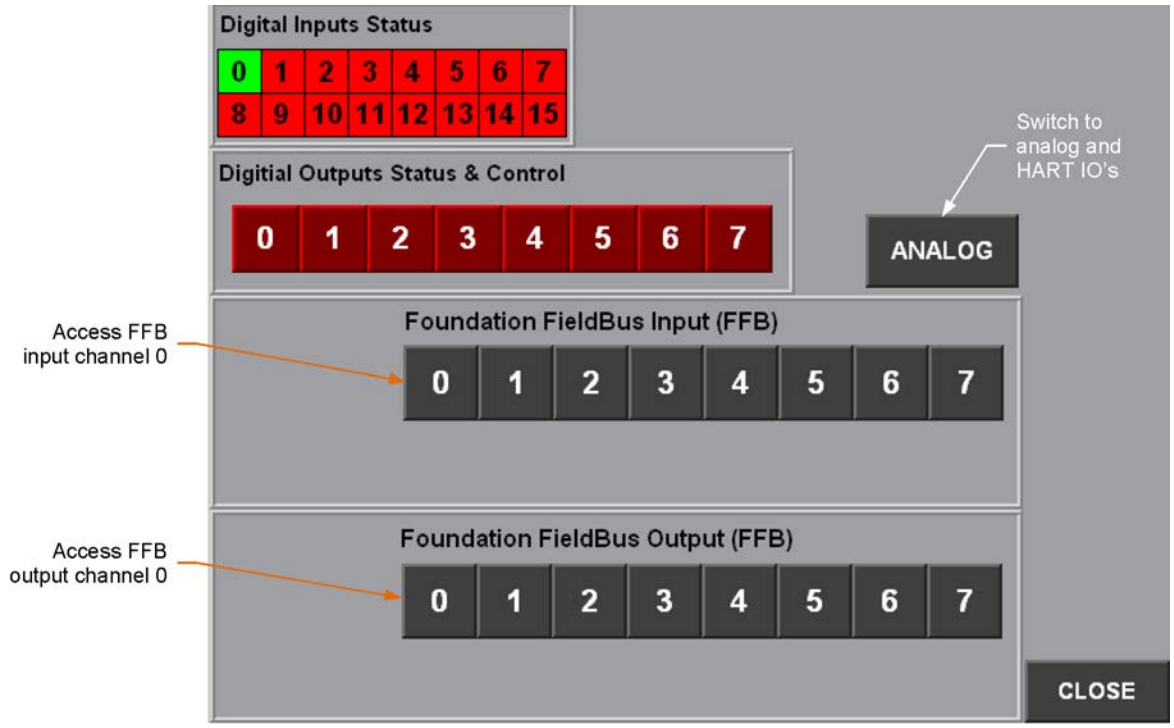


Figure 88: FF PLC I/O window (CTLX&PVP 1000).

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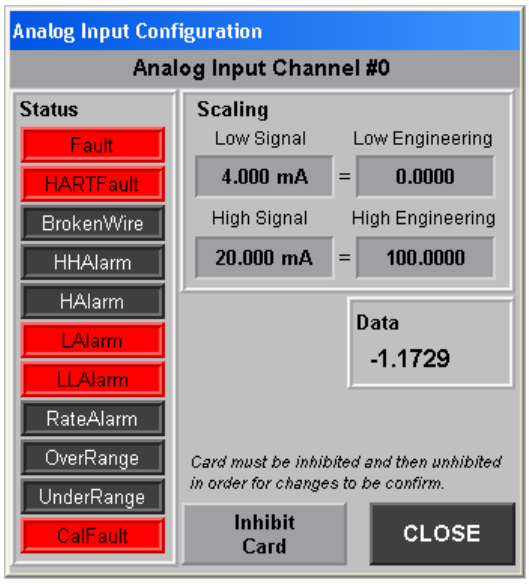


Figure 89: Analog Input Channel window (CTLX&PVP 1000).

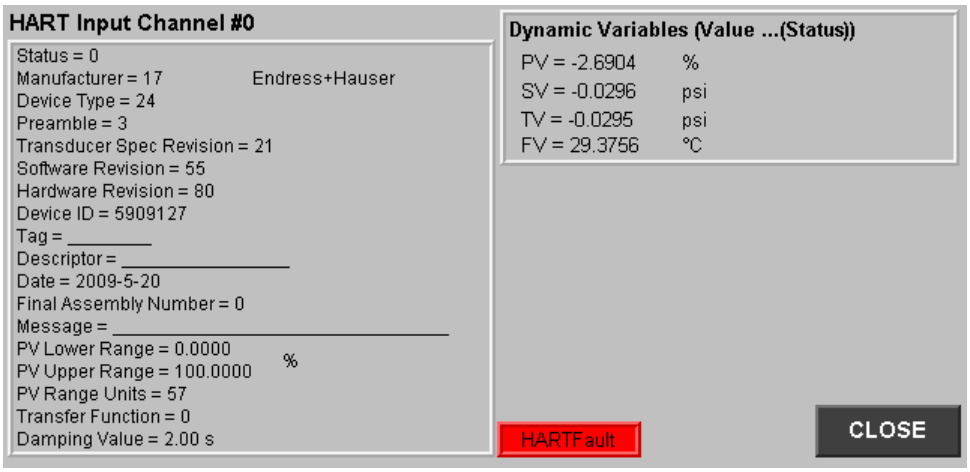


Figure 90: HART Input Channel window (CTLX&PVP 1000).

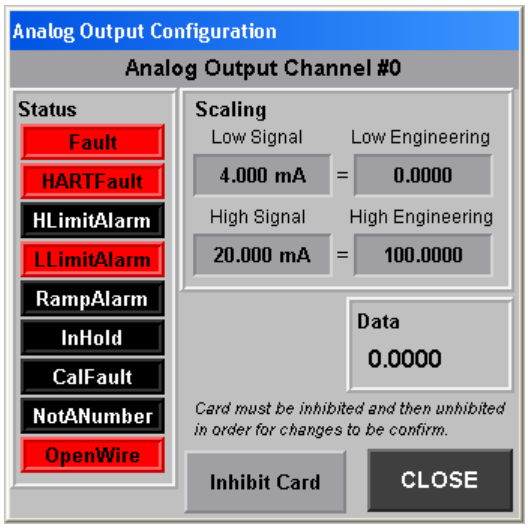


Figure 91: Analog Output Channel window (CTLX&PVP 1000).

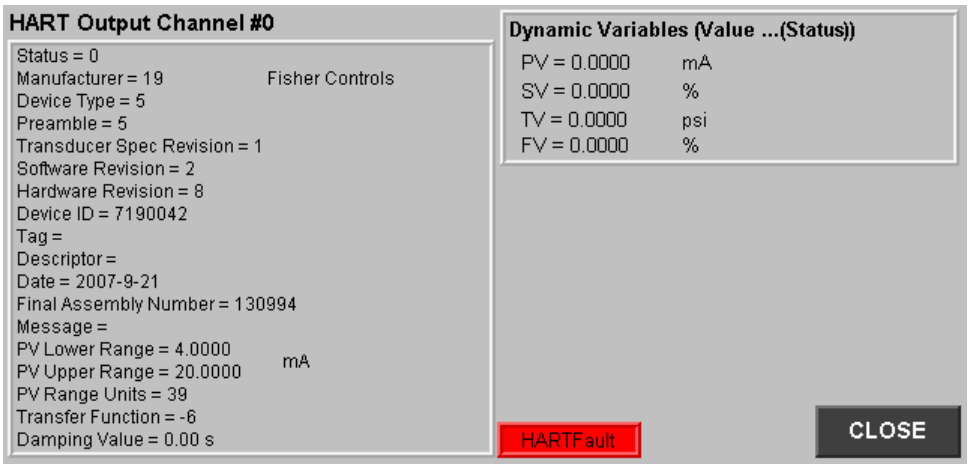


Figure 92: Hart Output Channel window (CTLX&PVP 1000).

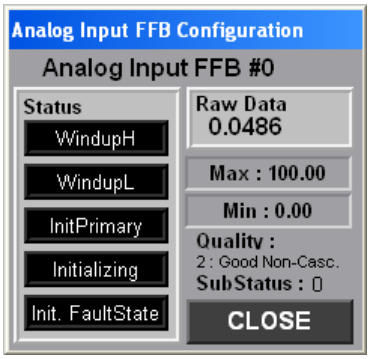


Figure 93: FF input Channel window (CTLX&PVP 1000).

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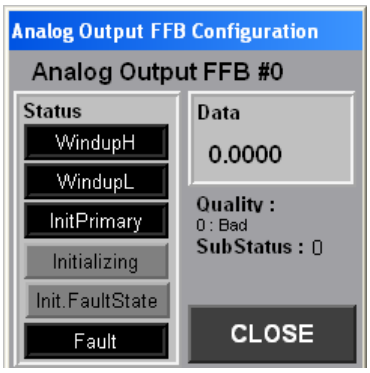


Figure 94: FF Output Channel window (CTLX&PVP 1000).

ControlLogix and PC

The PC version, shown in the following figure, is quite similar to that of the PVP 1000. However, in this version, four displays (trends and process views) can be shown simultaneously.

If you don't see the whole window as shown in the preceding figure, the resolution of your monitor needs to be adjusted. The HMI is designed for 1280 X 1024 screens. You can also use the interface for the PanelView Plus 1000 on your PC instead, if you prefer.

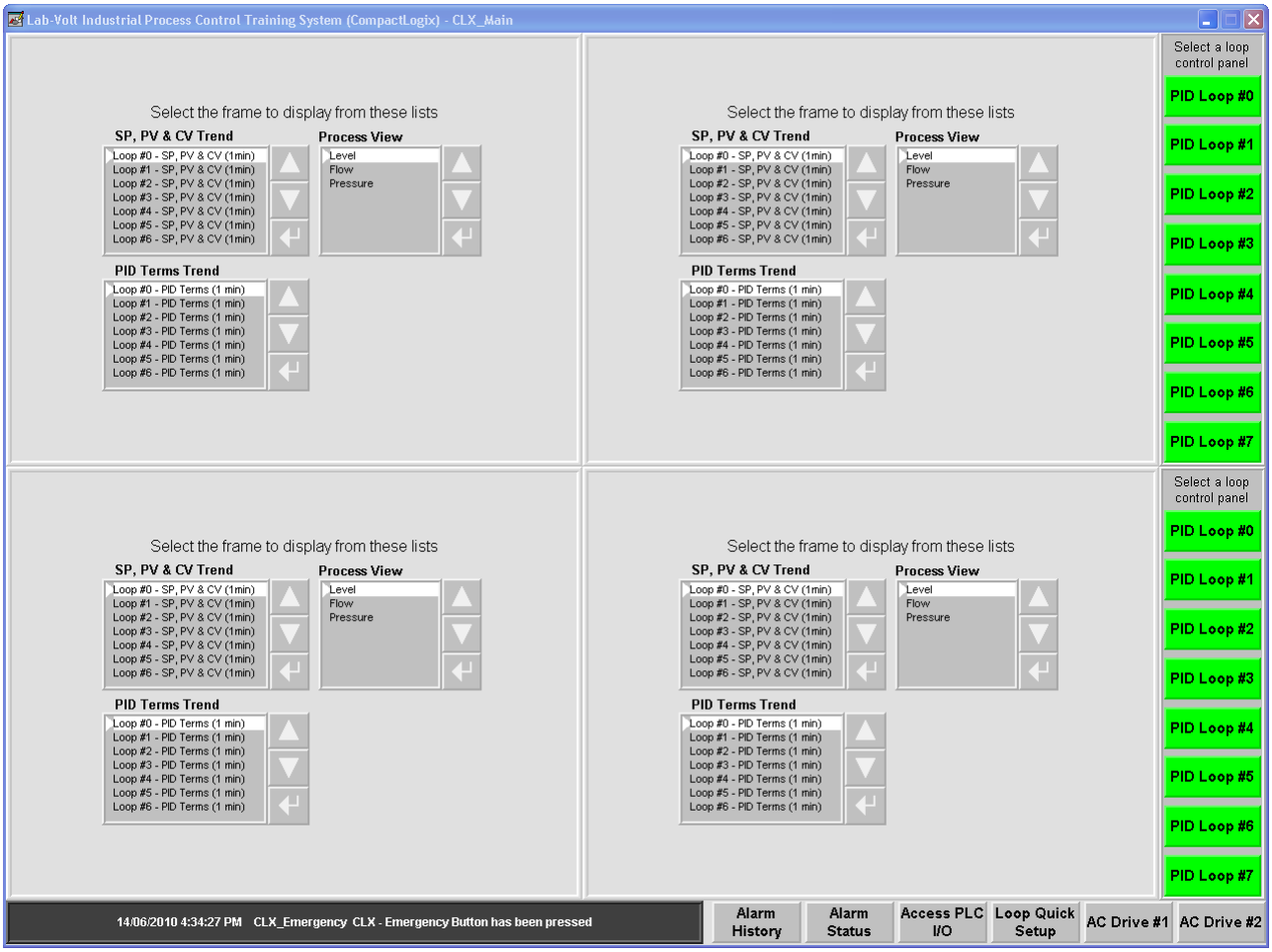


Figure 95: HMI main screen (CTLX&PC).

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Familiarization with your Foxboro Interface

7 min.

The PC-based interface structure for Foxboro controllers is shown in the following figure.

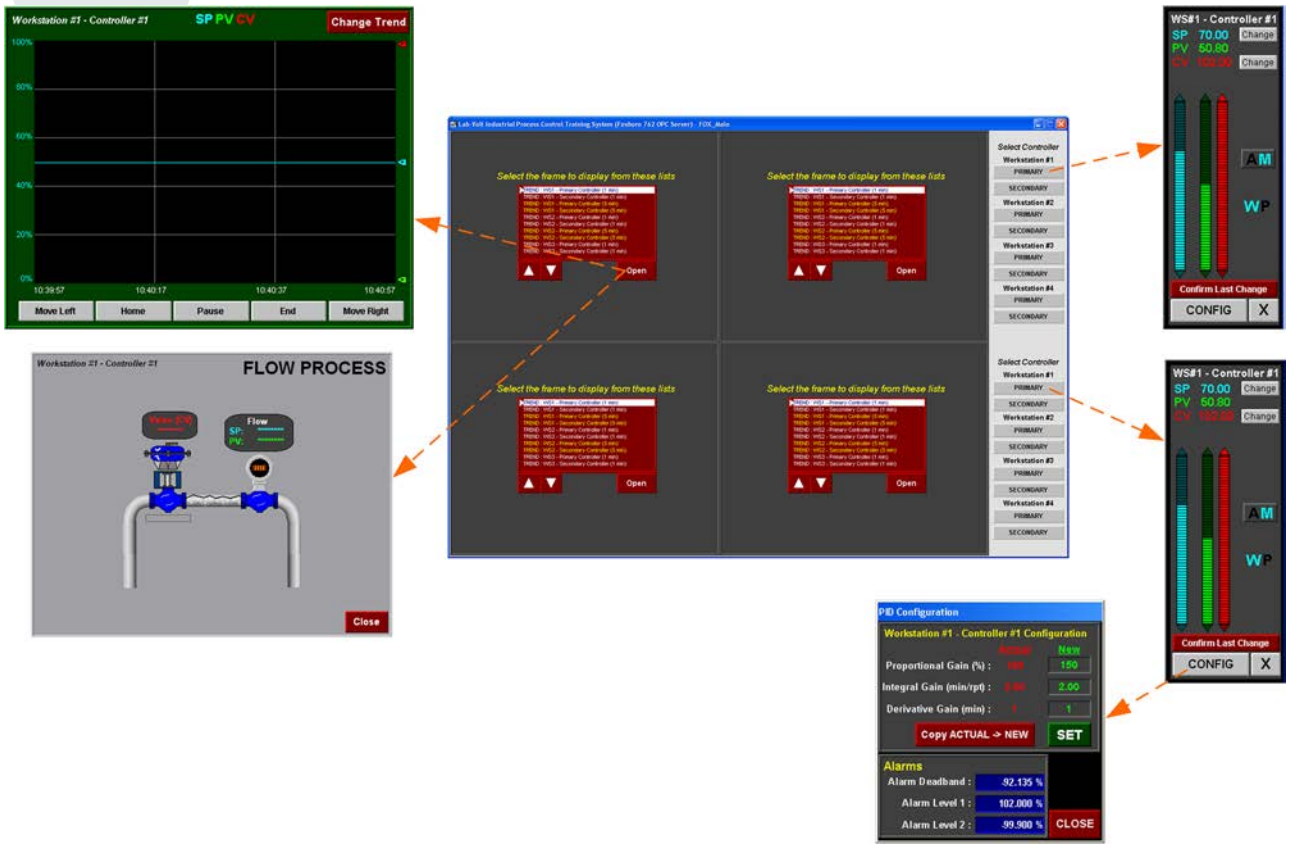


Figure 96: Foxboro and PC HMI structure.

The Foxboro HMI main screen, depicted in Figure 95, shows some similarities with the other PC versions for PLCs. The whole interface is nevertheless simpler because of the comparatively limited functionalities of the Foxboro controllers. The right pane is where you can select up to two PID loops. For example, Workstation #1 refers to the Foxboro with the address set to 1. PRIMARY and SECONDARY buttons make a distinction between the first and the second loop of a single Foxboro.

The OPC server should start automatically when you open the HMI for the Foxboro.

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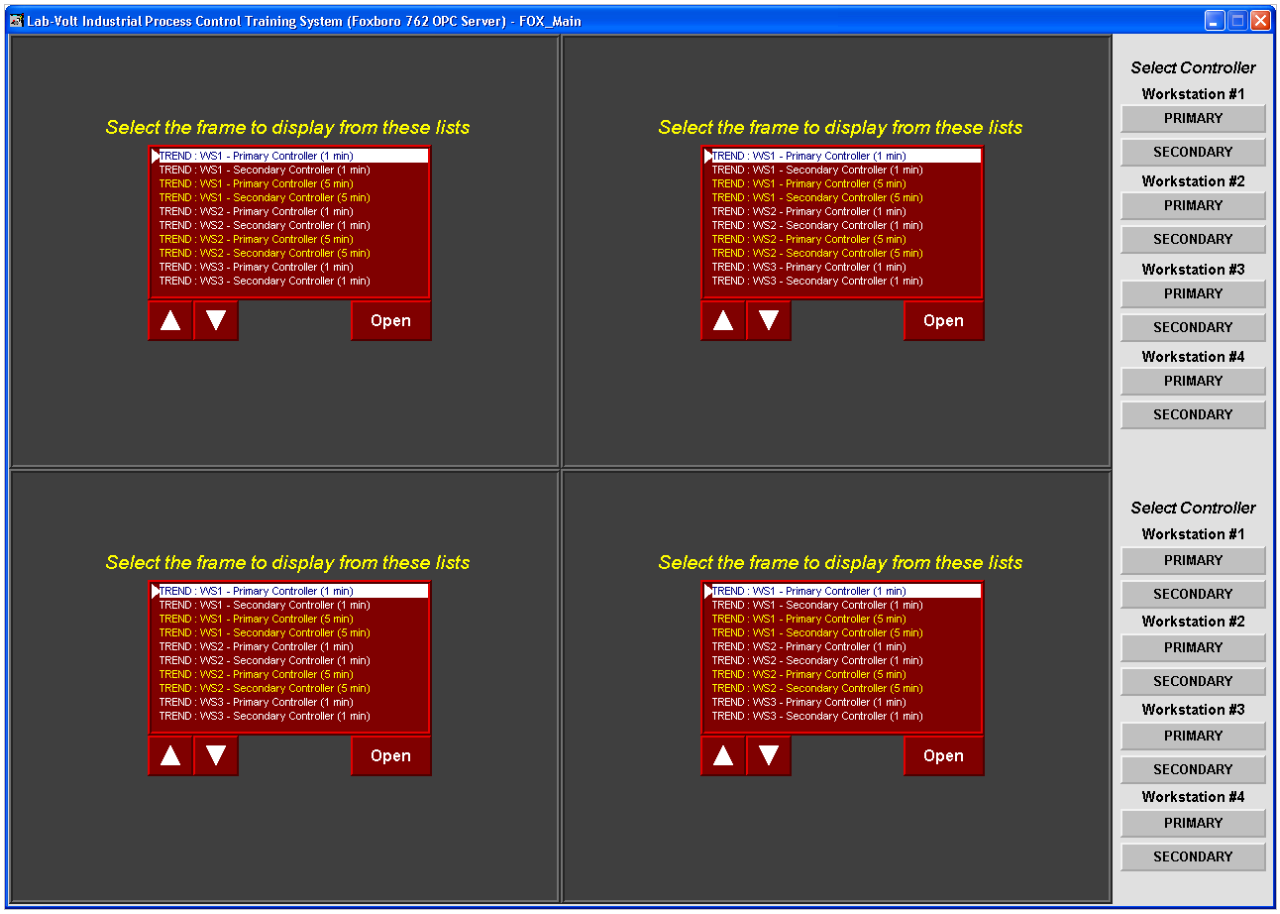


Figure 97: Main window (Foxboro&PC).

Twenty-four different trends can be viewed; one for each of the eight PID loops, in 1 minute, 5 minute, and 20-minute forms. The following figure shows the 1-minute trend for the primary loop of workstation #1.

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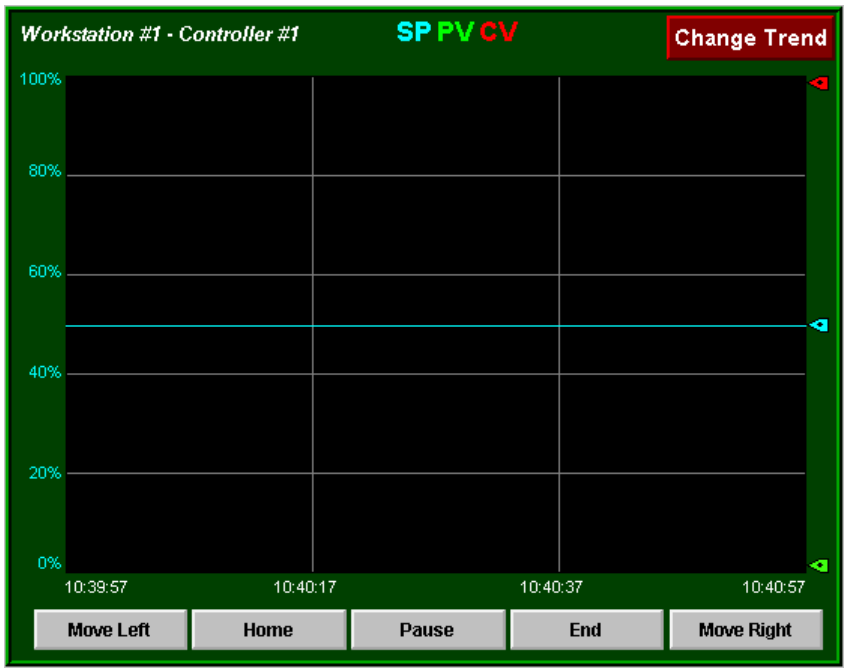


Figure 98: Trend (Foxboro&PC).

The actual version of HMI for Foxboro can only perform PI and PID control.

Once you have selected a controller on the left pane, a panel as shown in the following figure appears. Note that the controller shown below is actually in Manual mode with Panel supervision, as indicated by the cyan M and P letters.

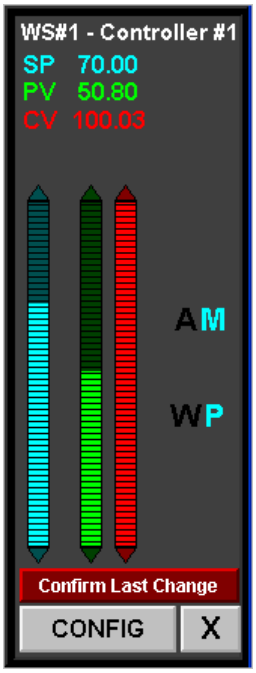


Figure 99: Controller panel (Foxboro&PC).

To permit remote supervision of the controller, you must press the W/P button located on the controller so that the W letter becomes cyan, as shown in the following figure. Observe that two new (change) buttons appear, permitting to change the SP and CV values.

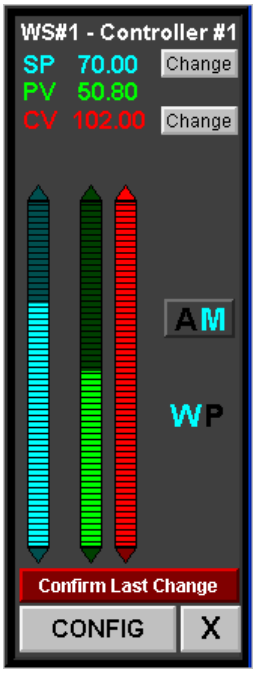


Figure 100: Controller remotely supervised (Foxboro&PC).

When you click on one of these buttons, you will notice another new button appears below CV (The following figure) with a series of question marks.

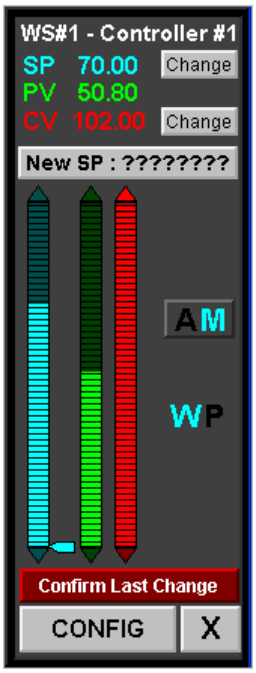


Figure 101: New SP (Foxboro&PC).

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When you click on this button, the input window, as shown in the following figure appears. You can now enter the value (0-100) of your choice. Press to exit this window while saving the value (the second figure).

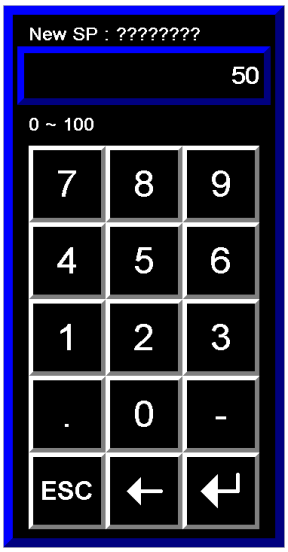


Figure 102: Entering new SP (Foxboro&PC).

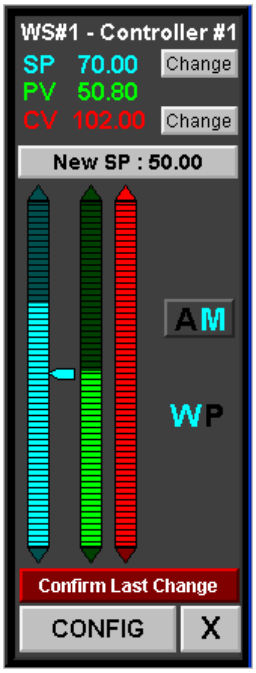


Figure 103: New SP value to be confirmed (Foxboro&PC).

However, the newly entered value is not effective until you press the Confirm Last Change button at the bottom the controller display (The following figure).

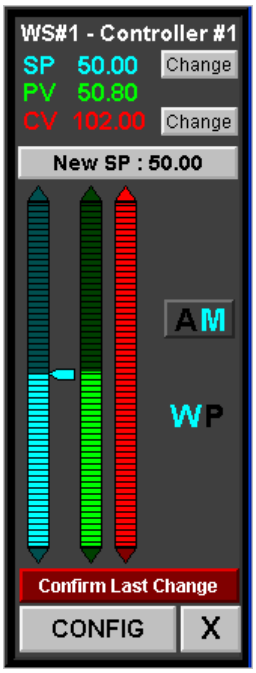


Figure 104: Change confirmed (Foxboro&PC).

Changing the controller mode

To switch between automatic and manual mode, click on the AM button so that it starts flashing (The following figure). The change becomes effective only after you press the Confirm Last Change button.

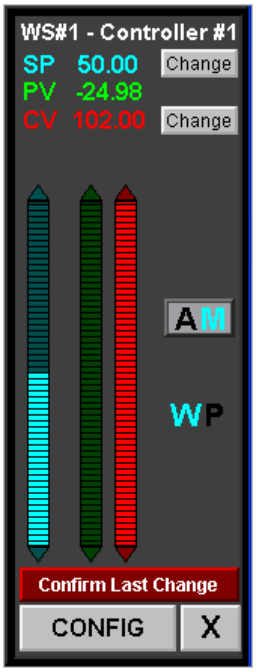


Figure 105: Switching controller mode (Foxboro&PC).

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Configuring the PID parameters and the alarms

The PID Configuration window is accessed by clicking on the CONFIG button on the controller display. New proportional, integral, and derivative gains are all applied at once when you press the SET button. Three alarms can also be set at the bottom of this window.

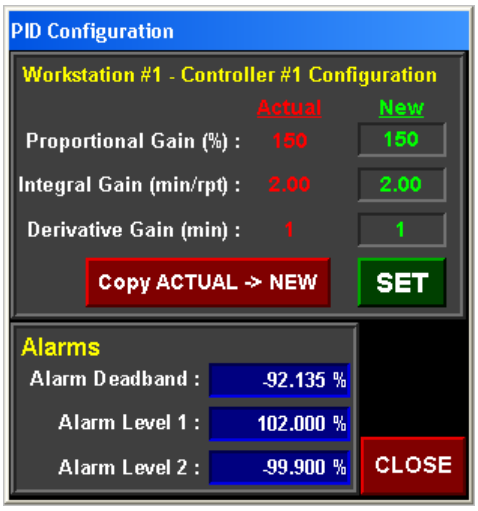


Figure 106: PID Configuration (Foxboro&PC).

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On-Off Control

25 min.

Rockwell's PLCs can be used to implement On-Off control for a process. This basic type of control can be used effectively for slowly changing processes. An analog input and an analog output are used for the process variable (PV) and for the control variable (CV) respectively. Three parameters must be set according to the requirements of the process: the set point, the value of the deadband, and the action of the controller.

Connecting the controller to the process loop

1. Connect the controller to the process as shown in the following figure.

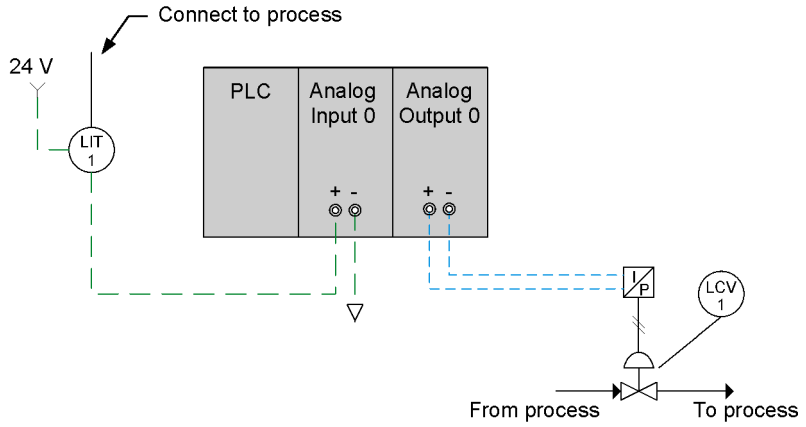


Figure 107: Typical connection for On-Off control.

HMI configuration for On-Off control

2. Make sure the PLC and the touch screen (or computer) are set up as explained in Appendix A with the appropriate program loaded and running in each device.

You can find the PLC pro-grams for HMI on the Re-source Kit disk (P/N 85692). MLX_3530_HMI.RSS is the file pertaining to the Micro-Logix, CLX_3530_HMI.ACD is for the ControlLogix, and CMPLX_3530_HMI.ACD is for the CompactLogix.

3. This project requires you to connect an emergency button for increased safety. If you are using a PLC and its digital input 0 is not powered, all processes are shut down. Connect digital input 0 of your PLC to a 24 V dc switched output source on

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the electrical unit of the Instrumentation and Process Control Training System. The switched output jacks become unpowered when the emergency button is pressed.

4. Configure your system for On-Off control by following the instructions pertaining to your controller and HMI combination as shown in the following figures.

MicroLogix and PanelView Plus 600

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

The Loop I/O and PID Loop Configuration windows need to be set for On-Off control as shown in the following figures.

With the Micrologix PLC, the deadband is between the setpoint and the setpoint plus Deadband Value.

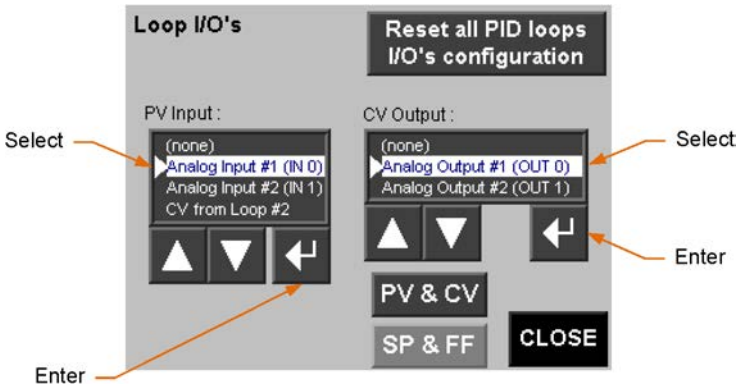


Figure 108: Loop Inputs and Outputs.

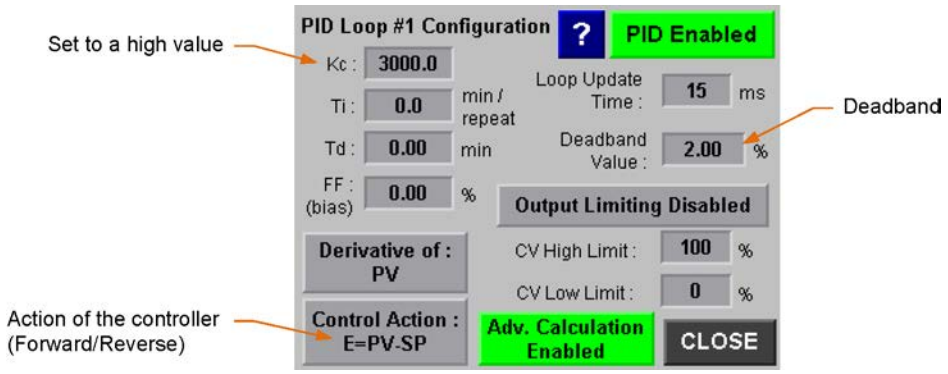


Figure 109: Loop configuration.

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MicroLogix and PanelView Plus 1000 or PC

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

The PID Configuration Loop window needs to be set for On-Off control as shown in the following figure.

With the Micrologix PLC, the deadband is between the setpoint and the setpoint plus Deadband Value.

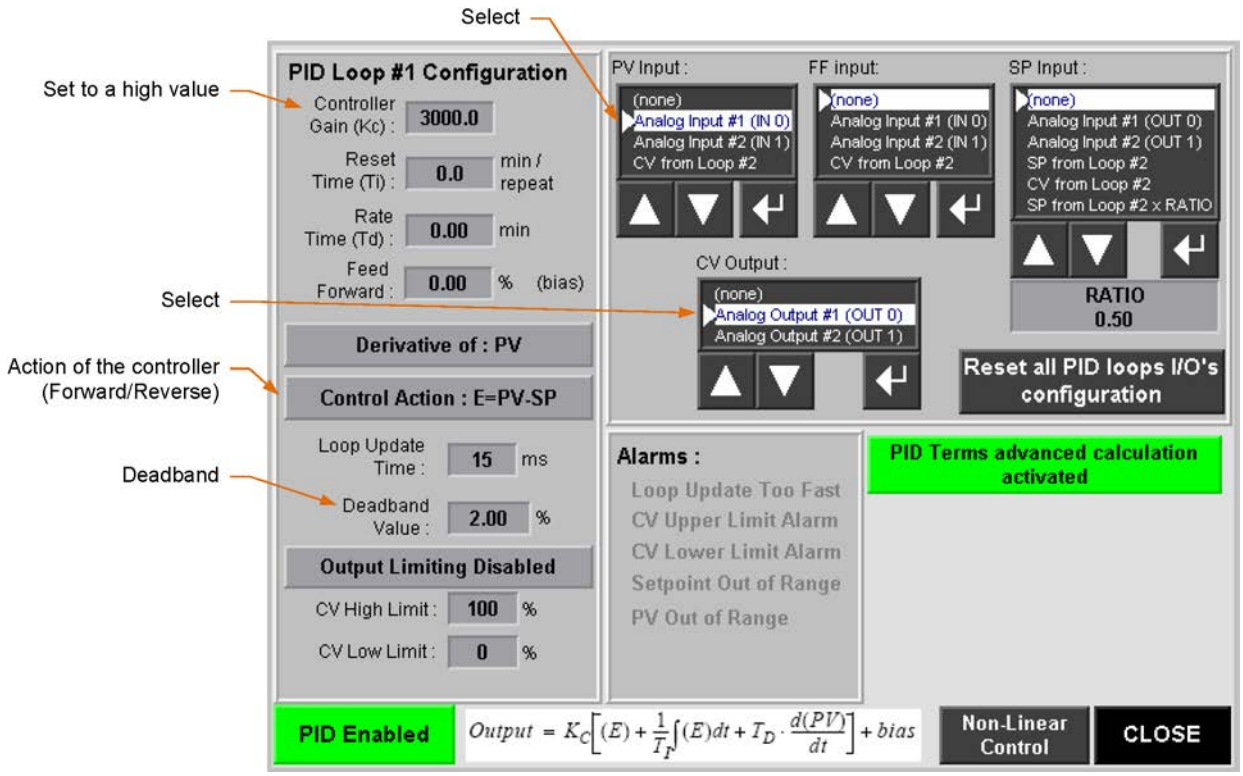


Figure 110: PID Loop Configuration.

CompactLogix / ControlLogix and PanelView Plus 600

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

The Loop I/O and Loop Configuration windows need to be set for On-Off control as shown in the following figures.

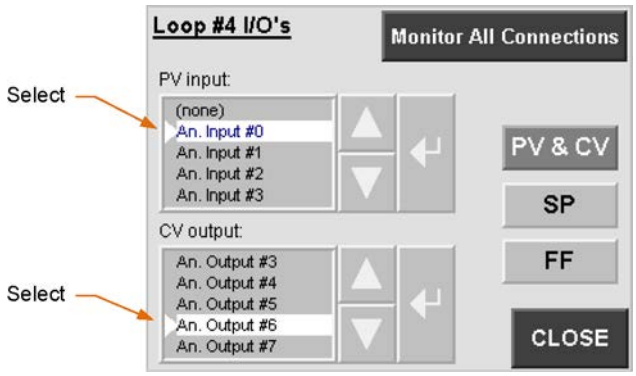


Figure 111: Loop I/O's.

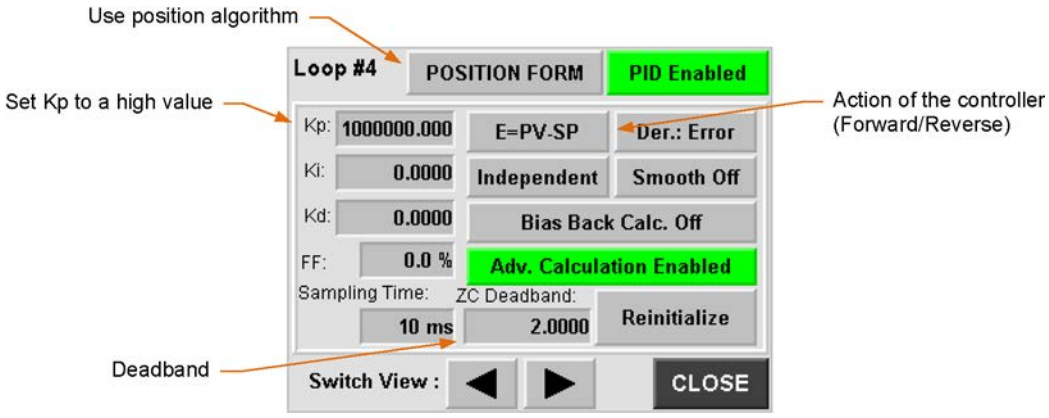


Figure 112: Loop Configuration.

With the ControlLogix or CompactLogix PLC, the deadband is between the setpoint minus ZC Deadband and the setpoint plus ZC Deadband.

CompactLogix / ControlLogix and PanelView Plus 1000 / PC

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

The PID Configuration Loop window needs to be set for On-Off control as shown in the following figure.

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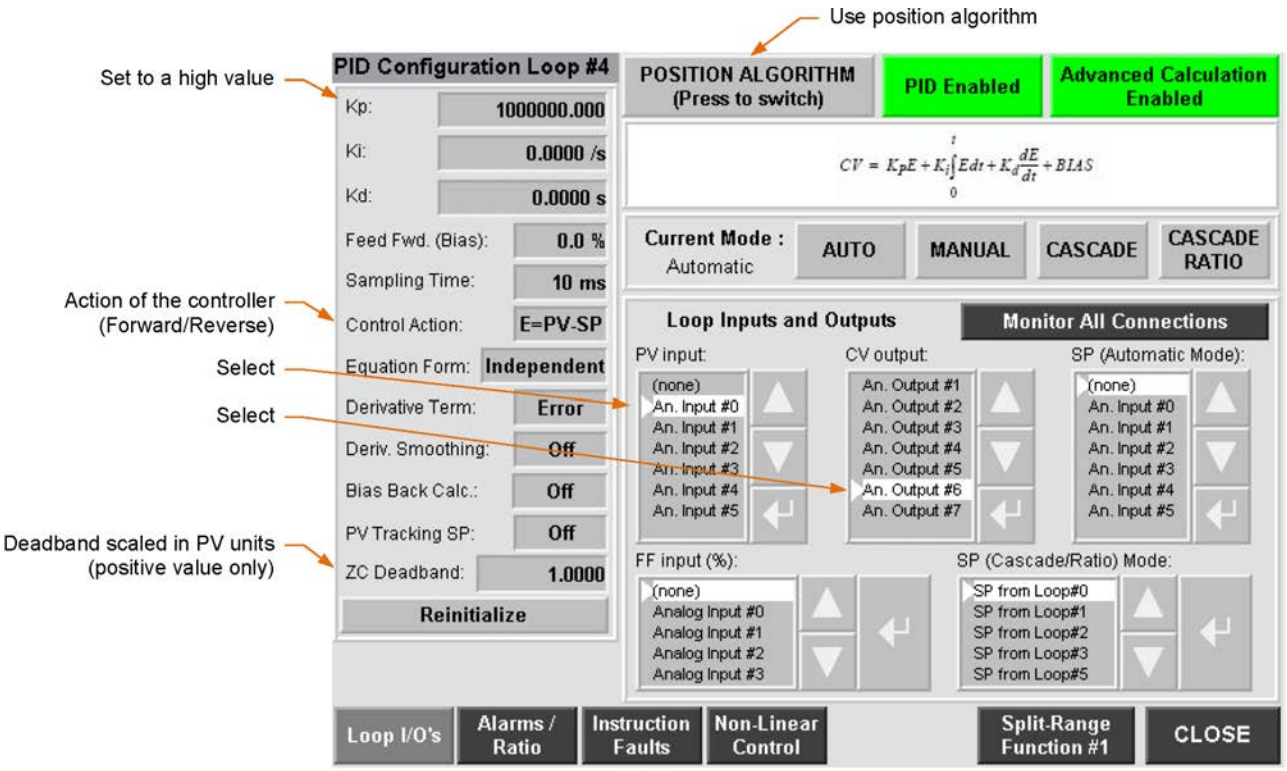


Figure 113: On-off settings with ControlLogix/CompactLogix and PVP 1000/PC.

With the ControlLogix or CompactLogix PLC, the deadband is between the setpoint minus ZC Deadband and the setpoint plus ZC Deadband.

Foxboro and PC

The HMI for Foxboro cannot be used for On-Off control.

Running On-Off control

5. Verify your setup and adjust the setpoint to an appropriate value. You are now ready to start your process. Make sure that the PLC mode is set to Automatic so that the PLC performs On-Off control.

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PID Control

23 min.

Rockwell's PLCs and Foxboro controllers can be used to implement PID control for a process. This basic type of control can be used effectively for many types of processes. An analog input and an analog output of the PLC are used for the process variable (PV) and for the control variable (CV) respectively. A series of parameters must be set according to the requirements of the process.

Connecting the PLC to the process loop

1. Connect the PLC to the process as shown in the following figure.

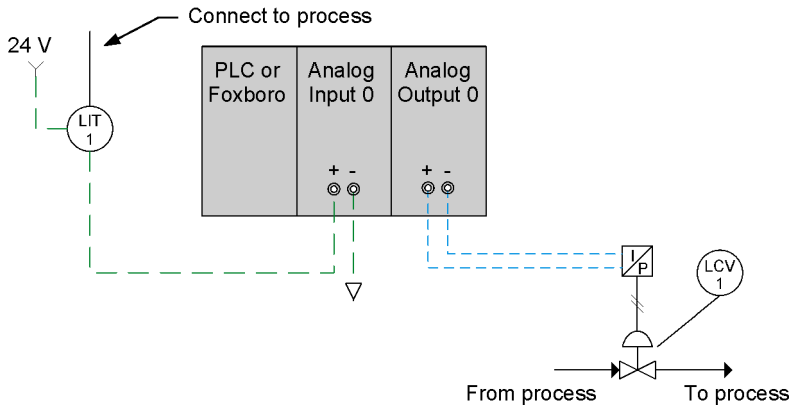


Figure 114: Typical connection for PID control.

HMI configuration of the PLC for PID control

2. Make sure the PLC and the touch screen (or computer) are set up as explained in Appendix A with the appropriate program loaded and running in each device. If you are using a Foxboro controller, refer to Appendix C.

You can find the PLC pro-grams for HMI on the Re-source Kit disk (P/N 85692). MLX_3530_HMI.RSS is the file pertaining to the Micro-Logix, CLX_3530_HMI.ACD is for the ControlLogix, and CMPLX_3530_HMI.ACD is for the CompactLogix.

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3. This project requires you to connect an emergency button for increased safety. If the PLC digital input 0 is not powered, all processes are shut down. Connect digital input 0 of your PLC to a 24 V dc switched output source on the electrical unit of the Instrumentation and Process Control Training System. The switched output jacks become unpowered when the emergency button is pressed.

4. Configure your system for PID control by following the instructions pertaining to your controller and HMI combination as shown in the following figures.

MicroLogix and PanelView Plus 600

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

The Loop I/O and PID Loop Configuration windows need to be set for PID control as shown in the following two figures.

The Micrologix PLC only works with the dependent form of the position PID algorithm.

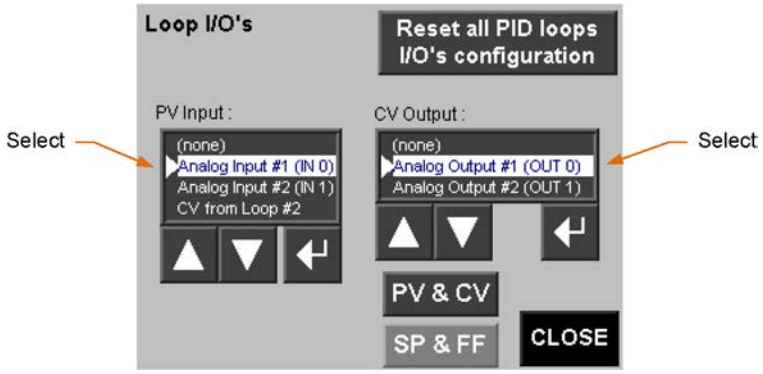


Figure 115: Loop Inputs and Outputs.

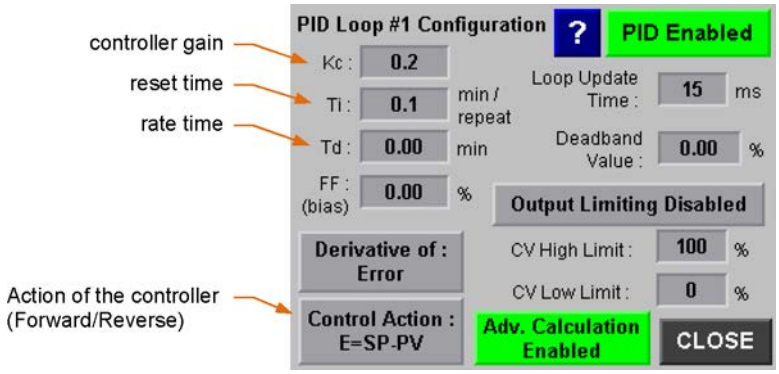


Figure 116: Loop configuration.

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MicroLogix and PanelView Plus 1000 or PC

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

The Configuration window needs to be set for PID control as shown in the following figure.

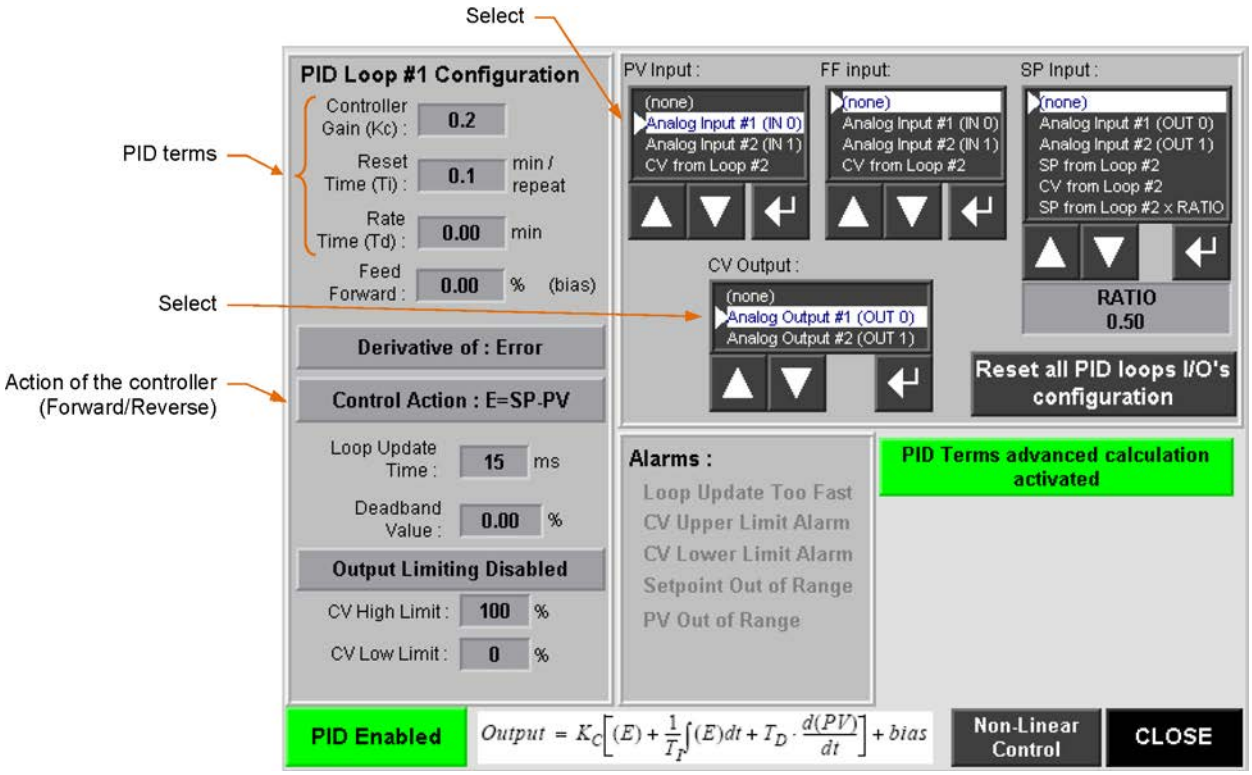


Figure 117: PID Loop Configuration.

CompactLogix / ControlLogix and PanelView Plus 600

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

The Loop I/O and Loop Configuration windows need to be set for PID control as shown in the following figures.

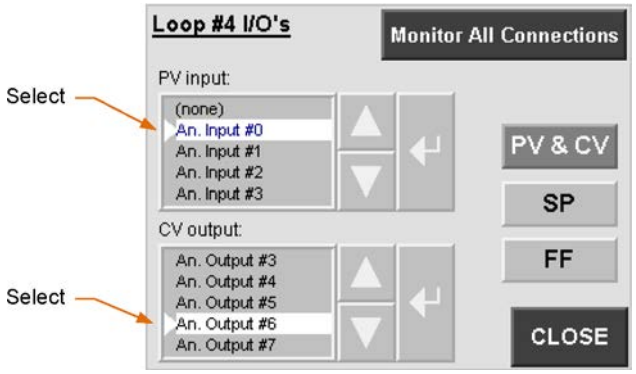


Figure 118: Loop I/O's.

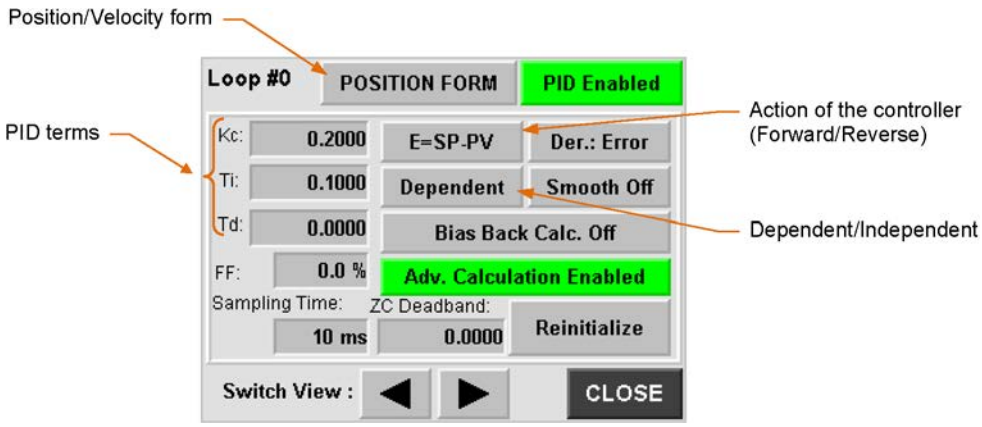


Figure 119: Loop Configuration.

CompactLogix / ControlLogix and PanelView Plus 1000 / PC

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

The PID Configuration Loop window needs to be set for PID control as shown in the following figure.

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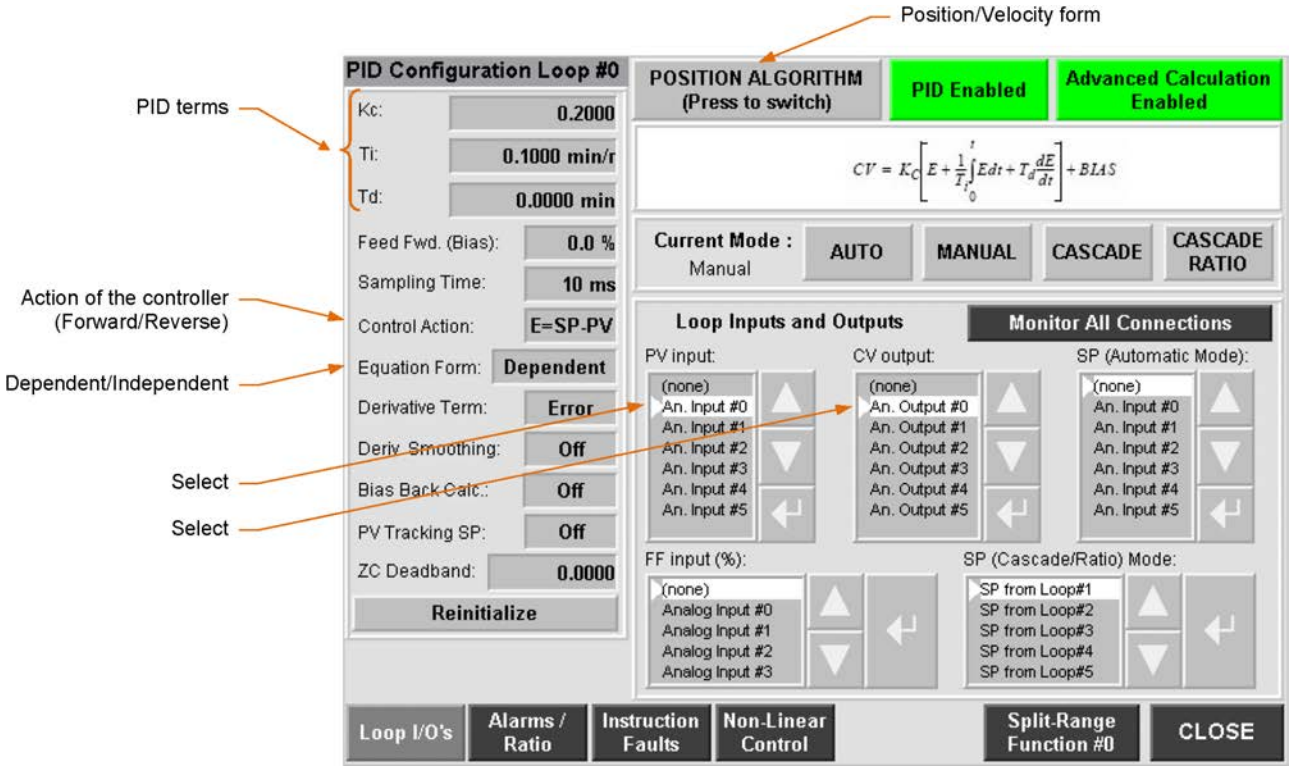


Figure 120: PID settings with ControlLogix/CompactLogix and PVP 1000/PC.

Foxboro and PC

The PID Configuration window needs to be set for PID control as shown in the following figure.

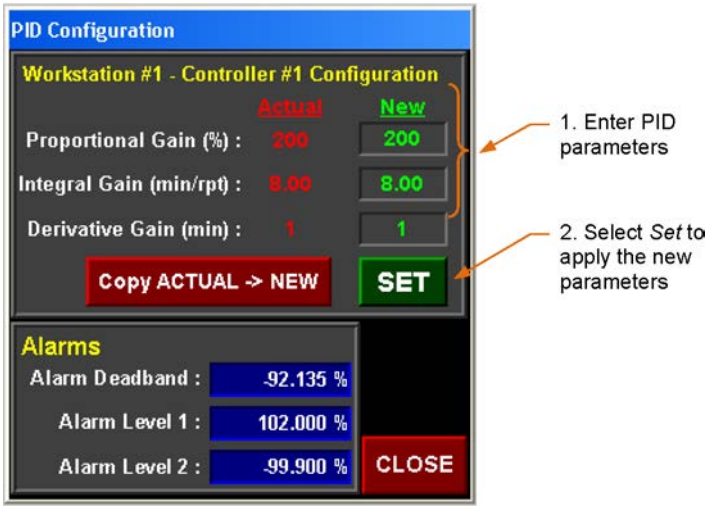


Figure 121: PID settings with Foxboro and PC.

Tuning the control loop

5. Verify your setup and perform the tuning of your PID loop by either adjusting the tuning parameters while in Auto mode (Trial-and-error or ultimate-cycle method) or by performing a step change in manual mode and proceeding with the Ziegler-Nichols calculations. In any case, fine-tune your process until it meets your control expectations.



You can switch the PLC mode (Auto/Manual) from the main window.

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Cascade Control

35 min.

Cascade control can be very useful when a fast-changing secondary process variable yields information about the behavior of the primary variable. The added information results in tighter control and the ensuing cascade scheme typically yields better overall performances. This type of control can be implemented on a Rockwell PLC simply by combining two PID control instructions.

Two analog inputs and one analog output are used for the two process variables (PV) and for the control variable (CV) respectively. A series of parameters must be set according to the needs of the process.

It is essential that you become familiar with PID control before using cascade control. Refer to Exercise 8 if necessary.

Connecting the PLC to the process loop

1. Connect the PLC to the process as shown in the following figure.

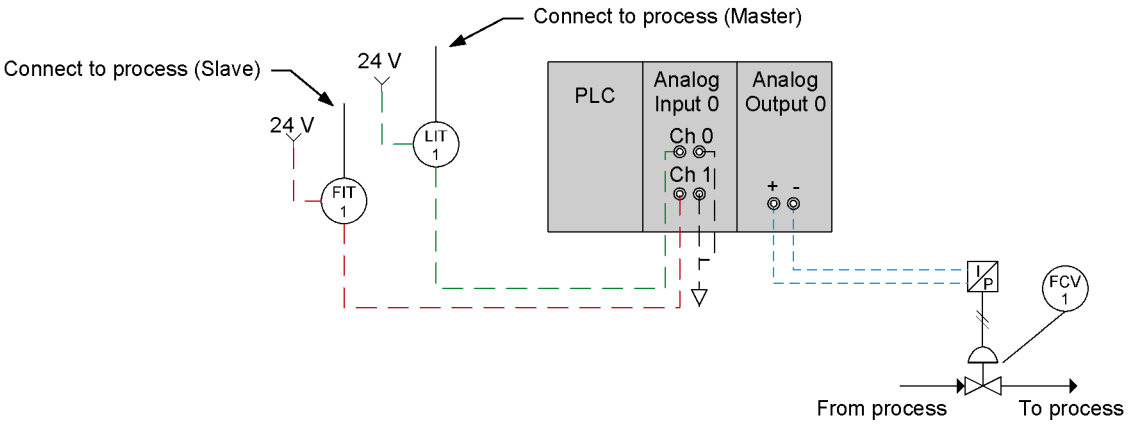


Figure 122: Typical connection of a PLC for cascade control.

HMI configuration of the PLC for cascade control

2. Make sure the PLC and the touch screen (or computer) are set up as explained in Appendix A with the appropriate program loaded and running in each device.

3. This project requires you to connect an emergency button for increased safety. If the PLC digital input 0 is not powered, all processes are shut down. Connect digital input 0 of your PLC to a 24 V dc switched output source on the electrical unit of the Instrumentation and Process Control Training System. The switched output jacks become unpowered when the emergency button is pressed.

   You can find the PLC pro-grams for HMI on the Re-source Kit disk (P/N 85692). MLX_3530_HMI.RSS is the file pertaining to the Micro-Logix, CLX_3530_HMI.ACD is for the ControlLogix, and CMPLX_3530_HMI.ACD is for the CompactLogix.

4. Configure your system for cascade control by following the instructions pertaining to your PLC and HMI combination as shown in the following figures. In Figure 114, the master loop is the first loop and uses analog input 0 to read the process level. The slave loop is the second loop and uses analog input 1 to read the process flow while analog output 0 is connected to the control valve. The master and slave loops should both be in manual mode for now, but the other parameters must be adjusted to allow a smooth transition later.

   The output of the master loop will be used (when in cascade mode) as the set point of the slave loop. This output does not have any other use and is simply ignored when the cascade mode is inactive.

MicroLogix and PanelView Plus 600

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

The Loop I/O windows need to be set for cascade control as shown in the following three figures.

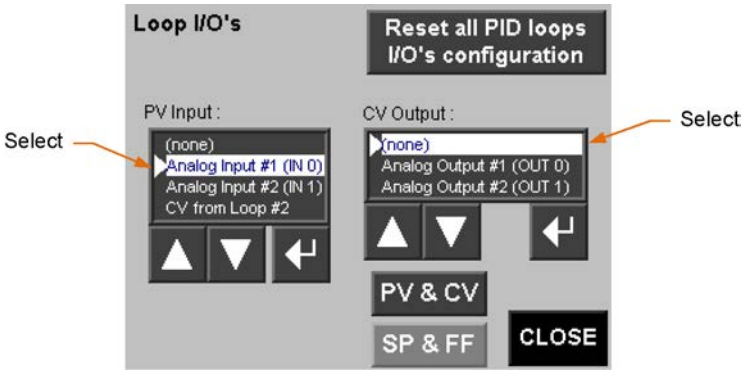


Figure 123: Master Loop Inputs and Outputs (loop #1).

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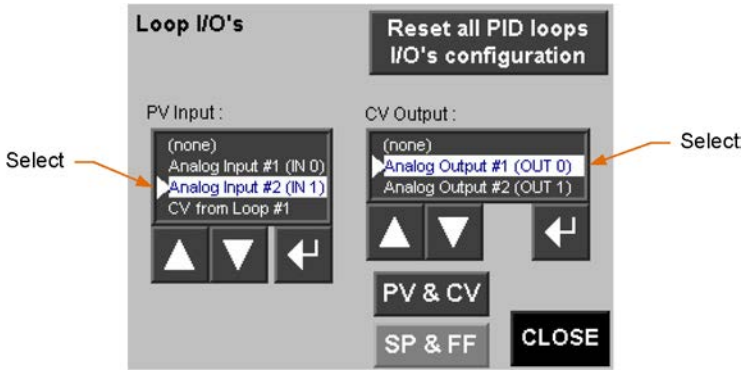


Figure 124: Slave Loop Inputs and Outputs (loop #2).

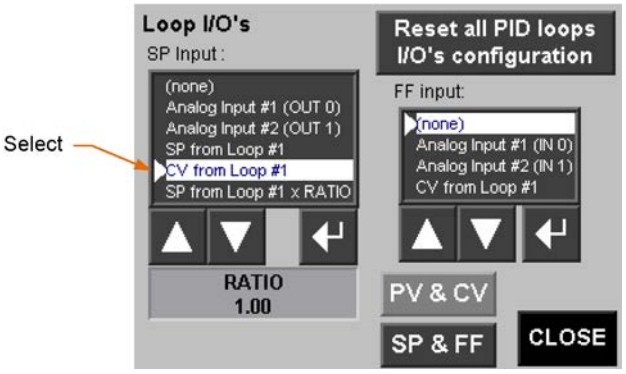


Figure 125: Slave loop setpoint selection (loop #2).

MicroLogix and PanelView Plus 1000 or PC

Chapter 19 (Process Control Instruction) of Rockwell Automation's Instruction Set Reference Manual for the MicroLogix PLC (1763-rm001) explains in great detail how the PID instruction is implemented. Do not hesitate to refer to it for any question regarding PID loop configuration.

PID Loop #1 Configuration and PID Loop #2 Configuration windows need to be set for cascade control as shown in the following two figures.

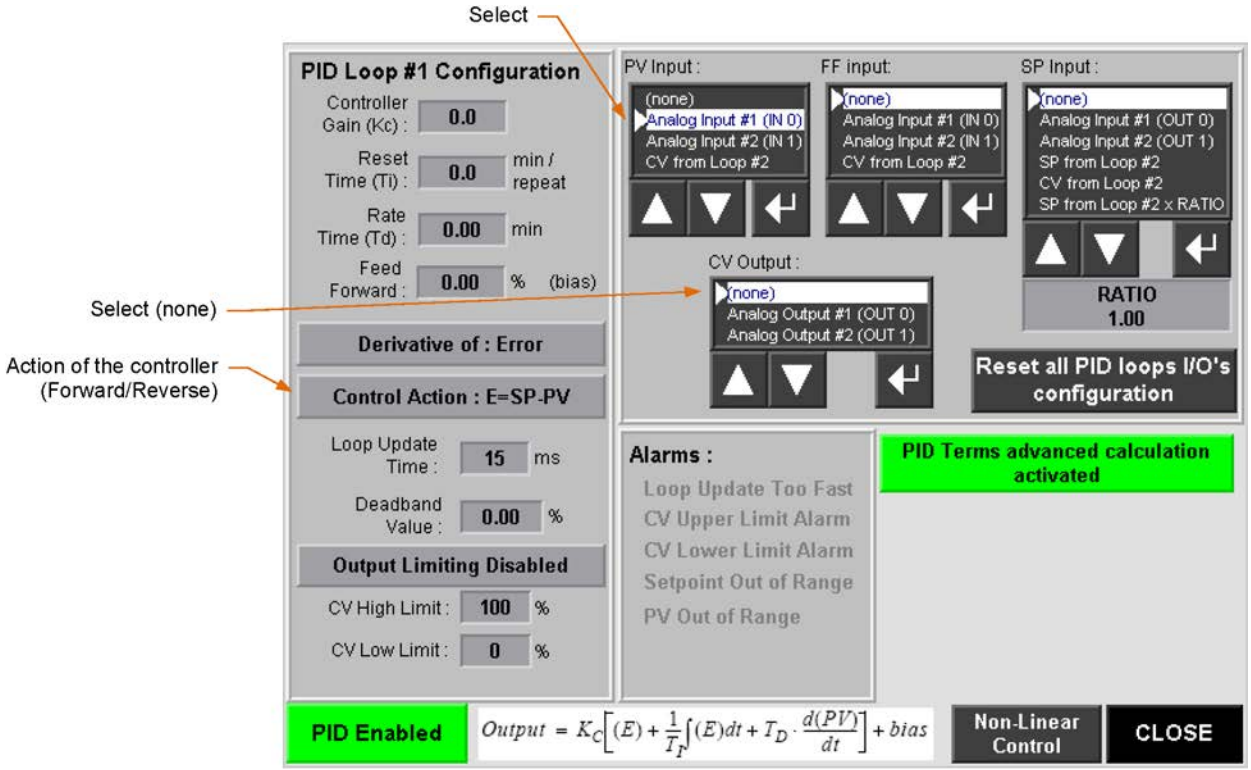


Figure 126: PID Loop Configuration (loop #1).

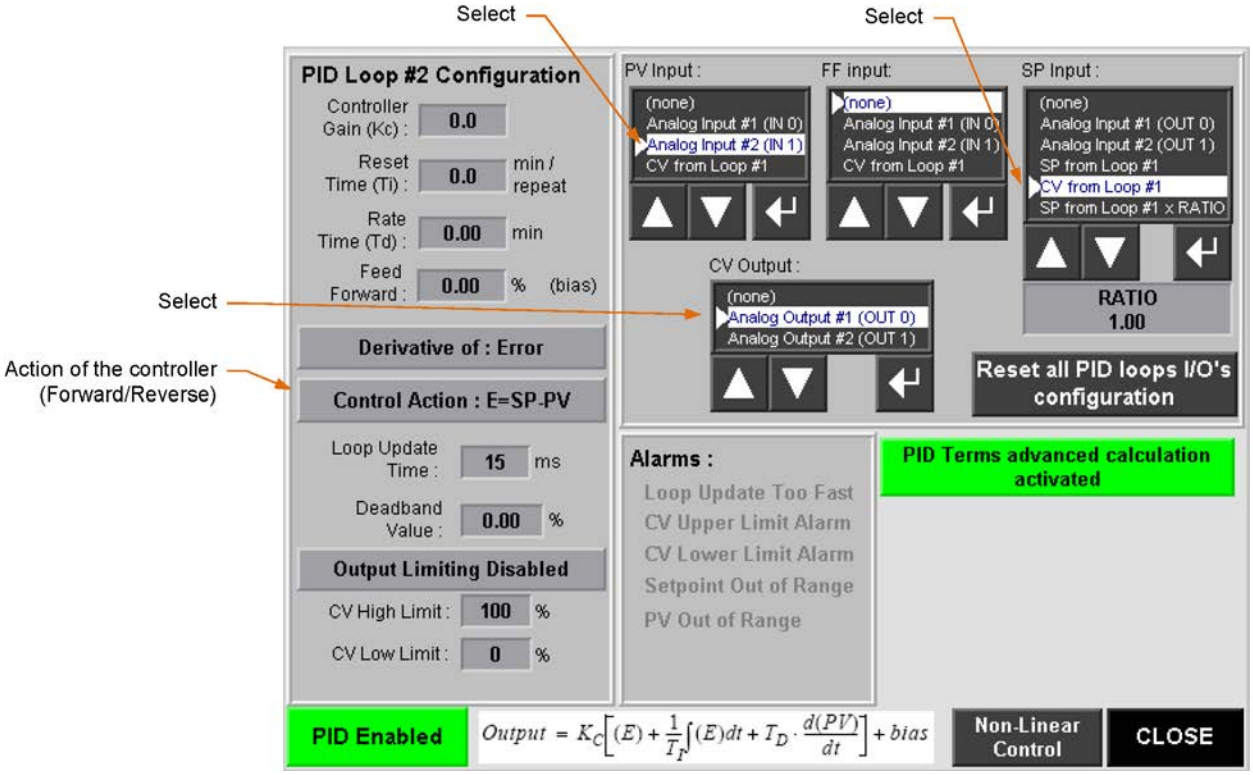


Figure 127: PID Loop Configuration (loop #2).

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On the main window, you should now see a red arrow flashing to indicate the link between loop #1 CV and loop #2 SP (The following figure).

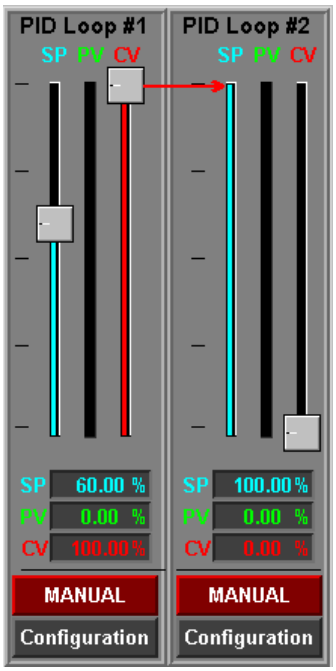


Figure 128: Arrow between CV #1 and SP #2.

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

The Loop#0 I/O and Loop#1 I/O windows need to be set for cascade control as shown in the following three figures.

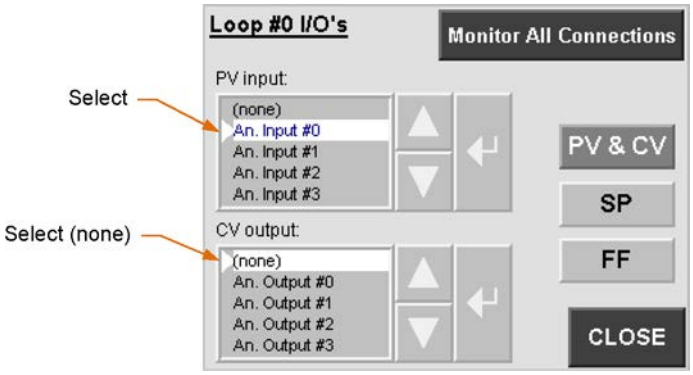


Figure 129: Loop #0 (PV & CV).

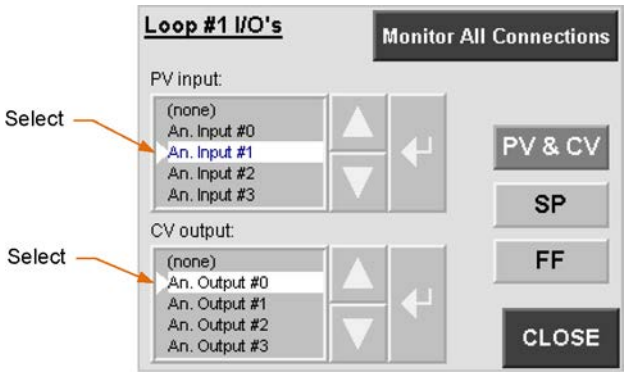


Figure 130: Loop #1 (PV & CV).

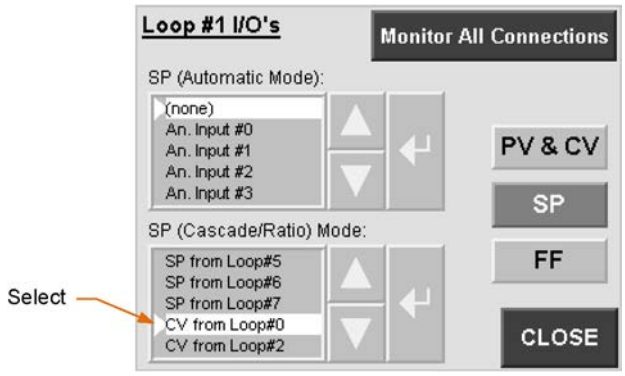


Figure 131: Loop #1 (SP).

CompactLogix / ControlLogix and PanelView Plus 1000 / PC

CompactLogix and ControlLogix PLCs can use two PID instructions: PID (position algorithm) and PIDE (velocity algorithm).

The PID instruction is described in chapter 14 (Special Instructions) of Rockwell Automation's Logix5000 Controllers General Instructions (1756-rm003).

The PIDE instruction is presented in chapter 1 (Process Control Instructions) of Rockwell Automation's Logix5000 Controllers Process Control and Drives Instructions (1756-rm006).

PID Configuration Loop #0 and PID Configuration Loop #1 windows need to be set for cascade control as shown in the following figures.

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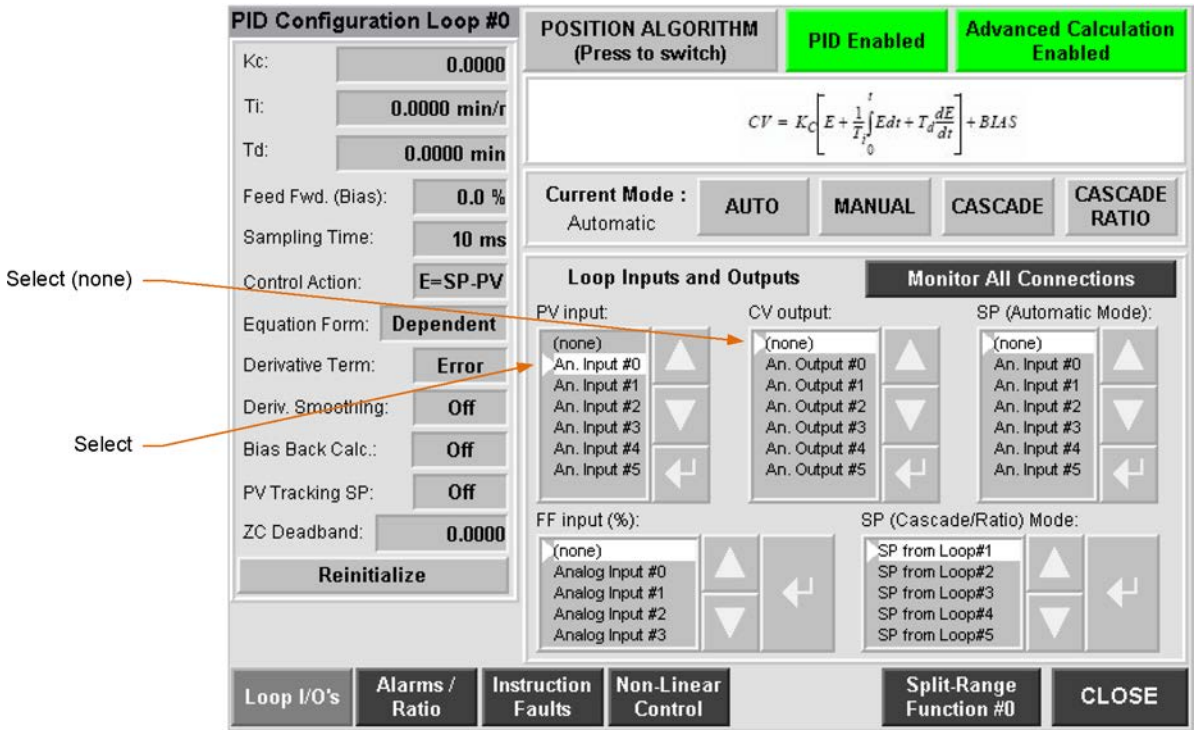


Figure 132: Cascade settings with ControlLogix/CompactLogix and PVP 1000/PC (Loop #0).

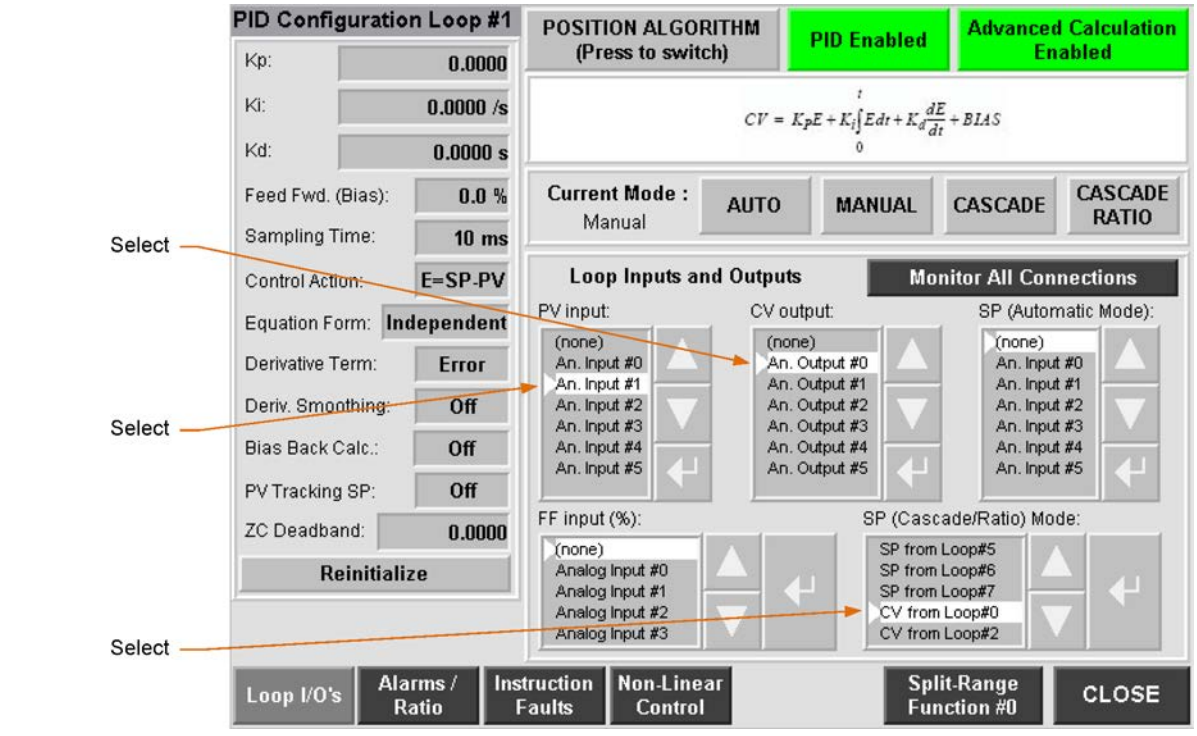


Figure 133: Cascade settings with ControlLogix/CompactLogix and PVP 1000/PC (Loop #1).

Foxboro and PC

The HMI for Foxboro cannot be used for cascade control.

Tuning the control loops

Tuning the slave loop

5. Perform the tuning of the PID slave loop by either adjusting the tuning parameters while in Automatic mode, or by performing a step change in manual mode and proceeding with the Ziegler-Nichols calculations. In any case, fine-tune your process until it meets your control expectations.

   Keep in mind that the slave and the master loops work on different variables. In the archetypical example, the slave loop controls the flow going into a tank while the master loop controls the level in the tank.

   Once the slave loop is tuned, activate the cascade mode. This is done differently depending on your PLC:

   - If you have a Micrologix PLC, simply activate the AUTOMATIC mode from the main window, as shown in the following figures. The slave loop will automatically take the master loop's CV loop as setpoint.

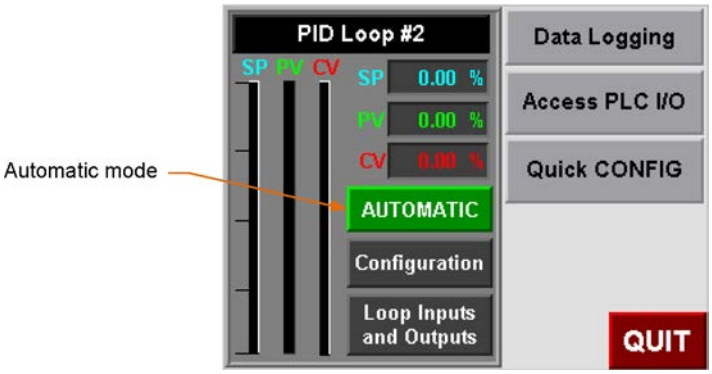


Figure 134: Micrologix in AUTO mode (PVP 600).

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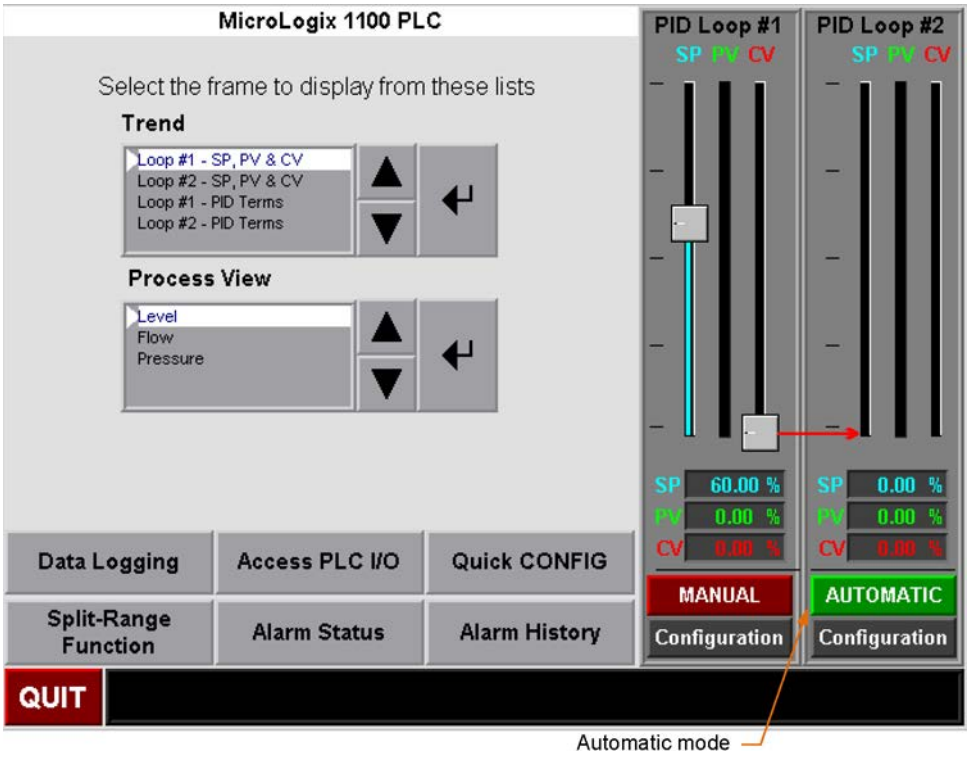


Figure 135: Micrologix in AUTO mode (PVP 1000).

- If you are using a CompactLogix or a ControlLogix PLC with the position form algorithm, go to the Configuration window and select the CASCADE mode as shown in the following figures.

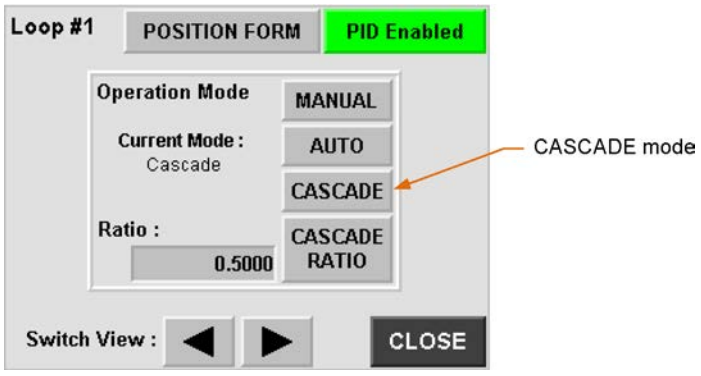


Figure 136: CompactLogix/ControlLogix in CASCADE mode (position form and PVP 600).

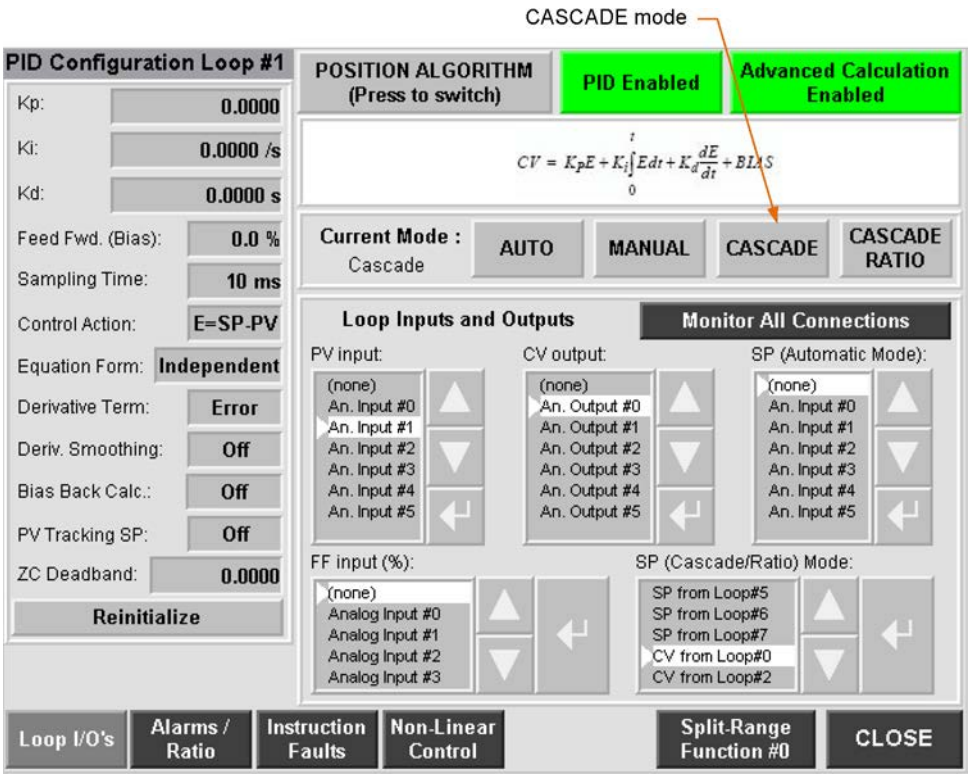


Figure 137: CompactLogix/ControlLogix in CASCADE mode (position form and PVP 1000).

- If you are using a CompactLogix or a ControlLogix PLC with the velocity form algorithm, go to the Configuration window, select the CASCADE RATIO mode, and specify Not Using Ratio as shown in the following figure.

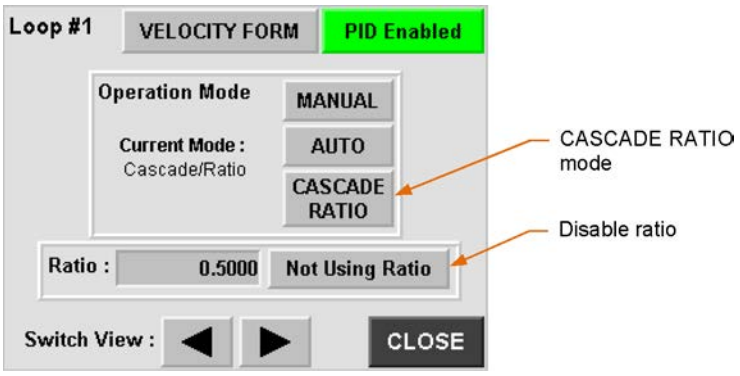


Figure 138: CompactLogix/ControlLogix in CASCADE mode (velocity form and PVP 600).

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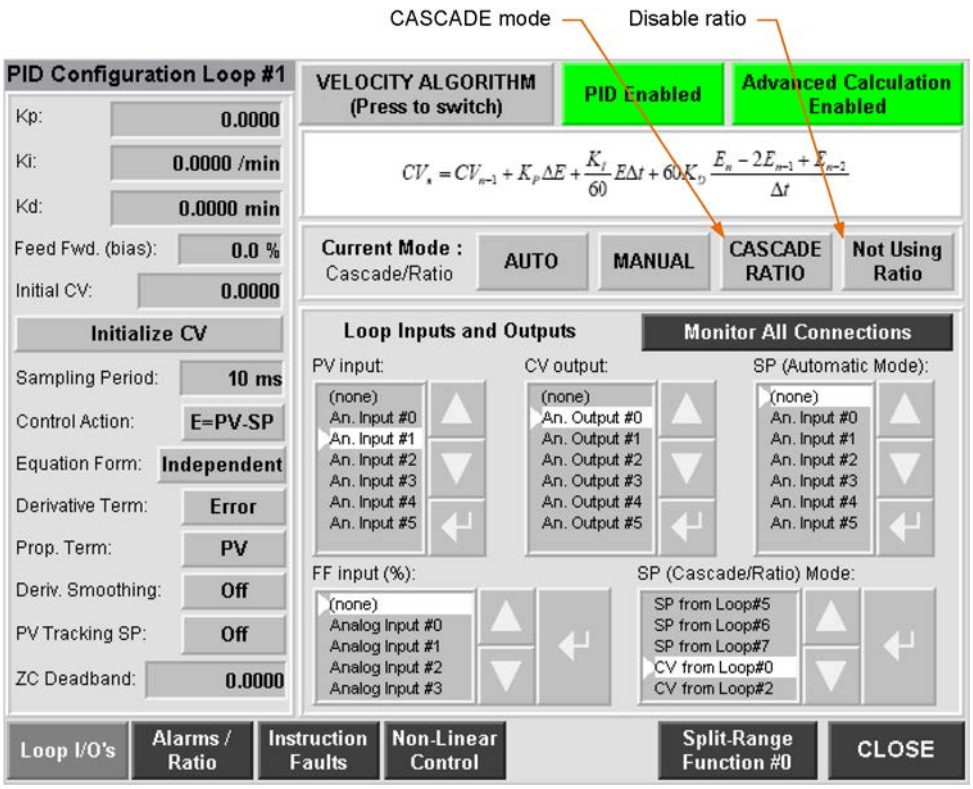


Figure 139: CompactLogix/ControlLogix in CASCADE mode (velocity form and PVP 1000).

Tuning the master loop

6. Perform the tuning of the PID master loop by either adjusting the tuning parameters while in Auto mode, or by performing a step change in manual mode and proceeding with the Ziegler-Nichols calculations. In any case, fine-tune your process until it meets your control expectations.

Leave the master loop in Auto mode. The PLC is now controlling your process in cascade.

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Appendix A

Rockwell Software Installation and Network Configuration

Several software components from Rockwell Automation (RA) are recommended for installation in order to take full advantage of your RA controllers and touch screens. The software programs are presented here in the order in which they must be installed. However, you may decide not to install any of these software components if you don't plan on using a PC and if the programs already included with your PLC and your touch screen fulfill all your needs.

- **RSLinx Classic.** RSLinx Classic is the first software program recommended for installation. The standard version provided by Festo Didactic is RSLinx Classic Lite and can be found in different RA software installation packages (i.e., RSLogix 500, RSLogix 5000, and FactoryTalk View Studio). RSLinx is the communication bridge between RA software (RSLogix and FactoryTalk View) and the physical equipment (PLC or touch screen).

- **RSLogix.** Different versions of the RSLogix PLC programming software are also available. Keep in mind that the different versions are specific to some PLCs and are not interchangeable.

    - RSLogix 500. For use with MicroLogix 1100 PLC (P/N 46964). This version uses only Ladder Logic programming.

    - RSLogix 5000. This is the most advanced PLC programming software of all the RSLogix family. It recognizes four different programming languages: Ladder Logic, Sequential Function Chart, Structured Text, and Function Block Diagram.

        - The RSLogix Lite Edition (P/N 5935-00 or 5935-A0) is for use with a CompactLogix (P/N 46966) PLC.

        - The RSLogix Full Edition (P/N 5935-B0 or 5935-10) is for use with a ControlLogix (P/N 46965) PLC.

- **FactoryTalk View Studio and FactoryTalk View ME Station.** FactoryTalk View Studio, formerly RSView Studio since version 5, is used to create and test HMI interfaces. These interfaces can run on a PanelView HMI or on a computer using FactoryTalk View ME Station. When installing this software, RSLinx Enterprise must also be installed. RSLinx Enterprise acts as an OPC server and manages real-time automation data exchange between the HMI and the PLC.



You must activate each software component after the installation using FactoryTalk Activation Tool and an Internet connection.

Rockwell Automation's documentation can be found on the accompanying resource kits (see the section "Resource kits" at the beginning of this course) or online at the following link:

www.ab.com

How to connect your PLC and HMI devices

There are two ways to connect the PLC to your HMI device. If the PLC and the HMI device are the only Ethernet devices you are using, you can connect them directly using a cross-wired Ethernet cable. For example, as illustrated in the following figure, the Micrologix PLC and PanelView Plus 600 are shown with a direct connection.

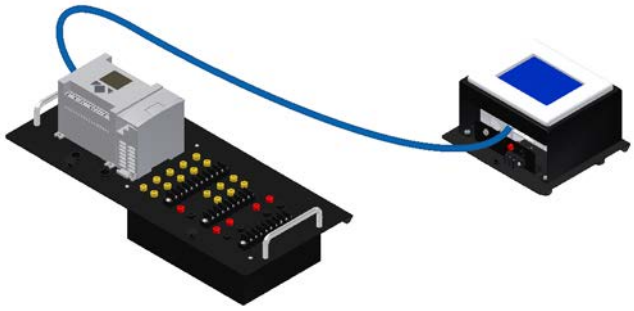


Figure 140: PLC and touch screen.

If you are using multiple Ethernet devices, you must connect each device to a switch using regular Ethernet cables (the following figure). Each device, including the switch, must have a compatible but different IP address to avoid conflicts. A list of suggested IP addresses is given below.

Your computer must be equipped with two Ethernet cards if you want it to be connected to a local network and to devices of the Instrumentation and Process Control Training System simultaneously.

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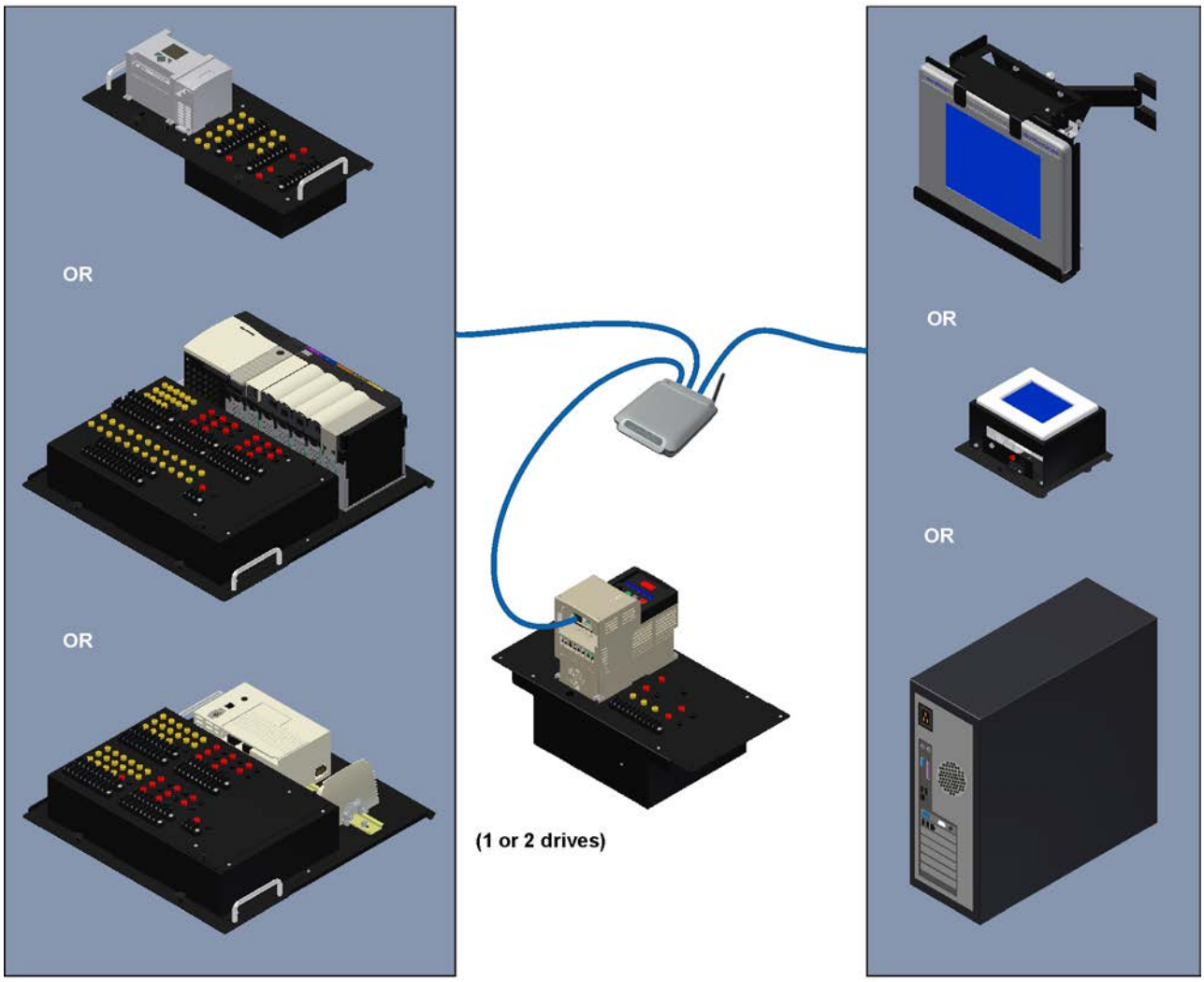


Figure 141: Multiple Ethernet devices on the local network.

IP addresses

The following table lists the recommended IP addresses that should be assigned to the different system components. Alternate addresses are proposed in case multiple similar products are connected to the same local network.

Table 2: 353X series IP addresses.

Product Number	Description	Default IP Address	Alternate IP Addresses
39969	Switch	192.168.2.1	192.168-2.2 – 192.168.2.9

Product Number	Description	Default IP Address	Alternate IP Addresses
5922-BX or 46973	Touch Screen Terminals	192.168.2.10	192.168.2.11 – 192.168.2.19
46965	ControlLogix PLC	192.168.2.20	192.168.2.21 – 192.168.2.29
46964	MicroLogix PLC	192.168.2.30	192.168.2.31 – 192.168.2.39
46999	Computer	192.168.2.40	192.168.2.41 – 192.168.2.49
85572 (3530 Series) or 46975		192.168.2.50	192.168.2.51 – 192.168.2.59
46966	Pump drive[2]	192.168.2.60	192.168.2.61 – 192.168.2.69
N/A	Additional Equipment	192.168.2.70	192.168.2.71 and up

[2] If two Pump Drives are used, set the first pump IP address to 192.168.2.50 and the second to 192.168.2.51 using BOOTP-DHCP Server utility from Rockwell. This procedure is detailed at the end of this section.

PanelView Plus EtherNet/IP settings

1. Power up the HMI (Human-Machine Interface) and wait for the on-board FactoryTalk View ME Station software to open. If the touch screen automatically loads the HMI application instead of displaying the FactoryTalk View ME Station Start window shown in the following figure, shutdown the application to access the Start window.

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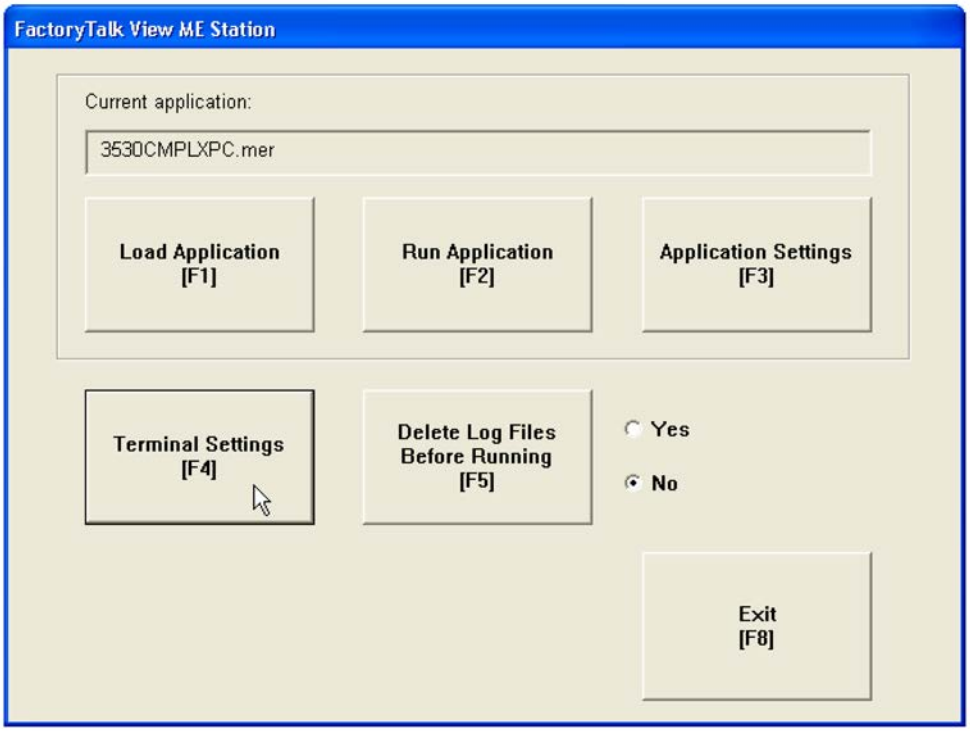


Figure 142: Start window.

2. Click on Terminal Settings. Then, in the Terminal Settings window, shown in the following figure, select Networks and Communications and click OK.

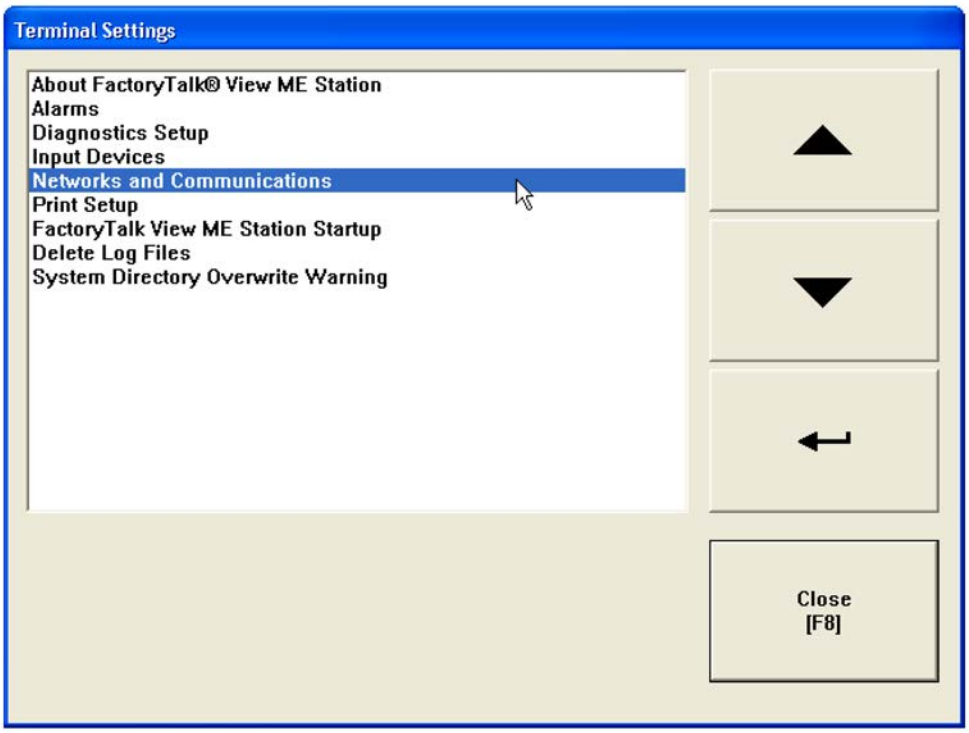


Figure 143: Terminal Settings window.

3. In the Networks and Communications window, shown in the following figure, select Network Connections and click OK.

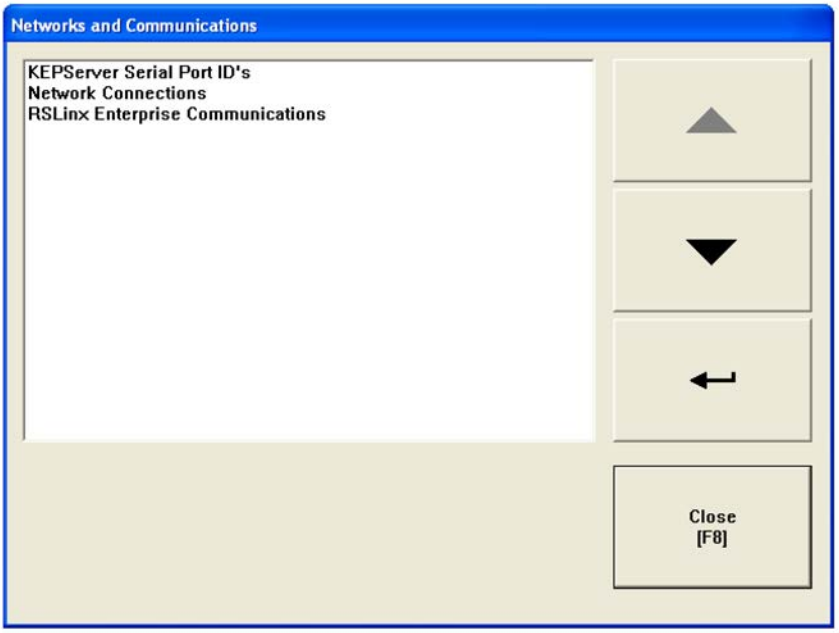


Figure 144: Network and Communications window.

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4. In the Network Connections window, select Network Adaptor and press on the IP Address button. When the IP Address window appears, enter the following configuration (IP address can be different). Confirm your settings by pressing OK.

Table 3: IP Configuration.

IP Address [F1]	192.168.2.10
Subnet Mask [F2]	255.255.255.0
Gateway [F3]	0.0.0.0
Use DHCP [F4]	No

Finally, you can reset the PanelView Plus so that the new settings take effect. You can verify the new settings by checking if your PanelView is visible from RSLinx.

Setting an IP address using BOOTP/DHCP

When a new device comes out of the Rockwell factory, the IP address is not preconfigured. Therefore, it must be located by its MAC address using BOOTP/DHCP server software. This software is installed by default when you install RA software.

5. At the first run, BOOTP/DHCP server will ask for the network setting. Enter the Subnet Mask the same way it is configured on the host computer (the following figure).

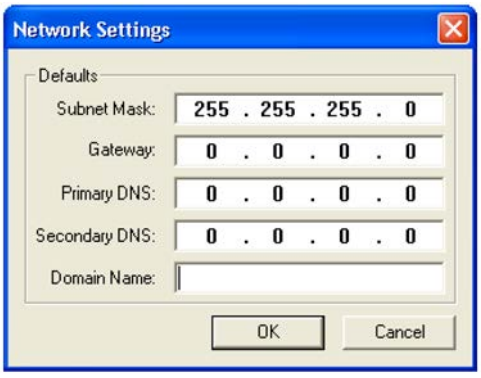


Figure 145: BOOTP/DHCP Network Settings.

This software will retrieve any MAC address without an IP address on your network. In the example below, a pump drive with the MAC address 00:00:BC:56:B3:00 is shown with a BOOTP configuration type.

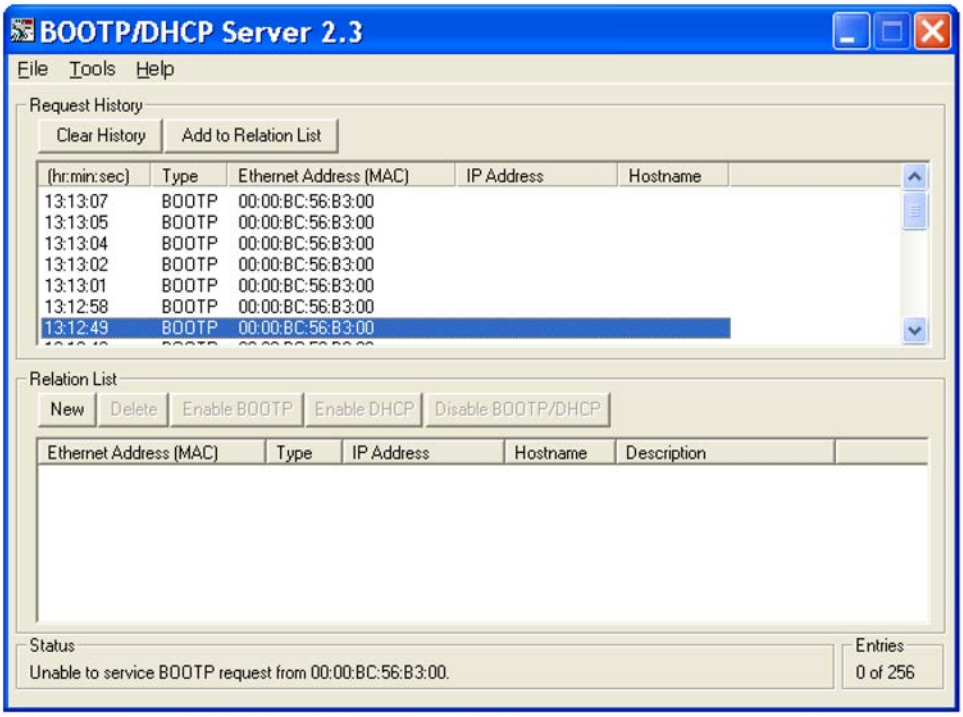


Figure 146: BOOTP/DHCP MAC addresses.

How to locate the MAC address?

Here are some examples of where training system components MAC addresses can be printed:

Pump drive: on the pump drive Ethernet card (you need to remove the front panel held by two screws).

MicroLogix 1100: under the right cap of the PLC.

CompactLogix: on the accessible printed circuit board of the processor (1769-L32E) or the Ethernet card (1768-ENBT) when the port is not embedded in the processor.

ControlLogix: on the side of the Ethernet card (1756-ENBT).

6. Locate the appropriate MAC address in the Request History window and double-click on it. A new window will appear (the following figure).

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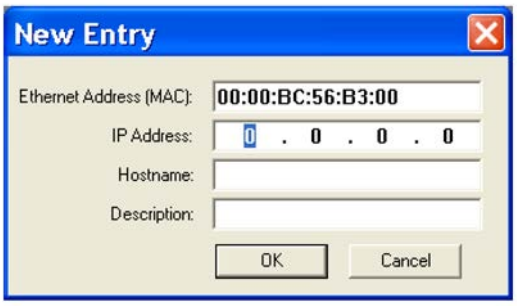


Figure 147: No IP address.

7. Enter the IP address you want for the pump drive and click on OK (the following figure). The configuration will appear in the Relation List (the last figure).

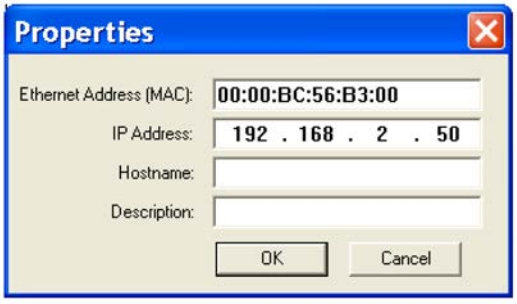


Figure 148: IP address.

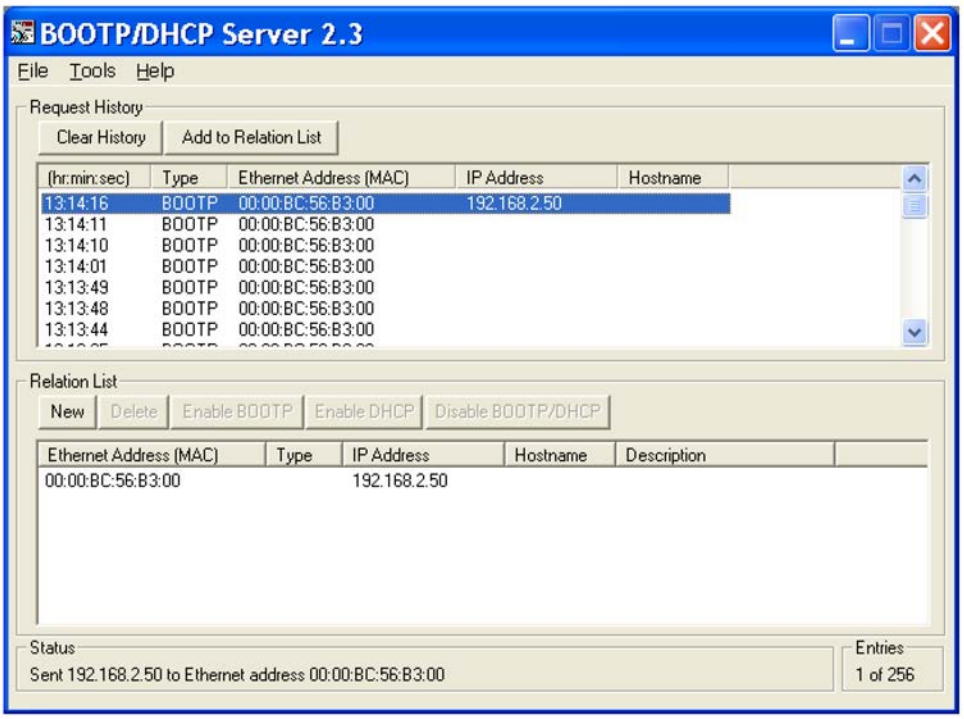


Figure 149: Relation list.

8. At this point, the IP address is not yet stored in the device, but it will appear on the network. To assign the IP address permanently, select the link you have created in the Relation List of BOOTP/DHCP Server (the following figure) and click on Disable BOOPT/DHCP (the last figure). You can then close the server application.

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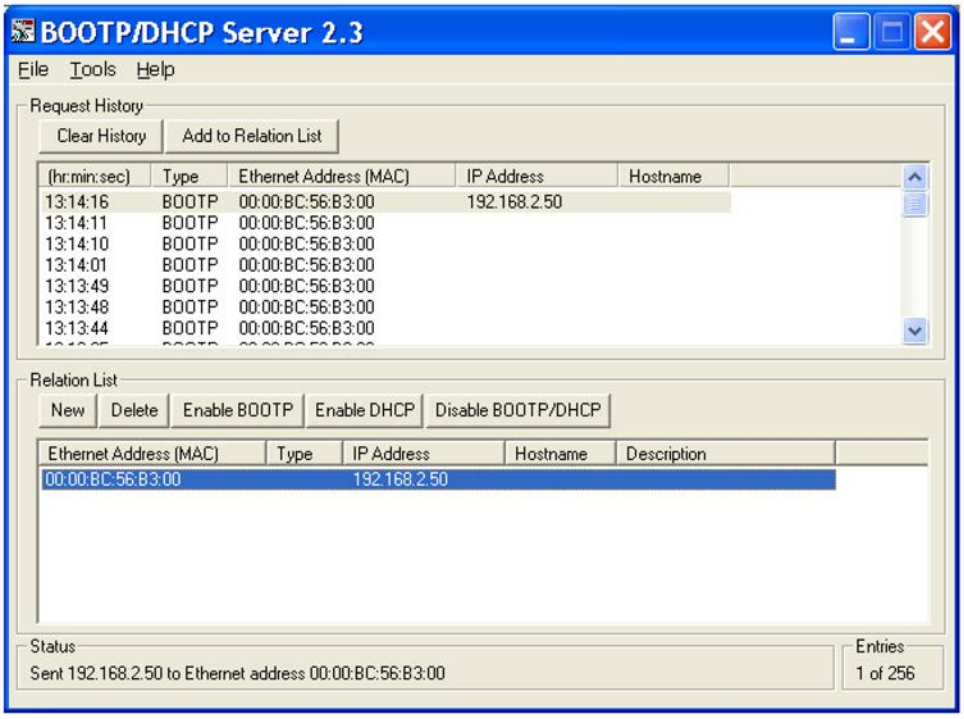


Figure 150: Link selected.

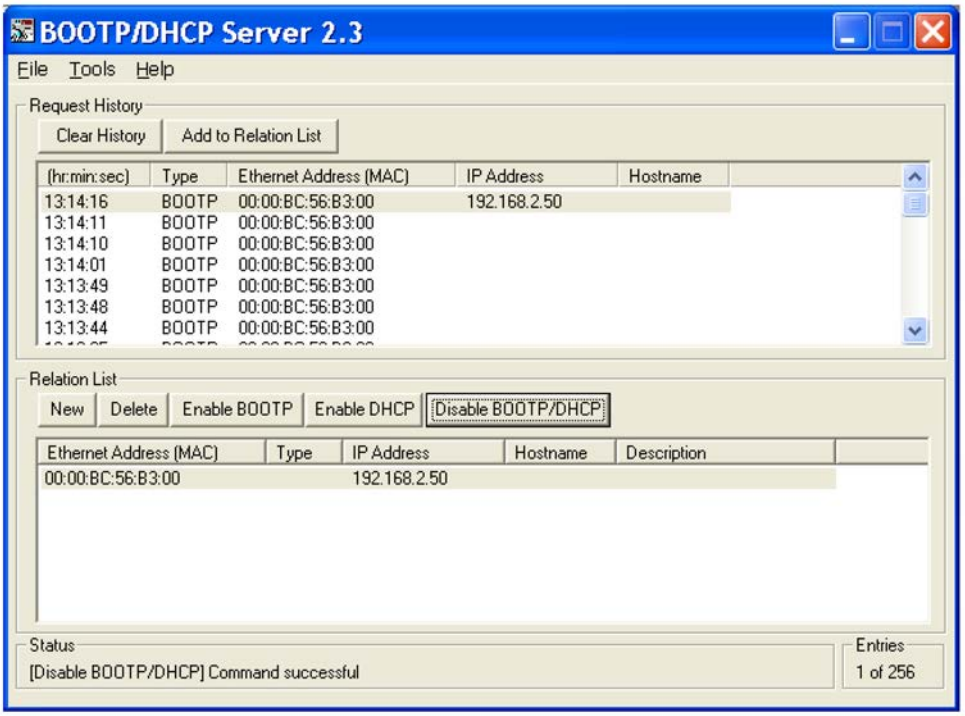


Figure 151: Disable BOOTP/DHCP.

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Common Operations with FactoryTalk View Studio

Restoring an application from an archive file

FactoryTalk View Studio is optional software included with the FactoryTalk View ME suite. FactoryTalk View Studio enables users to create, edit, test, and transfer HMI programs. The most common procedures for use with HMIs developed by Festo Didactic are listed below.

Before an application can be downloaded to the Touch Screen Graphic Terminal or used on a PC, it must be restored from an application archive file (.APA). The archive file of the application used for your configuration can be found in the resource kits (see the section "Resource kits" at the beginning of this course). Follow the steps below to restore an application from the archive file.

1. Start FactoryTalk View Studio and, once the software is loaded, click on the Cancel button to close the New/Open Machine Edition Application window, as the following figure shows.

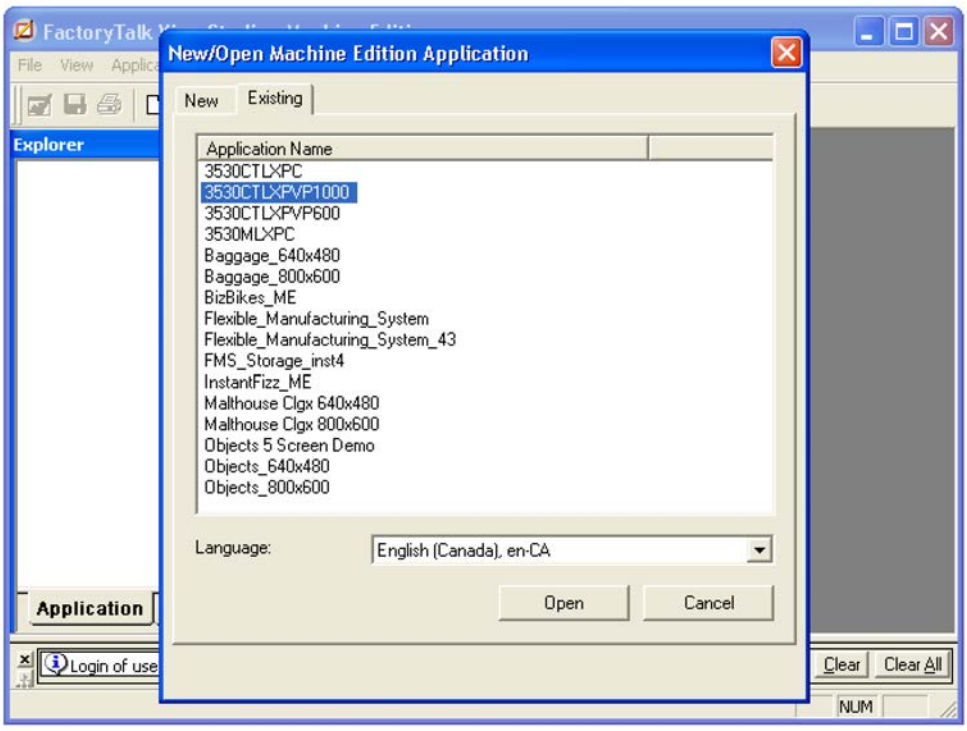


Figure 152: New/Open Machine Edition Application.

2. From the Tools menu select Application Manager. In the Application Manager window, select Restore application and click on the Next button, as the following figure shows.

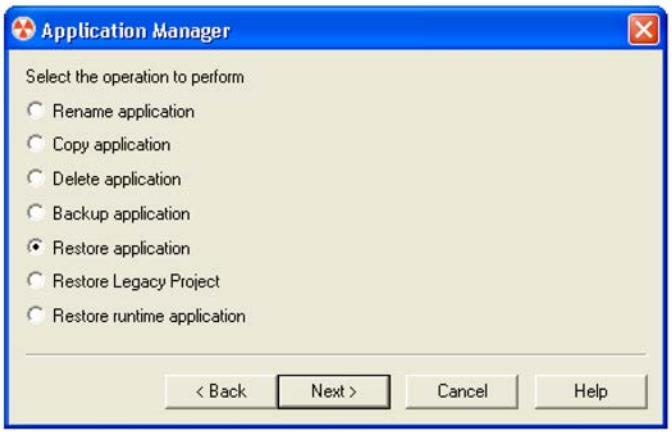


Figure 153: Restore application.

3. Click on "...". Select the archive file (.apa) for your combination of PLC and HMI device located in the resource kits. Click on the Next button, as the following figure shows.

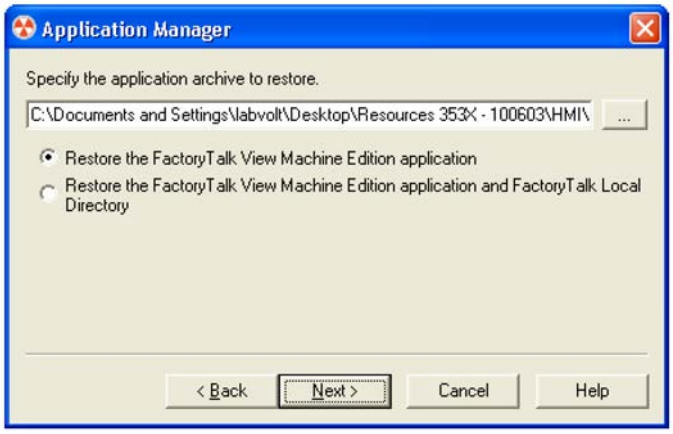


Figure 154: Specify the application.

4. Keep the default name for the application and click on the Finish button (see the following figure) to restore the application from the archive file.

To delete an application from the FactoryTalk View Studio application list, you must also use the Application manager.

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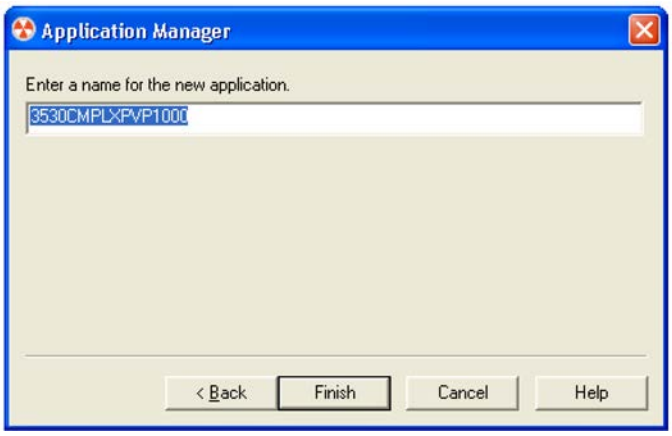


Figure 155: Name for the application.

Opening and editing the IP link in an HMI program

Once the application is restored, it can be opened using FactoryTalk View Studio.

5. From the File menu, select Open Application to open the New/Open Machine Edition Application window. Select your application from the list and click on the Open button (Figure 154).

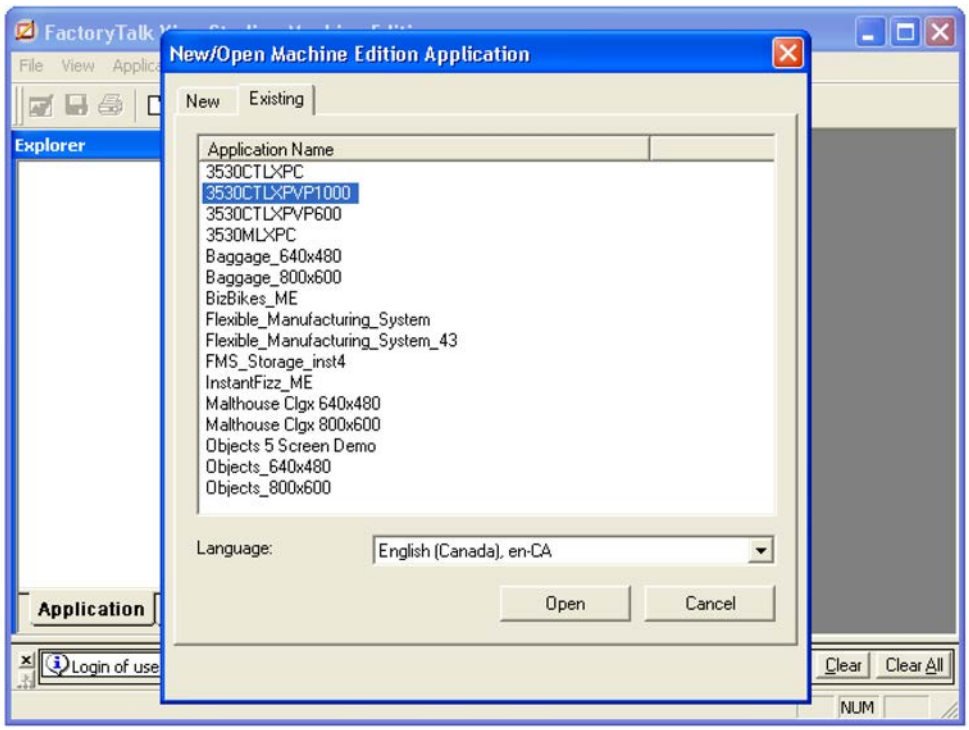


Figure 156: New/Open Machine Edition Application.

Changing the IP link with a Controller

This operation is necessary when the controller IP address is different from the default value. In these cases, a new runtime application must be created.

6. Double-click on the Communication Setup item as shown in the following figure.

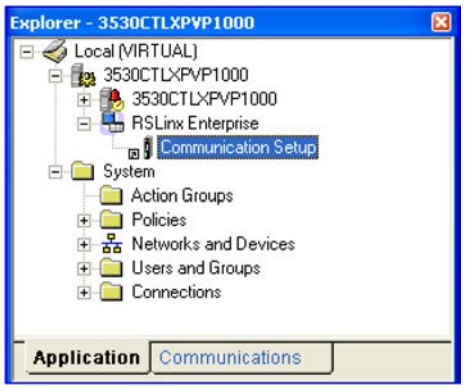


Figure 157: Communication Setup.

7. Under the Design (Local) tab of the new window, select the path to your controller (the following figure).

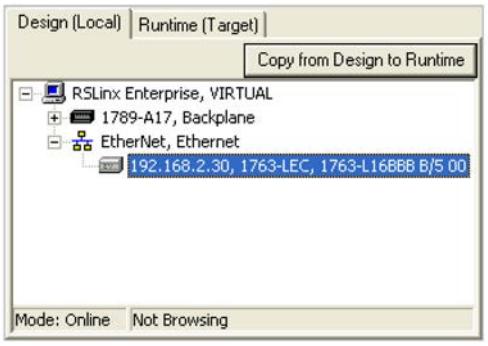


Figure 158: Device shortcut.

8. Click on Apply to assign the new path to the local application. Click Yes when the window in the following figure appears.

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Figure 159: Apply shortcut change.

9. Click on Copy from Design to Runtime and click Yes on the window shown in the following figure. The future runtime application now contains the new link to the controller.

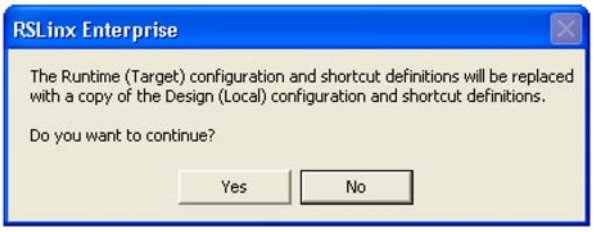


Figure 160: Replace runtime configuration.

10. You can verify the shortcut by clicking on Verify at the bottom. Be sure to acknowledge all warnings, errors, and notes displayed and make any required corrections.

Creating a runtime application

Once an archived application has been restored and opened, it is necessary to create a runtime application that will then be transferred to the touch screen or used on a PC running FactoryTalk View ME Station.

11. From the Application menu, select Create Runtime Application to open the Create Runtime Application window (the following figure).

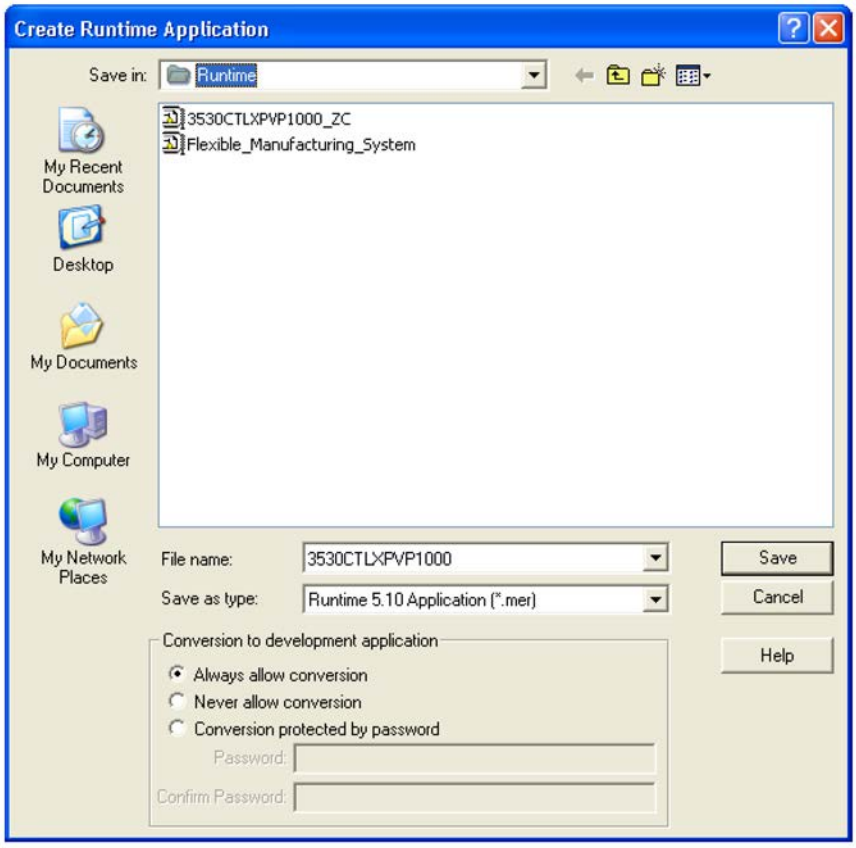


Figure 161: Create runtime application.

12. Save your application using a meaningful file name. Be aware of the path where you saved the runtime application.

Downloading a runtime application to a PanelView

If you create new runtime applications on your PC, here is how you can transfer them to a PanelView Plus so that they can be opened on the touch screen.

13. From the Tools menu, select Transfer Utility or click on the Transfer Utility icon located in the toolbar.

14. On the Download tab of the Transfer Utility, select your runtime application (.mer) as the source file. In the Select destination terminal tree, select the desired touch screen (i.e., PanelView Plus 1000), as shown in the following figure.

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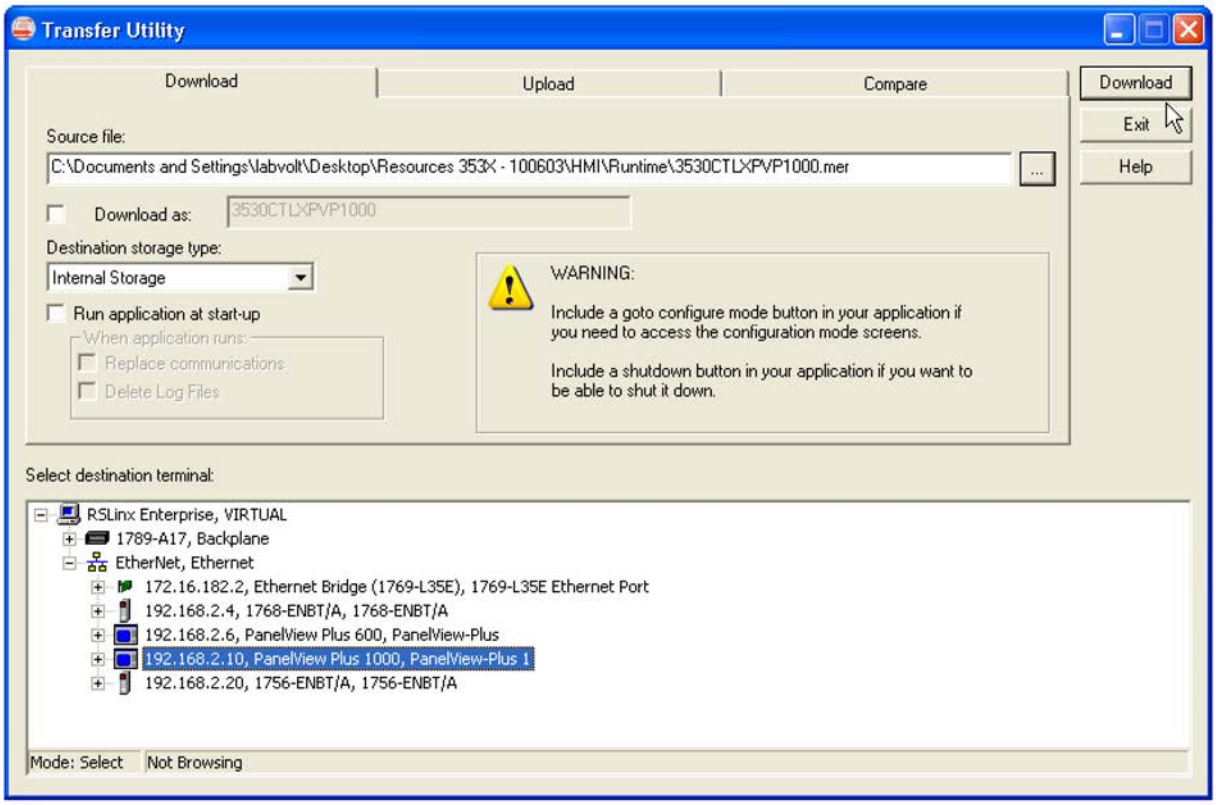


Figure 162: Transfer Utility window.

15. Click on the Download button to download the application to the touch screen.

Deleting an HMI application

To delete an application from the FactoryTalk View Studio application list, you must use the Application Manager.

16. Start FactoryTalk View Studio and, once the software is loaded, click on the Cancel button to close the New/Open Machine Edition Application window.

17. From the Tools menu, select Application Manager. In the Application Manager window, select Delete application and click on the Next button (the following figure).

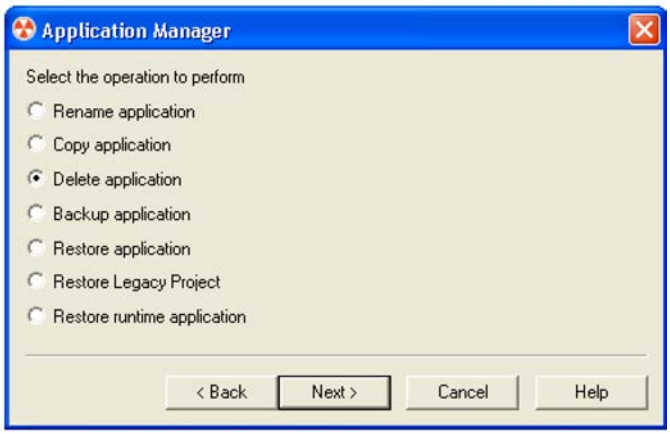


Figure 163: Delete application.

18. Select the application to delete and click on the Finish button (the following figure).

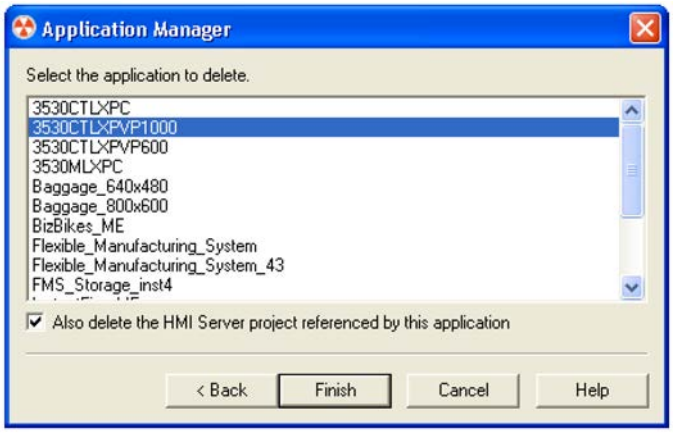


Figure 164: Select application to delete.

19. Confirm that you want to delete the application by clicking Yes.

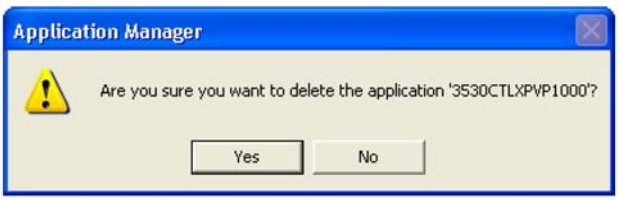


Figure 165: Delete application.

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Foxboro Controllers Configuration and OPC Server Installation

The Instrumentation and Process Control Training System can be interfaced with a server computer for control and monitoring with a Human-Machine Interface (HMI) using the FactoryTalk View ME technology. This appendix is a guide for installation and use of PID Controllers (Foxboro) with the DASTEC Foxboro 76X Series OPC Server and the dedicated FactoryTalk View ME HMI.

The HMI interface can accommodate up to four Foxboro workstations (or devices). Since every workstation has two controllers (primary and secondary) regulating one PID loop each, a total of eight possible loops per interface is possible.

FactoryTalk View Studio or FactoryTalk View ME Station must be installed on each PC on which you want to use an HMI. Every installation must be activated using Rockwell's FactoryTalk Activation Tool.



Rockwell Automation's documentation can be found on the accompanying disks or online at the following link:

www.ab.com

Hardware installation

Communication between the HMI, developed under FactoryTalk View Studio and the workstations is fairly different than with Rockwell's PLCs. A RS232 to RS485 Converter must be used between the server PC and the controllers as shown in the following figures. Also, an OPC server must be installed on the server PC to manage (similarly as RSLinx Enterprise) the real-time automation data exchange between the HMI and the controllers.

First method – Connection to a single computer

The first method, shown in the following figure, consists of connecting the workstations to a single computer running all the software. Using this method implies that the DASTEC Foxboro 76X Series OPC Server and the FactoryTalk View software are installed on a single computer that is both server and client. Make sure the stations are configured as specified in Table 4 before connecting them.

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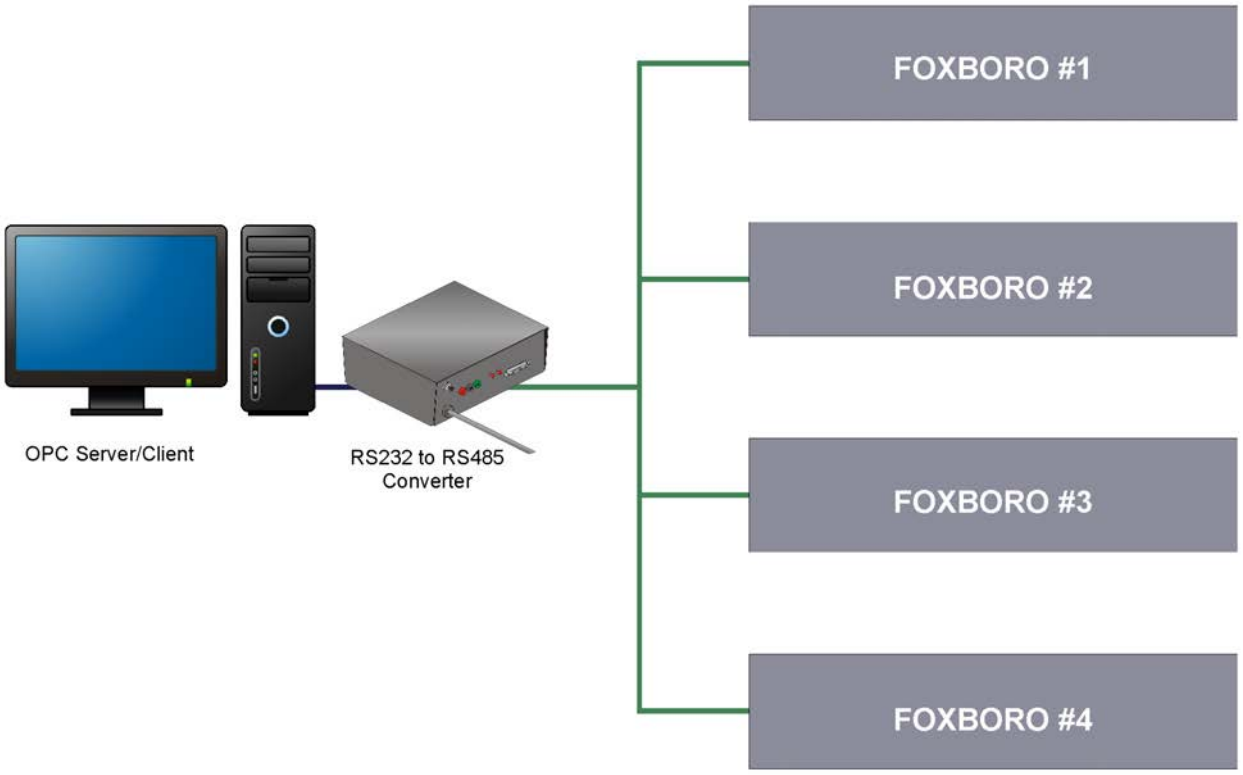


Figure 166: Connecting Foxboro workstations to a single PC.

Second method – Connection to a server computer with client computers

The second method, shown in the following figure, consists of connecting the workstations to a computer running the DASTEC Foxboro 76X Series OPC Server. This computer is used as a server for one or more client computer(s) running the FactoryTalk View software. Make sure the workstations are configured as specified in the following table before connecting them.

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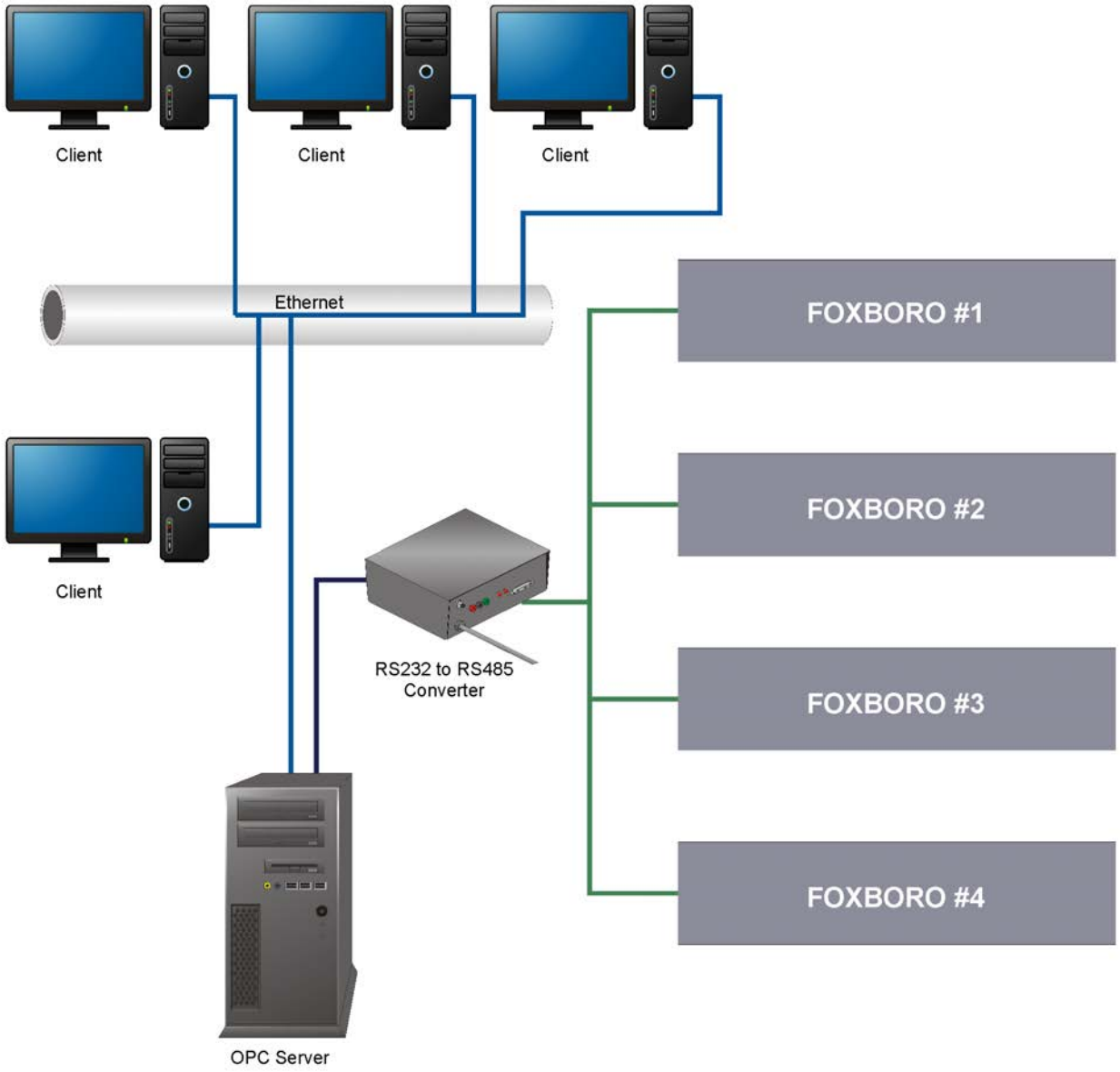


Figure 167: Connecting Foxboro workstations to multiple PCs.

Table 4: Communication parameters for the Foxboro controller.

PARAMETER	STANDARD FACTORY CONFIGURATION	FESTO DIDACTIC CONFIGURATION
CONFIG/WP	OFF	ON
ADDRESS	0	1[3]
BAUD	4800	19200
PARITY	NONE	EVEN
TIMEOUT	10	0.5
FLUNCK	P	W
PRIORITY	P	P
STARTUP	P	P
SWITCH	NONE	NONE

[3] Double-click on the communication port where the RS232 to RS485 Converter is connected to open the Communications Port (COMX) Properties window.

Configuring the server communication port

1. Before installing any software on the computer used as a server for the system, make sure the Windows Firewall is disabled.

2. The RS232 to RS485 Converter is connected to the server computer via a serial link. The DASTEC Foxboro 76X Series OPC Server uses a specific serial port setting for this communication. The properties of the communication port where the RS232 to RS485 Converter is connected must be modified to match the setting used by the DASTEC Foxboro 76X Series OPC Server.

3. To change the properties of the communication port where the RS232 to RS485 Converter is connected, open the Windows Control Panel. Click on the System and Security category, select System, then click on Advanced system settings to open the System Properties window.



The location of the System item may vary depending on your Windows configuration.

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4. Select the Hardware tab and click on the Device Manager button to open the Device Manager window. Click on the arrow symbol beside Ports (COM & LPT) to expand the ports list.

5. Double-click on the communication port where the RS232 to RS485 Converter is connected to open the Communications Port (COMX) Properties window.

6. Select the Port Settings tab and set the port settings as shown in the following table. Click OK to confirm the changes and close the Communications Port (COMX) Properties window. Close the Device Manager, the System Properties, and the Control Panel windows.

Table 5: Parameter settings for the port where the RS232 to RS485 Converter is connected.

Parameter	Setting
Bits per second	19200
Data bits	8
Parity	Even
Stop bits	1
Row control	None

Installing DASTEC Foxboro 76X Series OPC Server

1. The DASTEC Foxboro 76X Series OPC Server installation files are located on the FactoryTalk and OPC server resource kit (see the section "Resource kits" at the beginning of this course). Insert this disk in the computer drive, open the OPC_Server_Fox76X folder, and double-click on the SETUP.EXE file to start the software setup (see the following figure).



Figure 168: OPC server setup.

2. Click on the Next button to continue to the Software License Agreement window (see the following figure).

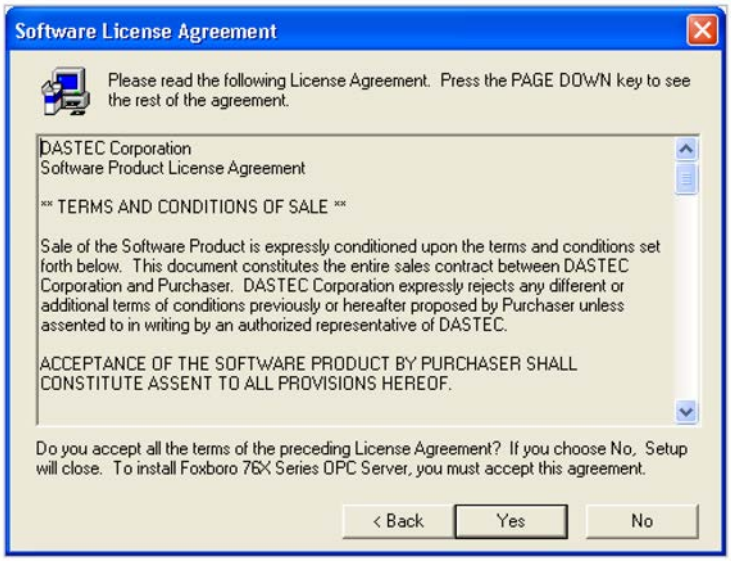


Figure 169: Software License Agreement.

3. Click on the Yes button to accept the terms of the license and continue to the Choose Destination Location window (see the following figure).

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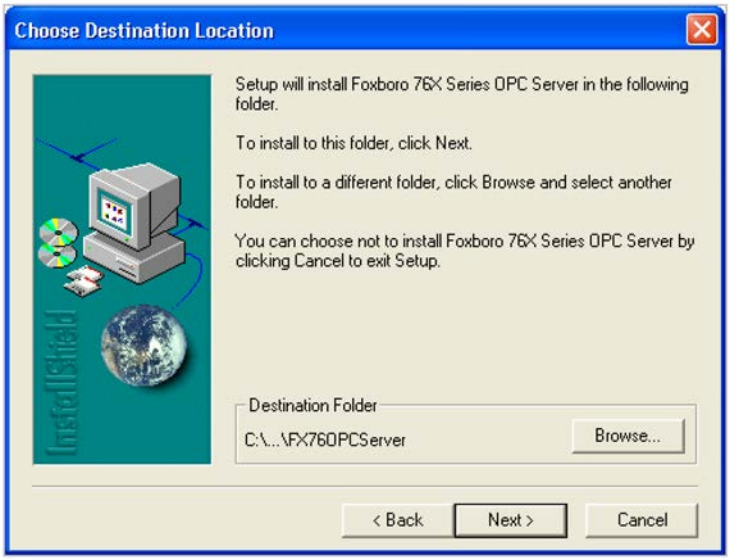


Figure 170: Choose Destination Location.

4. Click on the Next button to approve the destination folder and continue to the Select Program Folder window (see the following figure).

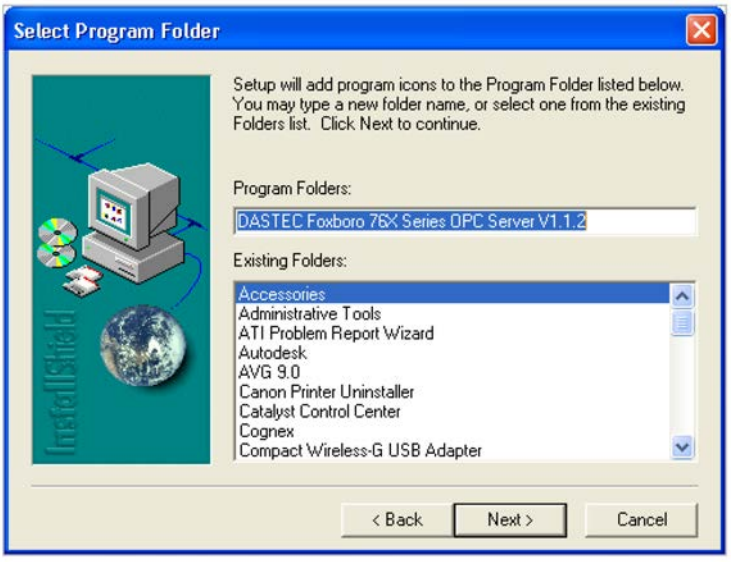


Figure 171: Select Program Folder.

5. Click on the Next button to approve the program folder and continue to the Start Copying Files window (see the following figure).

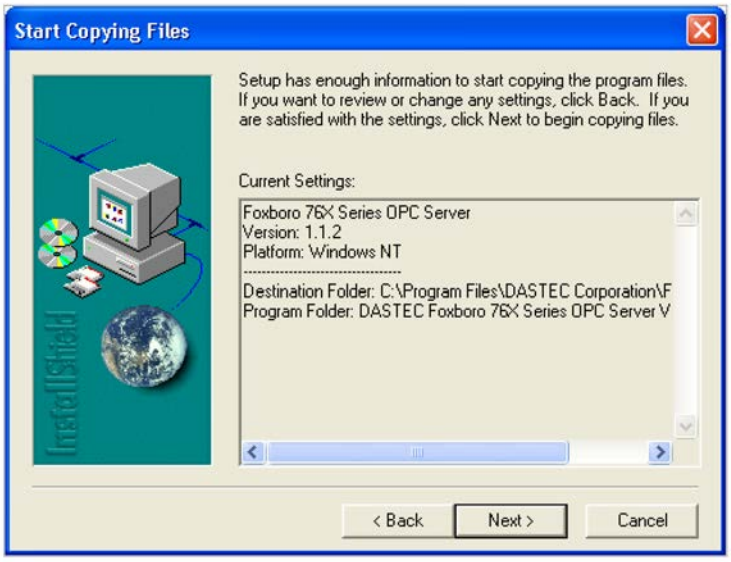


Figure 172: Start Copying Files.

6. Click on the Next button to start the DASTEC Foxboro 76X Series OPC Server installation.

Authorizing the DASTEC Foxboro 76X Series OPC Server

A detailed description of the Authorization procedure is given in the DASTEC Software Authorization/Un-Authorization User Manual. This course can be found on the OPC Server resource kit.

Once the installation is complete, the Authorization Utility opens automatically, as the following figure shows.

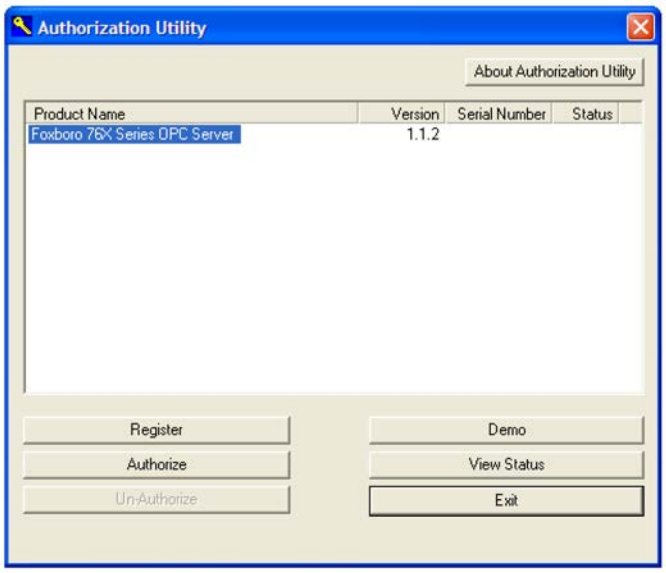


Figure 173: Authorization Utility.

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7. Select the Foxboro 76X Series OPC Server item and click on the Register button to open the DASTEC Product Information Details window. Enter the serial number of your DASTEC product in the Serial Number text area (see the following figure). This serial number can be found on the Festo Didactic License Authorization document provided with your system. Appendix E shows a typical Festo Didactic License Authorization document.

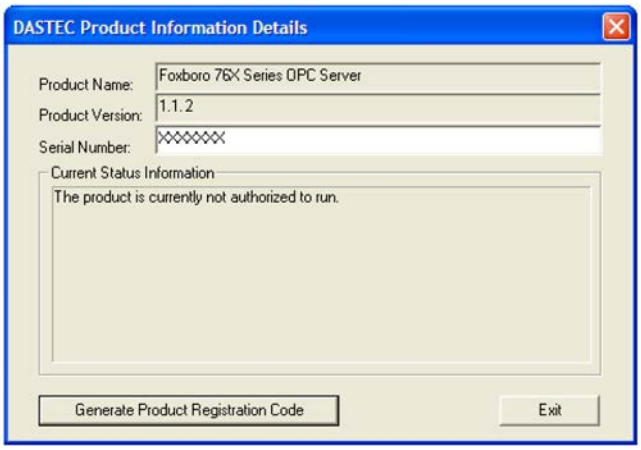


Figure 174: DASTEC Product Information Details.

8. Click on the Generate Product Registration Code button. If your computer is equipped with more than one Ethernet adapter, the Select Ethernet Adapter window, shown in the following figure, is displayed. You must select the MAC address of the Ethernet adapter with which the license of the DASTEC Foxboro 76X Series OPC Server is to be associated. Once the MAC address is selected, click OK to continue to the Registration Code window (the second following figure).



Figure 175: Select Ethernet Adapter.

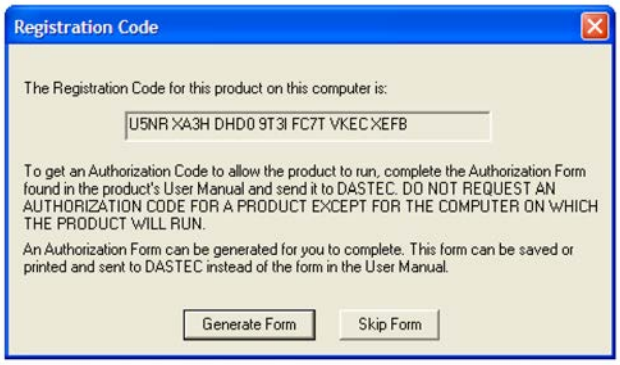


Figure 176: Registration Code.

9. Click on the Generate Form button to open the Generate Authorization Code Request Form window (see the following figure).

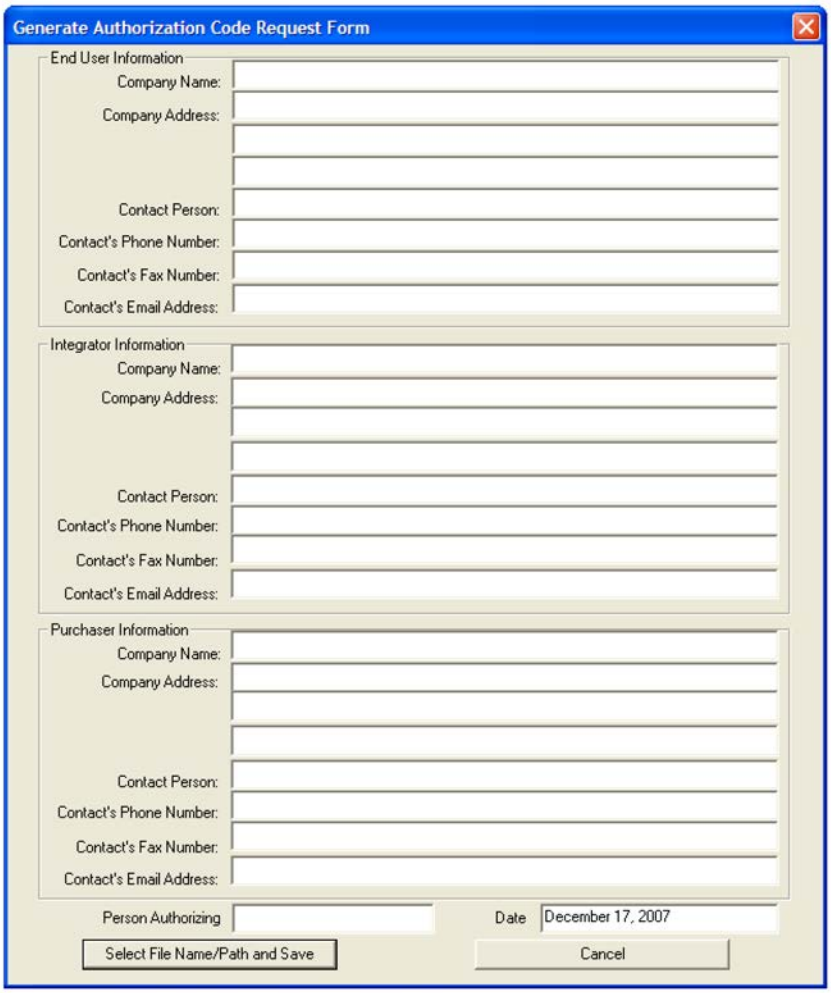


Figure 177: Generate Authorization Code Request Form.

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10. Fill in the form and click on the Select File Name/Path and Save button. This allows you to save your Authorization Code Request Form to a text file. Email the completed form to DASTEC Corporation at:

    sales@dastec.com

    DASTEC Corporation will return the form to you with your Authorization Code.

    Below are the steps to enter your Authorization Code. Keep in mind that while you are waiting for DASTEC Corporation to return your Authorization Code, you can run the DASTEC Foxboro 76X Series OPC Server in Demo mode for 3 days.

11. From the Authorization Utility, select the Foxboro 76X Series OPC Server item and click on the Authorize button to open the DASTEC Product Information Details window. The Serial Number text area should already be filled with the serial number of your DASTEC product (see the following figure).

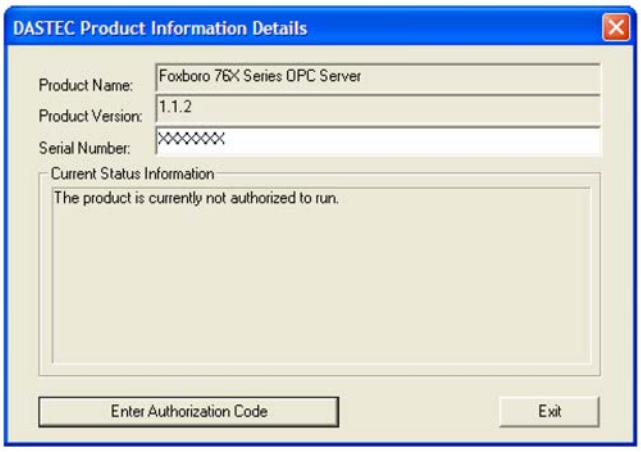


Figure 178: DASTEC Product Information Details.

12. Click on the Enter Authorization Code button to open the Code Entry window (see the following figure).

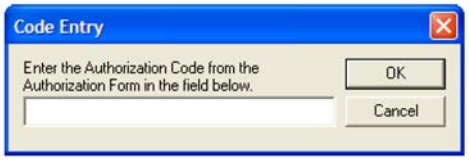


Figure 179: Code Entry.

13. Enter your Authorization Code in the text area and click OK to authorize the product. Click on the Exit button to close the Authorization Utility.

If you plan to transfer the DASTEC Foxboro 76X Series OPC Server to another computer, you must first un-authorize your product. Please refer to the DASTEC Software Authorization/Un-Authorization User Manual on the OPC Server resource kit for details on the un-authorization procedure.

14. Click on the Finish button to complete the setup of the DASTEC Foxboro 76X Series OPC Server (see the following figure).

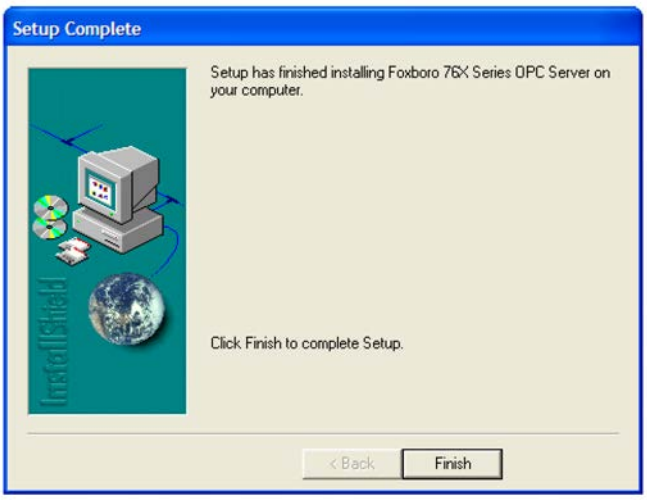


Figure 180: Setup Complete.

15. To complete the OPC server installation, copy the OPC_Server_Fox76x\Database folder from the FactoryTalk and OPC server resource kit to the computer hard drive. It is suggested to copy this folder into your My Documents folder. The Fox762.tdb tag configuration file in this folder is required to run the OPC server with the training system.

16. From the Windows Start menu, select the DASTEC Foxboro 76X Series OPC Server V1.X.X folder and start Foxboro 76X Series OPC Server (see the following figure).

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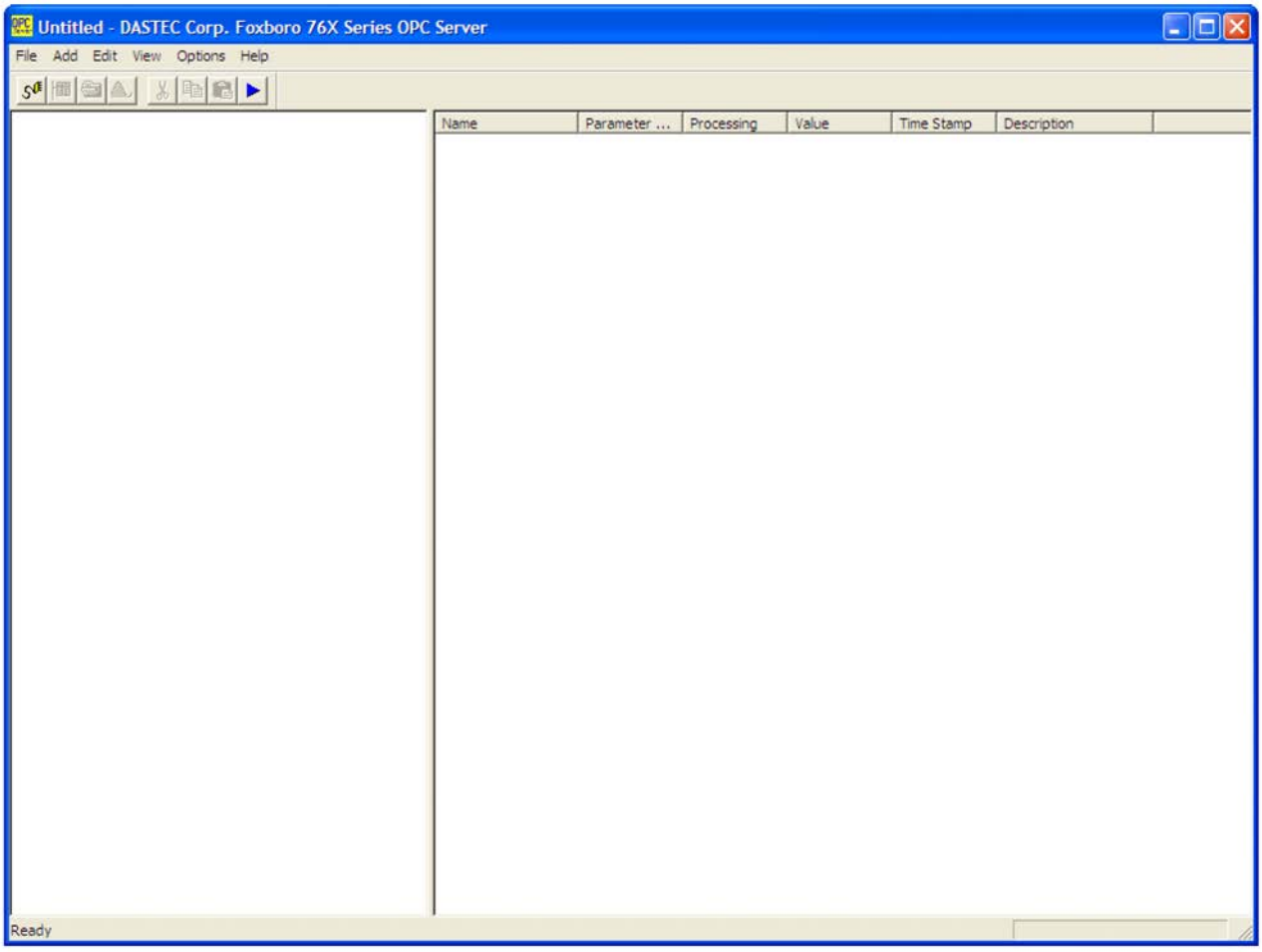


Figure 181: DASTEC Corp. Foxboro 76X Series OPC Server.

17. From the File menu of the OPC server, select Open and select the Fox762.tdb configuration file you just saved to the computer hard drive (see the following figure).



Figure 182: Opening the configuration file.

18. Once the configuration file is opened, the DASTEC Corp. Foxboro 76X Series OPC Server window should appear as shown in the following figure.

The Fox762.tdb configuration file is set for a computer using the COM 1 communication port. If the RS232 to RS485 Converter is not connected to COM 1, follow the procedure in Appendix D to change the OPC server communication setting.

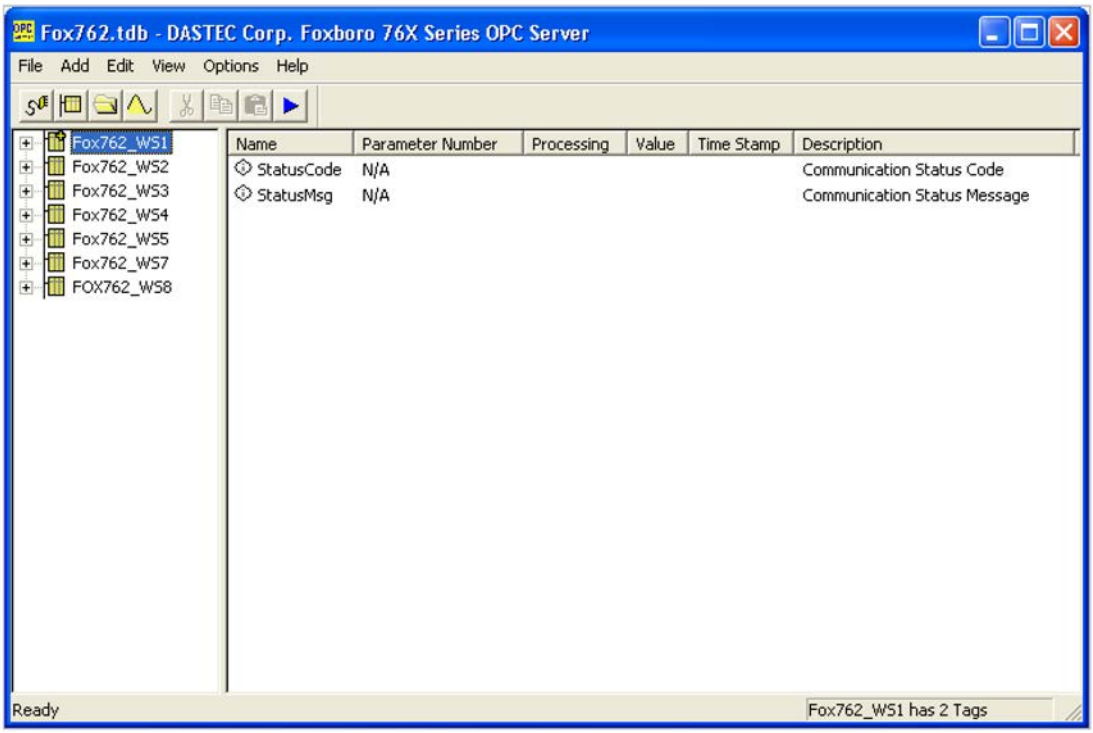


Figure 183: Fox762.tdb.

19. From the File menu, select Exit to close DASTEC Corp. Foxboro 76X Series OPC Server.

Overview of DASTEC's Foxboro 76X Series OPC Server

OPC is an acronym for OLE for Process Control, where OLE stands for Object-Linking and Embedding. The DASTEC Foxboro 76X Series OPC Server uses the OPC standard to read/write data to/from Foxboro 762 controllers. The OPC server and the controller(s) communicate via serial communications.

The computer running the OPC server can be its own client (i.e., the OPC server is set as a local server) or it can be used as a remote server. In this case, several client computers can be connected to the OPC server and data are exchanged between the OPC server and the clients over the computer network via the Distributed Component Object Model (DCOM) interface.

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The following figure shows the OPC server with the tag list for the eight workstations. The tags for each workstation are divided into four subgroups: Lab-Volt, Poll, Primary Set, and Secondary Set. The three last subgroups are pre-defined subgroups. When the HMI application is running, the tags can be monitored in real time by selecting the View ▶ Monitor from the DASTEC Foxboro 76X Series OPC Server menu. The following figure shows the tags of the Lab-Volt subgroup. Monitoring tags allows the user to check if the OPC server is actually communicating with the controller(s).

You can also use the LEDs on the RS232 to RS485 Converter, Model 75883, to check if the OPC server is actually communicating with the controller(s). If the two LEDs are not flashing, the OPC server is not communicating with the controller(s).

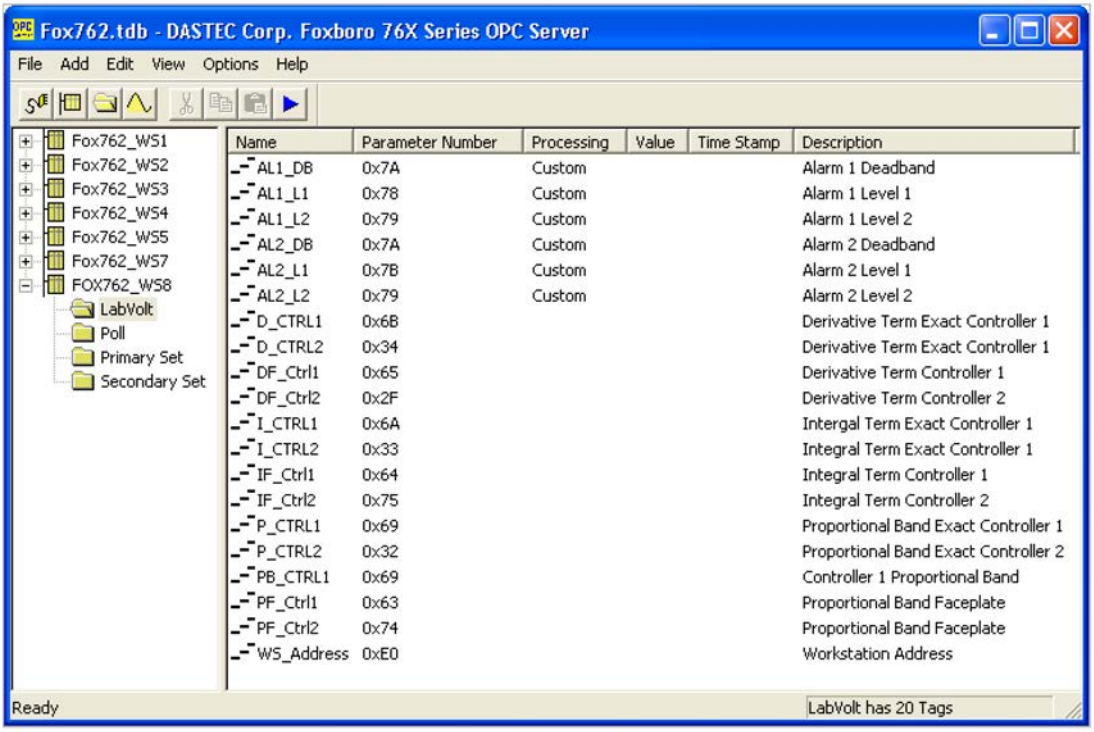


Figure 184: DASTEC Foxboro 76X Series OPC Server.

Running the HMI on the server

The runtime application on the FactoryTalk and OPC Server resource kit (see the section "Resource kits" at the beginning of this course) can be opened without modification with FactoryTalk View ME Station on the server computer.

Running the HMI application 3530FOX762_OPC.mer triggers the start of the DASTEC Foxboro 76X Series OPC Server on the server computer.

To check if the OPC server communicates with the station(s) controller(s), select View ▶ Monitor in the DASTEC Foxboro 76X Series OPC Server window and browse through the stations' tags to verify that they are actualized in real time. The following figure shows an example of the values that can be displayed when the OPC server is properly communicating with a Foxboro controller.

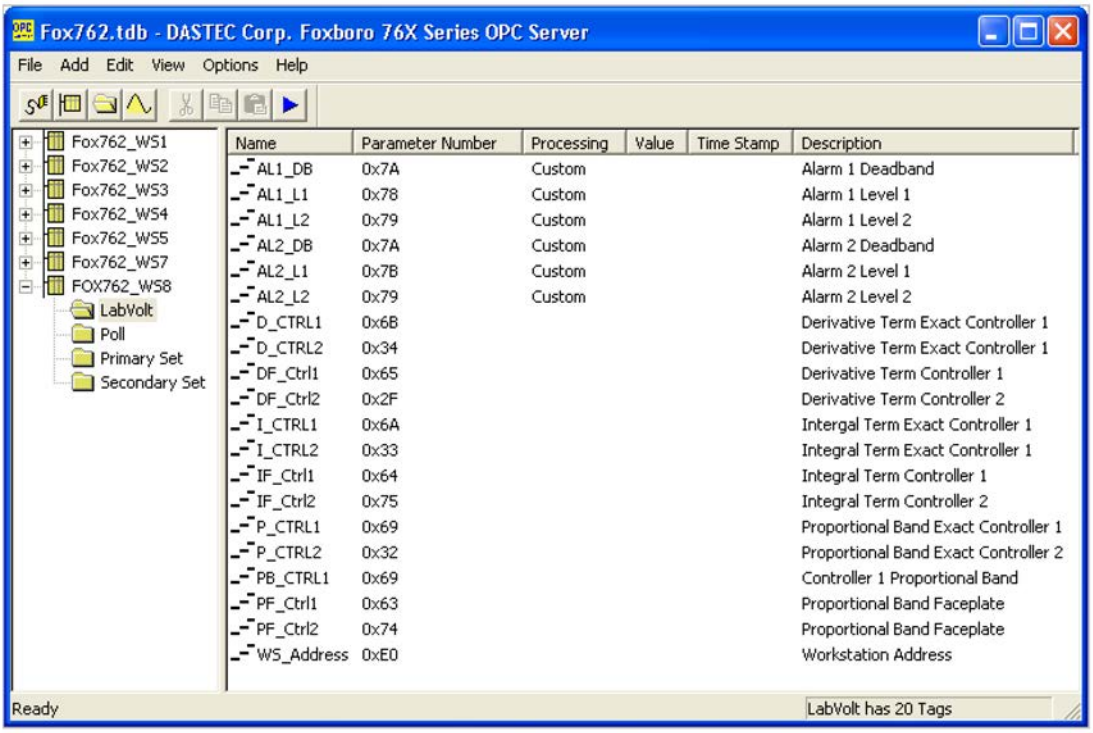


Figure 185: OPC server communicating.

Two OPC servers opening simultaneously

Only one OPC server can run effectively at any given time. If two OPC server instances start upon the launch of the 3530FOX762_OPC.mer HMI application, this means that you have to edit the user account to use to run the OPC Server. Here is how to proceed:

1. From the Start menu of Windows, open the Accessories folder, then click on the Run application. In this application, enter dcomcnfg.exe in the field, then click Ok to launch the program. This opens the Component Services window.

2. In the Component Services window, go to Component Services ▶ Computers ▶ My Computer ▶ DCOM Config and right-click on DASTEC Corporation Foxboro 76X Series OPC Server to access the Properties.

3. Under the Identity tab, select The interactive user as the user account to use to run the application and click OK.

Running the HMI from a client computer

The archived FactoryTalk application (.apa) on the FactoryTalk and OPC server resource kit (see the section "Resource kits" at the beginning of this course) has to be modified with FactoryTalk View Studio to create a runtime application (.mer) that can be opened with FactoryTalk View ME Station on a client computer.

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1. When the HMI project is open in FactoryTalk View Studio, double-click on the Fox server icon in the Explorer window (the following figure) to open the Fox Properties window.

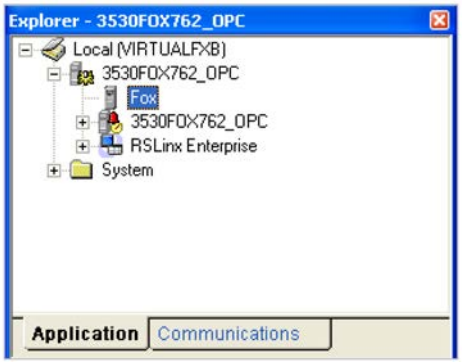


Figure 186: Fox server icon.

2. In the Fox Properties window (see the following figure), change the Computer hosting the server option for Server will be hosted on remote computer. Click on the two Browse buttons to select your server computer and OPC Server name. When this information is entered correctly, click OK to close this window.

The server and client computers must be on the same local network.

3. Generate a new runtime application by selecting Application ▶ Create Runtime Application. Running this new runtime application from a client computer triggers the start of the DASTEC Foxboro 76X Series OPC Server on the server computer.

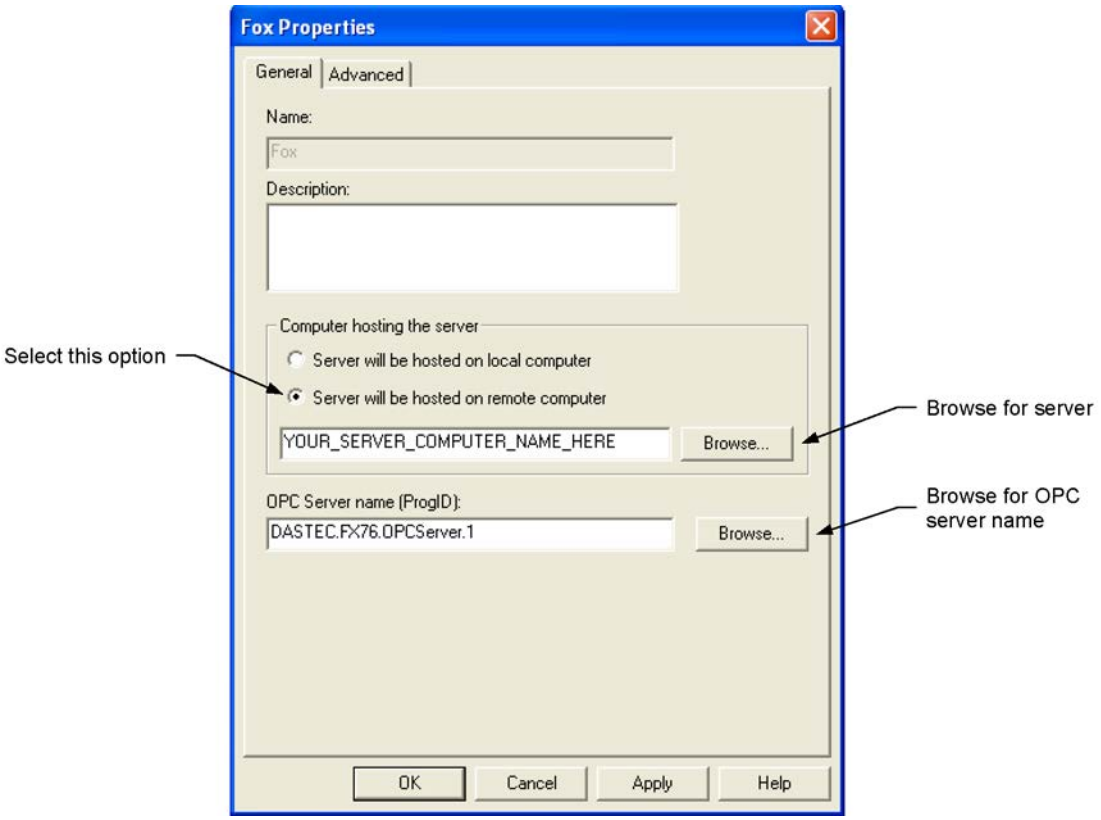


Figure 187: Fox Properties window.

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Changing the Serial Port of the OPC Server

The Fox762.tdb configuration file provided on the FactoryTalk and OPC server resource kit (see the section "Resource kits" at the beginning of this course) is set for a computer using the COM 1 communication port. If the RS232 to RS485 Converter of your system is not connected to the COM 1 port of your computer, follow the procedure below to change the OPC server communication setting.

1. From the Windows Start menu, select the DASTEC Foxboro 76X Series OPC Server V1.X.X folder and start Foxboro 76X Series OPC Server. From the Edit menu, select Comm. Path to open the Communication Path Selection window (the following figure).

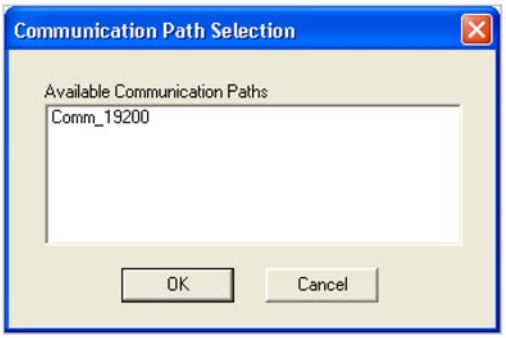


Figure 188: Communication Path Selection window.

2. Select Comm_19200 and click OK. This opens the Communication Path Properties window (the following figure). Change the Port Number to match the communication port of the computer to which the RS232 to RS485 Converter is connected.

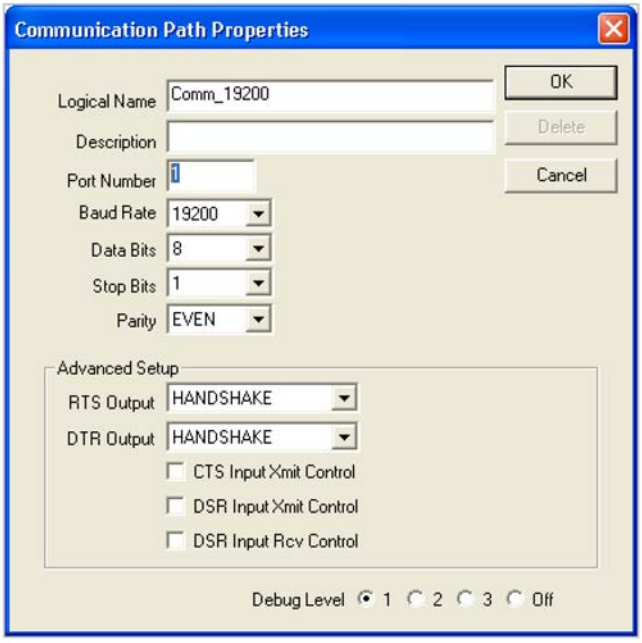


Figure 189: Communication Path Properties window.

3. Do not change the other communication parameters. Make sure these parameters match the port settings of the computer where the RS232 to RS485 Converter is connected.

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