

# PAC DISPLAY USER'S GUIDE



# PAC DISPLAY<sup>TM</sup> USER'S GUIDE

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PAC Display User's Guide

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# 1: Welcome to PAC Display

Welcome to PAC Display™, Opto 22's human-machine interface (HMI), alarming, and trending software for Microsoft® Windows® operating systems. PAC Display works with Opto 22 control programs (or *strategies*) running on Opto 22 industrial controllers.

PAC Display lets you easily create graphical, on-screen operator interfaces to monitor and manage control applications running on Opto 22 industrial control engines. With PAC Display, you can present real-time control engine information to the operator, set alarms to notify the operator of changing data, visually track trends in the data using graphs, and securely log data to local or remote computers. Additionally, you can configure the interface to allow a specified operator or group of operators to change values such as alarm thresholds.

## PAC DISPLAY BASIC AND PAC DISPLAY PROFESSIONAL

Two versions of PAC Display software are available: **Basic** and **Professional**. PAC Display Basic provides all the HMI functions that are listed above and documented in this user's guide. PAC Display Professional adds several capabilities that are important if you need to do the following:

- Import projects created in Opto 22's OptoDisplay™ applications
- Take advantage of redundant Ethernet networking features in Opto 22 SNAP PAC controllers.
- Access Scratchpad variables on a SNAP PAC controller or brain.
- Have a PAC Display project connect to an Opto 22 controller that is running an OptoControl strategy.

This user's guide covers both PAC Display Basic and PAC Display Professional.

In this User's Guide, the "Pro" image indicates features or functions that apply only to PAC Display Professional.



## ABOUT THIS GUIDE

This user's guide teaches you how to use PAC Display, including designing a PAC Display project, configuring and connecting an Opto 22 control engine, and monitoring information in your operator interface.

This guide assumes that you are already familiar with Microsoft Windows on your personal computer, including how to use a mouse, standard menus and commands, and how to open, save, and close files. If you are not familiar with Windows or your PC, see the documentation from Microsoft and your computer manufacturer.

Here's what is in this user's guide:

**1: Welcome to PAC Display**—this introductory chapter.

**2: PAC Display Tutorial**—a short lesson to get you up and running with a PAC Display project as quickly as possible. You'll use a sample project to learn how to work with graphic objects, assign dynamic attributes, and run a project.

**3: What Is PAC Display?**—an introduction to PAC Display, basic design and programming concepts, and PAC Display controls and windows.

**4: Working with Projects**—an explanation of what PAC Display projects are, the files they're made of, and how they're organized.

**5: Configuring Control Engines and Tags**—detailed procedures on configuring control engines and I/O from a PAC Control strategy for use in a PAC Display project.

**6: Working with Graphic Objects**—detailed steps for working with graphic objects—including assigning animation attributes—and the windows in which objects appear.

**7: Using Animated Graphic Objects**—covers how to assign dynamic attributes to on-screen objects to create an animated, real-time display of I/O information.

**8: Working with Trends**—explains how to create and configure graphs to track data from I/O points over time.

**9: Configuring Trigger-Based Events**—explains how to use historical logging, application launching, sounds, recipes, and how to change window states based on events.

**10: Configuring and Using PAC Display Runtime**—describes how to customize configurable Runtime features and what you'll see during a Runtime project session.

**A: PAC Display Troubleshooting**—gives tips for solving problems you may encounter while building and using your PAC Display project.

**B: PAC Display Errors**—explains warnings and error messages you may see while running a program in PAC Display Runtime.

**C: PAC Display Files**—lists all PAC Display files located in the PAC Display directory.

**D: Menus**—lists commands and other menu bar options.

**E: International Characters**—provides an alphabetical list of key words and their page locations.

**F: Using the Old-Style Dynamic Attribute Dialog Boxes**—describes an older method of configuring dynamic attributes. The method was streamlined starting in PAC Display R10.0a, but the old method is still available to those who prefer to use it.

## Document Conventions

The following conventions are used in this document:

- Italic typeface indicates emphasis and is used for book titles. Example: "For details, see the *PAC Control User's Guide* (form 1700)."
- Names of menus, commands, dialog boxes, fields, and buttons are capitalized as they appear in the product. (Example: "From the File menu, select Print.")
- File names appear either in all capital letters or in mixed case, depending on the file name itself. (Example: "Open the file TEST1.txt.")
- Key names appear in small capital letters. (Example: "Press Shift.")
- Key press combinations are indicated by hyphens between two or more key names. For example, Shift+F1 is the result of holding down the Shift key, then pressing and releasing the F1 key. Similarly, Ctrl+Alt+Delete is the result of pressing and holding the Ctrl and Alt keys, then pressing and releasing the Delete key.

- “Click” means press and release the left mouse button on the referenced item. “Right-click” means press and release the right mouse button on the item.
- Menu commands are referred to with the Menu > Command convention. For example, “File > Open Project” means to select the Open Project command from the File menu.
- Numbered lists indicate procedures to be followed sequentially. Bulleted lists (such as this one) provide general information.

## OTHER PAC DISPLAY RESOURCES

### Documents and Online Help

To help learn and use PAC Display, the following resources are provided:

- **Online Help** is available in PAC Display, PAC Control, and in most of the utility applications. To open online Help, choose Help > Contents and Index in any screen.
- PAC Display User’s Guide (this document)

Online versions (Adobe® pdf format) of PAC Display documentation are provided on the PAC Display CD and are also available from the Help menu in PAC Display. To view a document, select Help > Manuals, and then choose a document from the submenu.

PAC Display and PAC Project resources are also available on the Opto 22 website at [www.opto22.com](http://www.opto22.com). You can conveniently access this and other sections of the Opto 22 website from PAC Display’s Help menu. Select Help > Opto 22 on the Web, and then select an online resource from the submenu.

### For Developers: SNAP PAC REST API

If you’re a developer who’d like to use PAC Control strategy tags in communications with other devices, the Opto 22 SNAP PAC REST API is a secure and powerful way to do just that. The API is available in SNAP PAC R-series and S-series controllers with PAC firmware R9.5a and higher. To configure HTTPS access to your PAC’s RESTful server and learn how to call the API, visit [developer.opto22.com](http://developer.opto22.com).

### Product Support

If you have any questions about PAC Display, you can call, fax, or e-mail Opto 22 Product Support.

**Phone:** 800-TEK-OPTO  
 (800-835-6786 toll-free in the U.S. and Canada)  
 951-695-3080  
 Monday through Friday,  
 7 a.m. to 5 p.m. Pacific Time

**Email:** [support@opto22.com](mailto:support@opto22.com)

**Opto 22 website:** [www.opto22.com](http://www.opto22.com)

When calling for technical support, you can help us help you *faster* if you provide the following information to the Product Support engineer:

- A screen capture of the Help > About dialog box showing software product and version (available by clicking Help > About in the application’s menu bar).
- Opto 22 hardware part numbers or models that you’re working with.
- Firmware version:

## INSTALLING PAC DISPLAY

- For groov EPIC processors and groov RIO modules: available in groov Manage by clicking Info and Help > About.
- For SNAP controllers and brains: available in PAC Manager by clicking Tools > Inspect.
- Specific error messages you received.
- Version of your computer's operating system.
- For PAC Control, PAC Display, OptoOPCServer, or PAC Manager, you may be requested to provide additional information, such as log or dump files. You can find these files in a support files sub-folder:
  - a. On your Windows Desktop, double-click the PAC Project 10.5 folder.
  - b. Double-click Support Files.
  - c. Double-click on the appropriate shortcut to open the sub-folder containing the requested files.

**Note:** *PAC Control, PAC Display, OptoOPCServer, and PAC Manager create appropriate sub-folders when they create diagnostic log or dump files. If they have not created these files, the sub-folder may not exist; in this case, the shortcut will not work.*

## INSTALLING PAC DISPLAY

PAC Display is a component of the PAC Project Software Suite, a comprehensive set of software tools for industrial automation, remote monitoring, and data acquisition projects in any line of business.

Installation is easy and quick, and you can download PAC Project directly from the [Opto 22 Support > Downloads webpage](#).

The PAC Project installer includes both the Basic (free) version of the software suite, and the software for PAC Project Professional. [Click here](#) for a comparison of PAC Project Basic and PAC Project Professional features.

### To install PAC Display:

1. Download PAC Project from the [Opto 22 Support > Downloads webpage](#).
2. Navigate to the folder where you downloaded PAC Project, and then double-click the installation file (PAC\_Project\_<release number>.exe) to begin installation.

*NOTE: You must have an OptoPassword to install the Professional version of PAC Display. For details, see the Opto 22 website, [www.opto22.com](http://www.opto22.com), Support > Downloads tab, and click the link for OptoPassword (located in the text above the Search field).*

If you have trouble installing PAC Display, contact Opto 22 Product Support at 800-835-6786 (toll-free in the U.S. and Canada) or 951-695-3080.

## System Requirements

Here's what you need to install and run PAC Display:

- A computer with at least the minimum processor and memory required for your version of Microsoft® Windows®, and Ethernet capability. Additional memory and a better CPU may be required for some configurations. We recommend staying away from low-end CPUs and using one of the following operating systems:
    - Microsoft® Windows® 10 Professional (32-bit or 64-bit) or Windows 11 Professional (OptoOPCServer and OptoDataLink) \* must install .NET Framework 4.0 prior to installing PAC Project on these operating systems
- NOTE: PAC Project cannot be installed on Windows XP or older Windows operating systems. Other versions of Windows operating systems and embedded Windows operating systems are not supported.*

- Ethernet capability
- VGA or higher resolution monitor. Minimum size: 800x600 with small fonts
- Mouse or other pointing device
- (Optional) Installed Windows printer
- For PAC Display Basic: At least 141 MB available hard disk space.  
For PAC Display Professional: At least 158 MB available hard disk space.
- At least 500MB available RAM.  
If your PAC Display project uses many basic trends, SuperTrends, or XY Plots, **Opto 22 strongly recommends adding RAM beyond the minimum requirement.** For details, see "[Memory Requirements for SuperTrend Pens](#)" on page 190.
- If your PAC Display Professional project accesses an M4-series controller (such as a SNAP-LCM4 or M4RTU) via an Ethernet connection, controller firmware version R4.1a or newer is required. In addition, in order to access strings or string tables, controller firmware R4.1d or newer is required.

*NOTE: If you're using an operating system such as Windows 10 that supports multiple monitors, you can display the operator interface you create in PAC Display on more than one monitor as long as all monitors have identical video cards.*

### Compatible Databases (Pro only)

- Microsoft® SQL Server® 2022, 2019, 2017, 2016, 2014, 2012, 2008, 2005, and 2000
- Microsoft Azure SQL Database
- MySQL® 3.51 and 5.1 (32-bit only)
- Microsoft Access® 2000–2003 and 2007–2016

*NOTE: Microsoft has ended support for SQL Server 2005 (and lower) and for Access 2003 (and lower). If you're using applications that Microsoft no longer supports, you should consider upgrading.*

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## INSTALLING PAC DISPLAY

# 2: PAC Display Tutorial

## INTRODUCTION

The quickest way to become familiar with PAC Display is by working through a simple example. Our example will use a cookie factory to show you how easy it is to use PAC Display. You'll learn how to start PAC Display, open and save a project, and assign a PAC Control strategy to the project. Then you'll bring in a bitmap, add some animation attributes, and watch your project in action. We'll repeat this process to fine-tune the visuals and we'll end up with a final "working" cookie factory.

*NOTE: If you can't access an Opto 22 control engine at the moment, you can still do everything in the Quick Start up to the point of running your project. Or, you can simulate the control engine of an Opto 22 programmable automation controller (PAC) using the Opto 22 SNAP PAC Sim software utility. For more information, visit the Opto 22 website, [www.opto22.com](http://www.opto22.com).*

### In This Chapter

<a href="#">Opening the Project</a> .....	page 7
<a href="#">Examining the Project</a> .....	page 9
<a href="#">Configuring a Control Engine</a> .....	page 10
<a href="#">Adding a Dynamic Attribute</a> .....	page 16
<a href="#">Downloading to the Control Engine</a> .....	page 20
<a href="#">Running the Project</a> .....	page 27
<a href="#">What's Next?</a> .....	page 29

## OPENING THE PROJECT

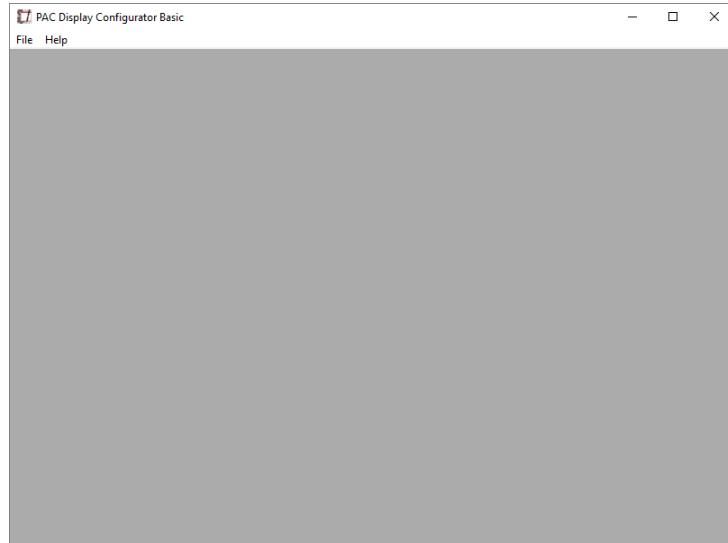
Let's start by opening our sample project. PAC Display projects contain windows, graphic objects, and other information needed to produce an animated operator interface.

**1.** Start PAC Display Configurator Basic:

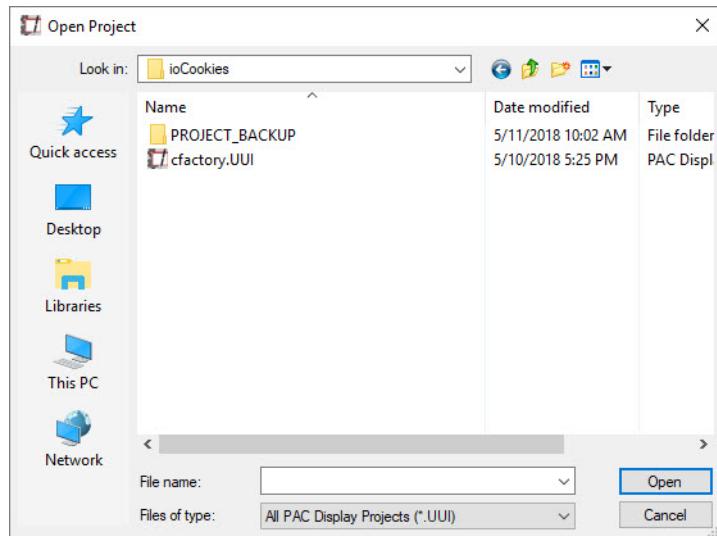
- In Windows, press the Windows Start key , type **PAC Display Configurator Basic 10.5** and then press the Enter key.

## OPENING THE PROJECT

The PAC Display main window opens.

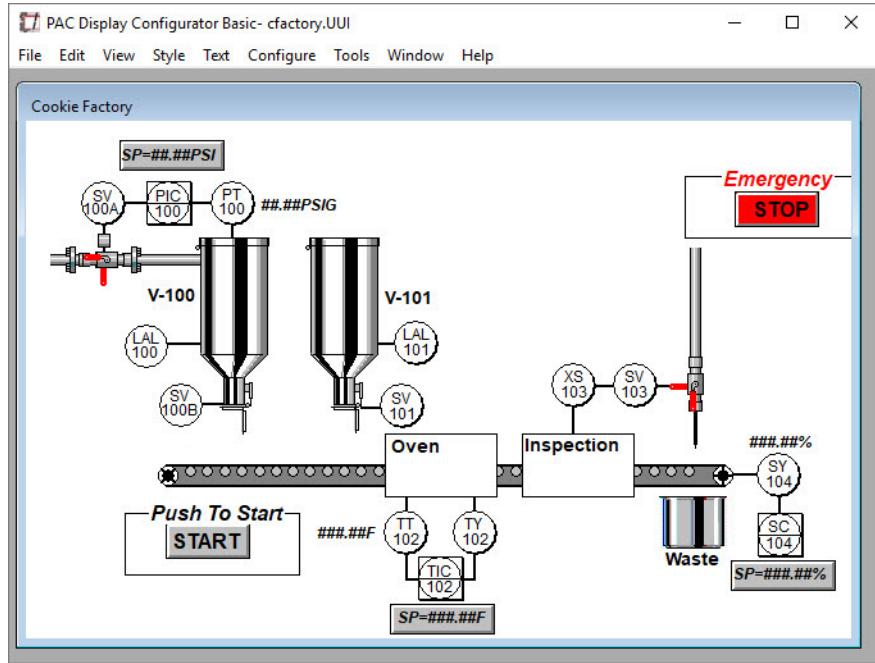


2. Click File > Open Project (or Ctrl+O), and then navigate to C:\Users\Public\Public Documents\Opto 22\PAC Project\Display Basic Examples\Display\ioCookies.



3. Double-click the project file cfactory.uui to open it.

The main window should look like this:



## EXAMINING THE PROJECT

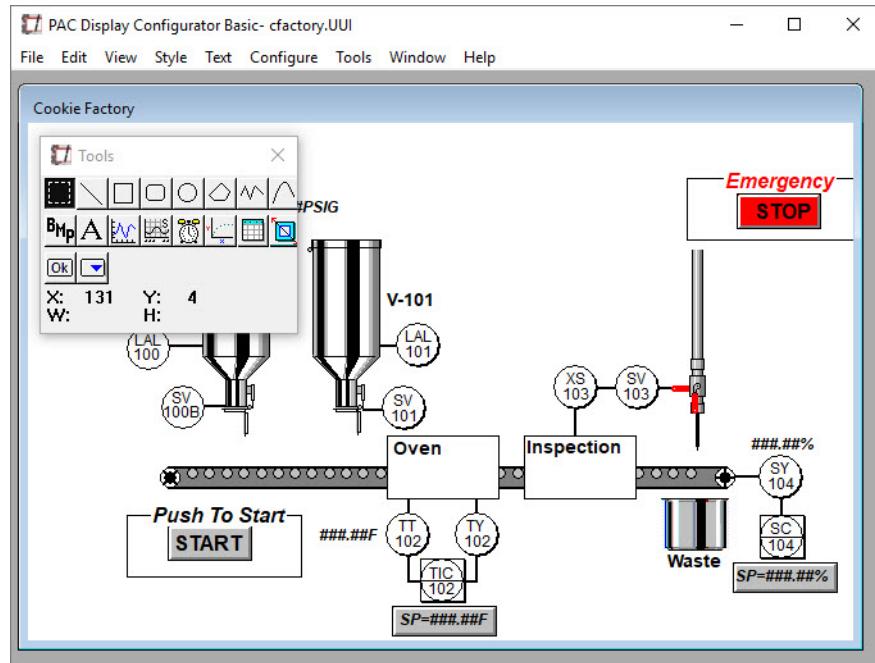
This particular PAC Display project models a simple cookie factory that uses the following components:

- A tank of pre-mixed cookie dough
- A tank of chocolate chips
- An oven
- A visual inspection station
- Some plant air to blow out bad cookies
- A conveyor belt to move material between the different components.

At the start of the process, a measured amount of dough is dropped onto the conveyor belt. The dough moves first under the chip tank to receive some chips, and then into the oven to be baked. The next stop is an inspection station, where rejected cookies are blown off the belt. The good cookies go to shipping. Should anything go wrong, we also have some alarms built in to stop the process if necessary.

## CONFIGURING A CONTROL ENGINE

The window for the cookie factory project should look like this:



This window is called a *draw window*, because in PAC Display Configurator this is where you can create and position graphic objects and other elements for your operator interface. This is also where you assign animation characteristics, or *dynamic attributes*, to graphic objects. Floating on top of the window is a toolbox with all the tools you need to draw graphic objects.

## CONFIGURING A CONTROL ENGINE

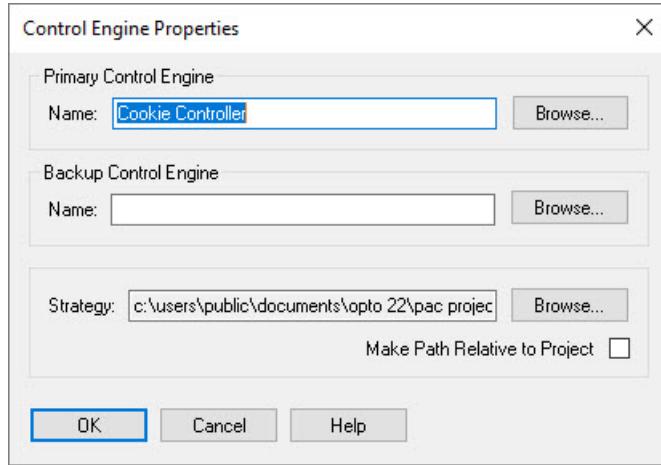
We'll start out by configuring a control engine so that our graphic objects are tied to actual values in a PAC Control strategy. The strategy will be downloaded to your control engine later so we can actually see things running. We'll briefly go through the configuration process, which is covered in greater detail in ["Chapter 5: Configuring Control Engines and Tags" on page 61](#).

### If the Control Engine Already Exists

If you've already completed the Tutorial chapter in the [PAC Control User's Guide](#) (form 1700), a control engine named "Cookie Controller" should be available. Follow the instructions below to check if this control engine already exists.

1. Choose the **Configure > Control Engine(s)** menu item.  
The Control Engines dialog box opens.
2. Do the following:
  - If the control engine "Cookie Controller" is listed in this dialog box, continue to [step 3](#) below.
  - If the control engine "Cookie Controller" is *not* listed in this dialog box, follow the steps in ["Adding a Control Engine" on page 12](#).

- Select "Cookie Controller" in the Control Engines dialog box, and then click Replace.

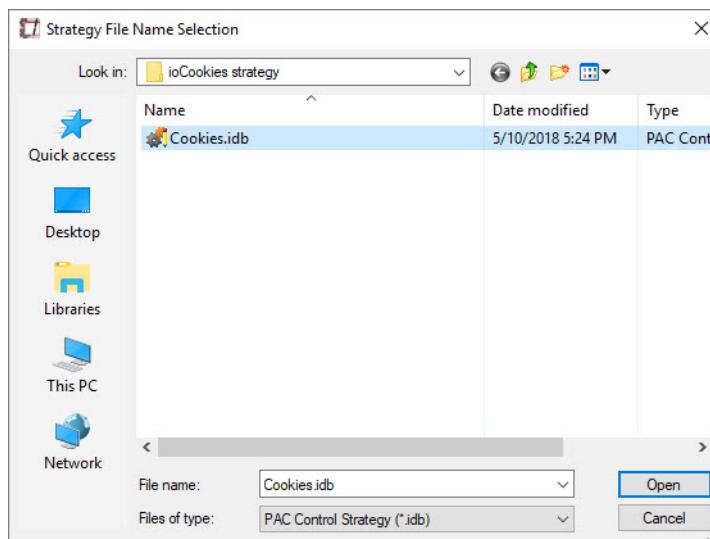


- In the Control Engine Properties dialog box that appears, click Browse in the Strategy section. At the warning prompt, click OK to continue.

**Pro**

*NOTE: This dialog box is slightly different in PAC Display Professional, but the Strategy section and corresponding Browse button are the same.*

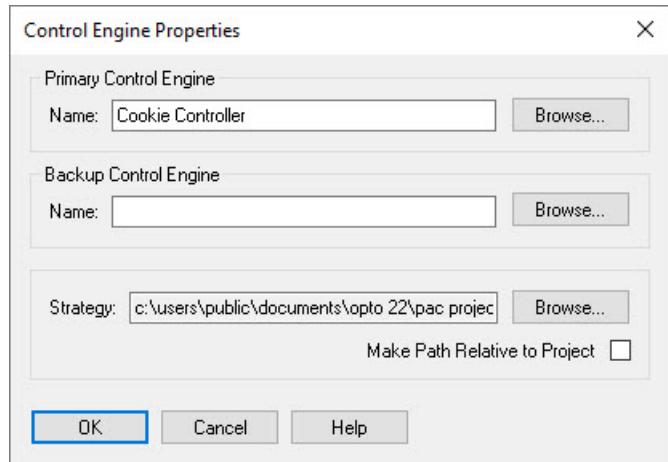
The Strategy File Name Selection dialog box appears. This dialog box is much like the Open Project dialog box we used to find our cookie factory project.



- Change directories to C:\Users\Public\Documents\Opto 22\PAC Project\Display Basic Examples\Control\ioCookies strategy directory. Then, select the Cookies.idb file, and click Open.

## CONFIGURING A CONTROL ENGINE

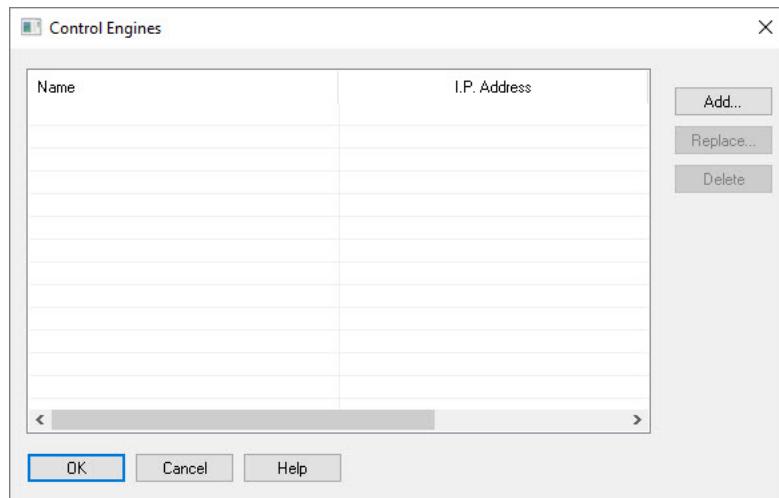
The Control Engine Properties dialog box should now show both the name of the control engine and the PAC Control strategy that will be used.



The PAC Display project is now configured to use your control engine for this Quick Start exercise. Skip the next section, ["Adding a Control Engine,"](#) and continue with the steps in ["Adding a Dynamic Attribute" on page 16](#).

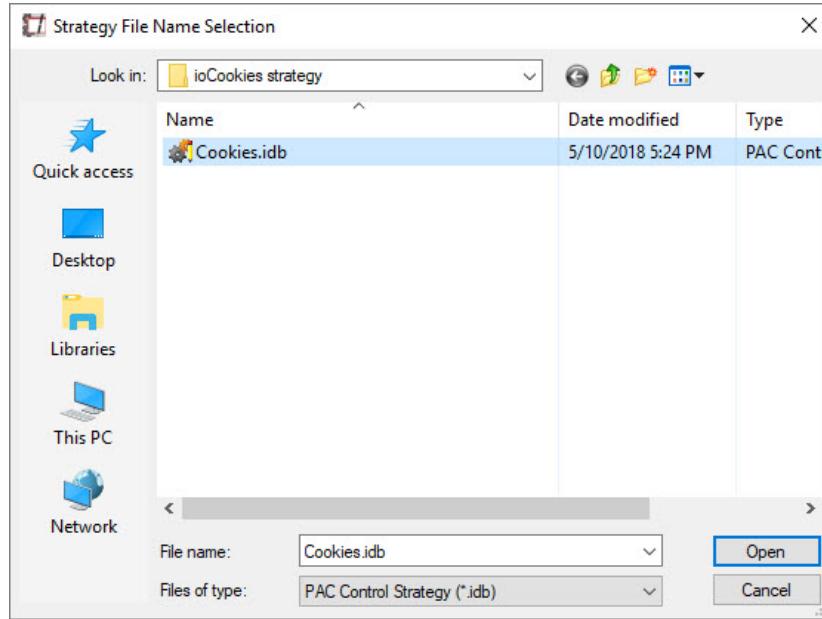
## Adding a Control Engine

1. Choose the Configure > Control Engine(s) menu item.  
The Control Engines dialog box appears.



2. Click the Add button.

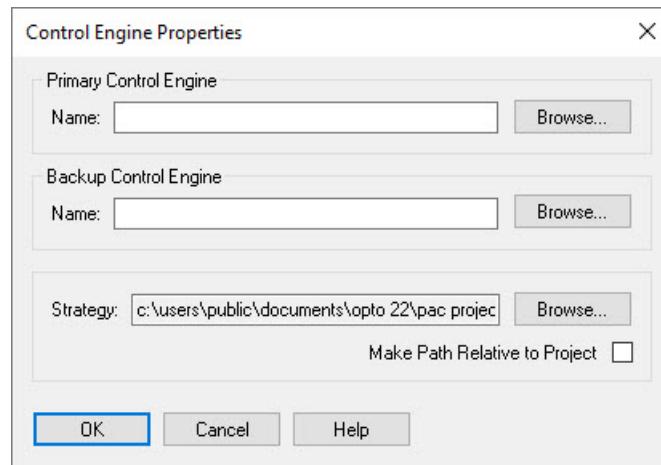
The Strategy File Name Selection dialog box appears. This dialog box is much like the Open Project dialog box we used to find our cookie factory project.



3. Change directories to Program C:\Users\Public\Documents\Opto 22\PAC Project\Display Basic Examples\Control\ioCookies strategy directory.
4. Select the Cookies.idb file, and then click Open.

The Control Engine Properties dialog box appears. Notice that the PAC Control strategy you just picked is shown in the Strategy field.

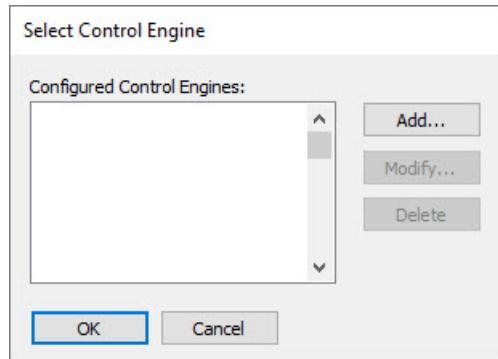
*NOTE: This dialog box is slightly different in PAC Display Professional, but the Strategy section and corresponding Browse button are the same.*



5. To define your control engine in the Primary Control Engine field, click the Browse button in the Primary Control Engine group.

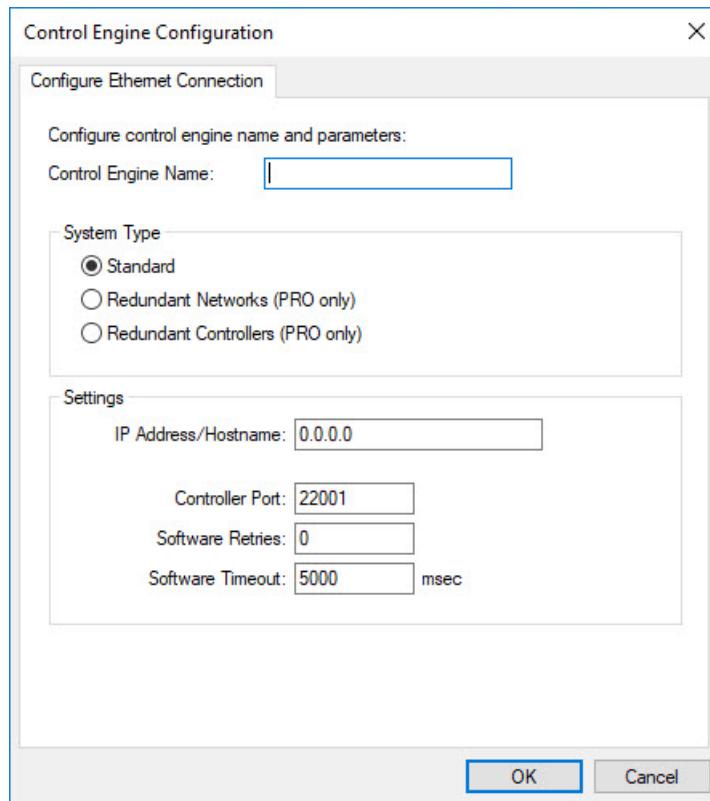
## CONFIGURING A CONTROL ENGINE

The Select Control Engine dialog box opens.



6. Click Add to add a control engine.

The Control Engine Configuration dialog box appears.



7. Enter Cookie Controller as the control engine name.

The name can contain letters, numbers, spaces, and most other characters except colons and square brackets. Spaces cannot be used as first or last characters.

8. Enter the control engine's IP address or hostname.

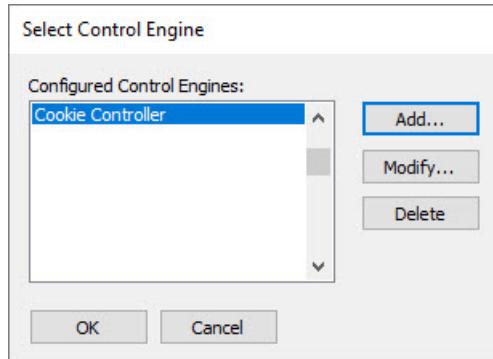
On hardware such as a SNAP PAC R-series controller, IP address assigned to the device is usually written on a sticker on the side of the unit. If an IP address has not been assigned to the control engine, see the user's guide for that device for configuration instructions.

On a Soft PAC controller, if PAC Control and SoftPAC are on the same PC, use the loopback IP address, 127.0.0.1. However, if SoftPAC is on a different PC, use the address for that PC's network interface card (NIC). In this case, the SoftPAC PC's NIC must be configured with a static IP address.

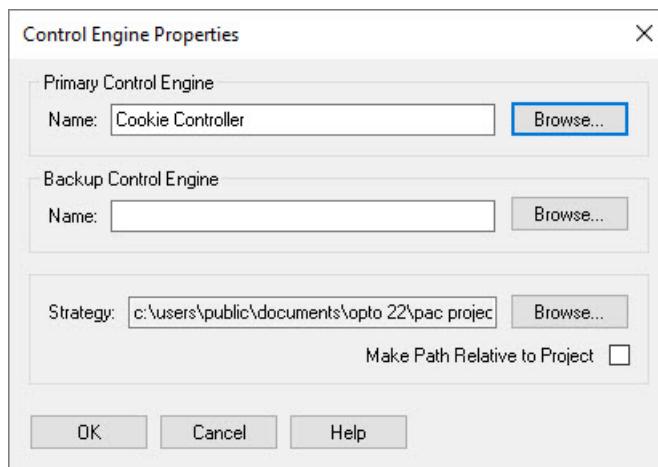
**Pro**

You can also configure a secondary IP address if your system has been designed to have link redundancy. If a SNAP PAC control engine is used, the second IP address can be the controller's second Ethernet interface.

9. Make sure that you have not changed the values in the Port, Retries, and Timeout, and then click OK. The newly configured control engine appears in the Select Control Engine dialog box.



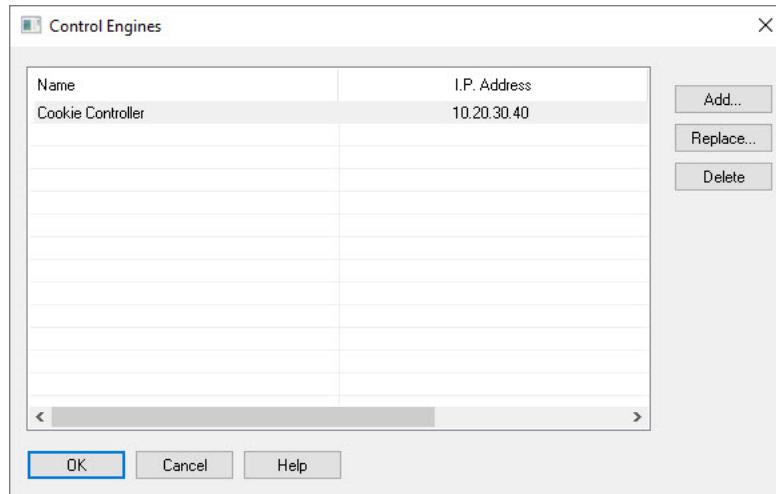
10. Click the new Cookie Controller control engine to select it, and then click OK. The Control Engine Properties dialog box appears with the new control engine listed in the Primary Control Engine group.



11. Click OK.

## ADDING A DYNAMIC ATTRIBUTE

The Control Engines dialog box appears with the new control engine Cookie Controller.



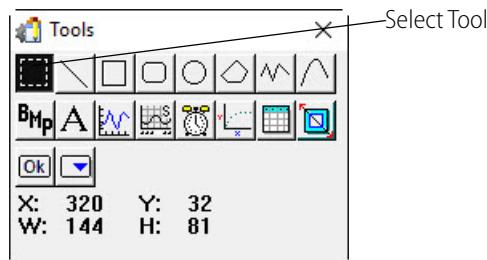
12. Click OK to finish configuring the control engine.

## ADDING A DYNAMIC ATTRIBUTE

Dynamic attributes allow you to manipulate graphic objects; for example, to animate them, to use them to read and write to the associated strategy, and to perform many other functions.

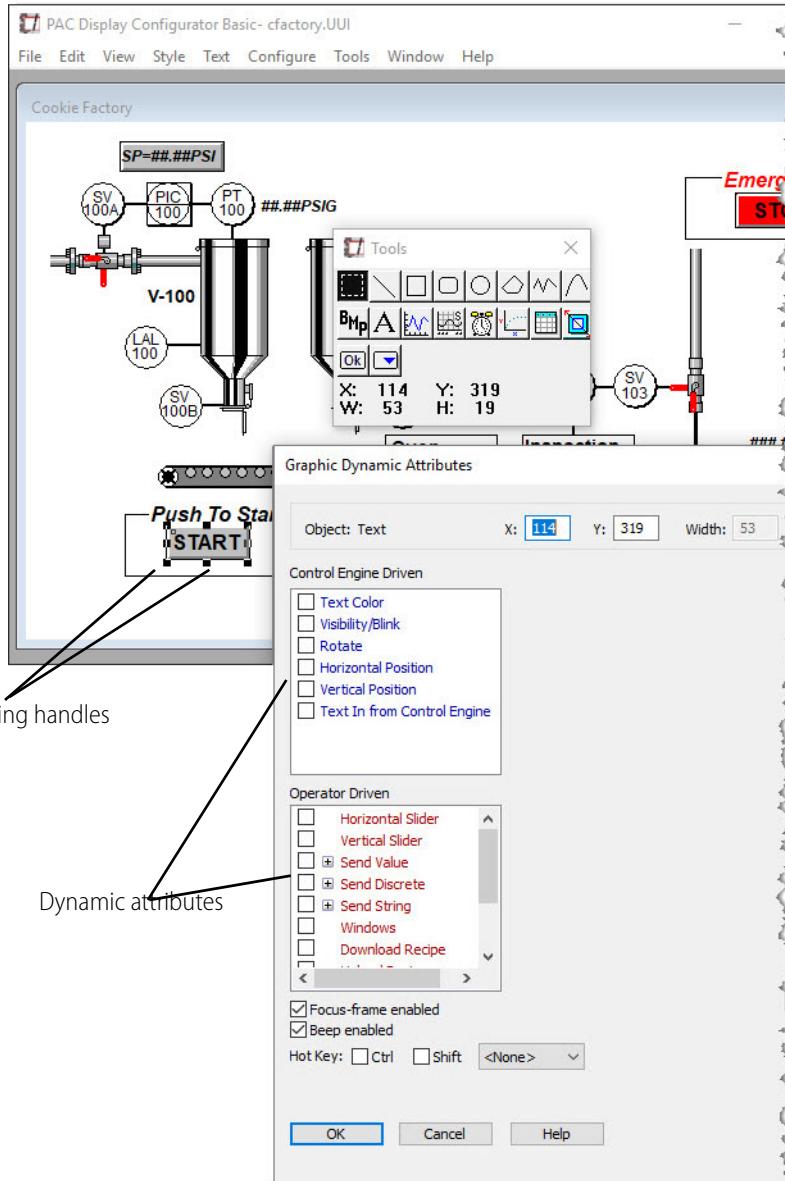
Let's assign a dynamic attribute to the button that starts the cookie factory display.

1. Click the Select tool in the PAC Display Configurator toolbox as shown below.



2. Double-click the Start button in the Cookie Factory window.

Small black boxes—called *sizing handles*—appear around the button. They indicate that the button is currently selected. The Graphic Dynamic Attributes dialog box also opens.



Notice that the dialog box has two separate groups of attributes: *Control Engine Driven* attributes and *Operator Driven* attributes.

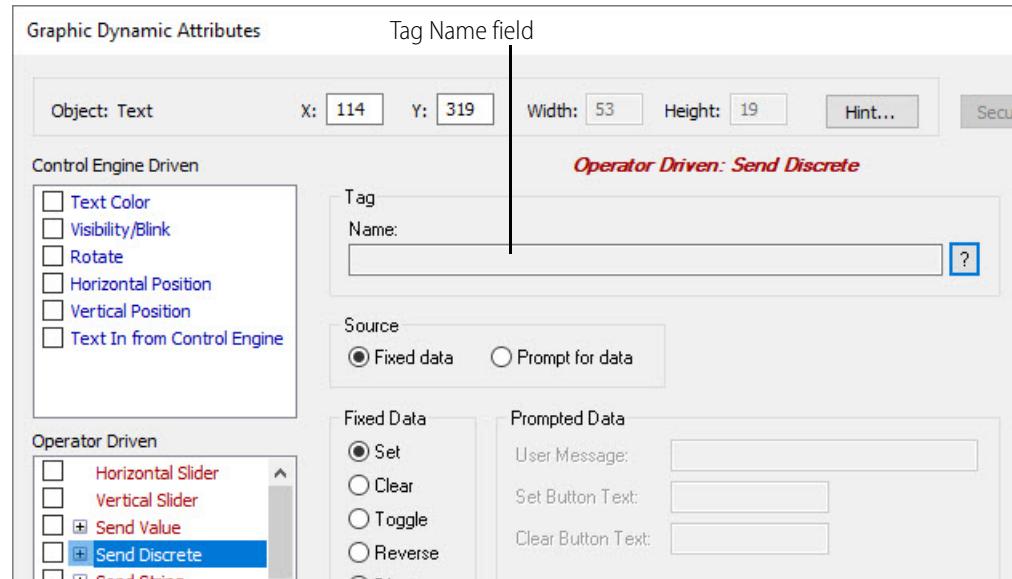
Control engine-driven attributes are attributes that are driven by tag values from the PAC Control strategy running in the controller. Operator-driven attributes are driven by an operator's interaction with a graphic object in PAC Display.

We're going to choose the operator-driven attribute *Send Discrete* to send a discrete value to the control engine. The PAC Control strategy interprets the value as a signal to start the cookie factory.

3. In the Operator Driven list, click *Send Discrete*. (Note: Click its name, not its check box.)

## ADDING A DYNAMIC ATTRIBUTE

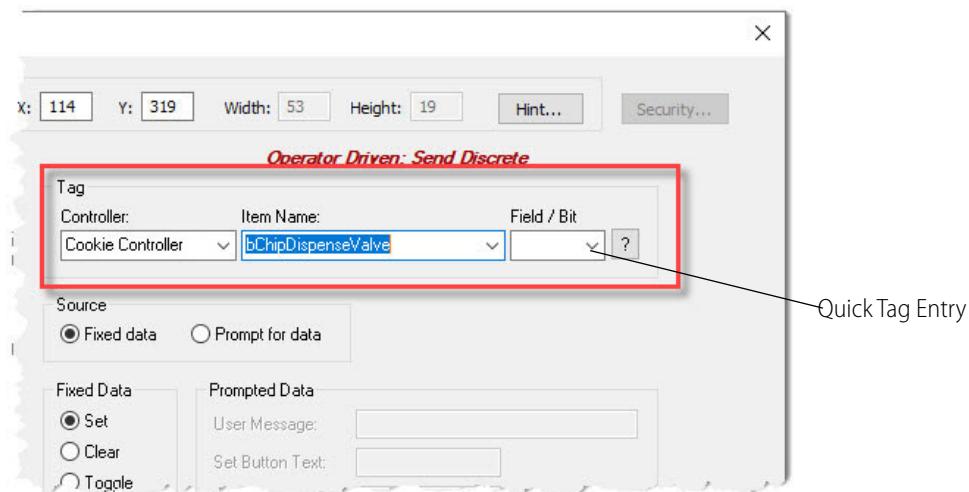
The features of the Send Discrete attribute are displayed.



4. There are two ways to configure a tag for a dynamic attribute:
  - The Tag Selection dialog box
  - Quick Tag Entry

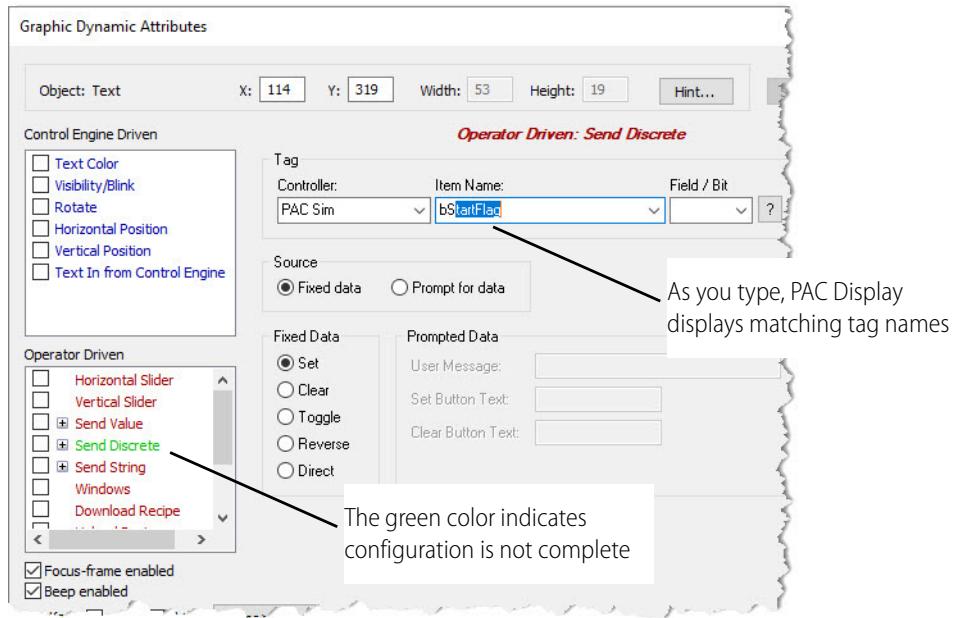
In this example, we'll use the Quick Tag Entry:

- a. Click anywhere in the Tag Name field.  
Quick Tag Entry appears.



- b. In the Item Name field, start typing: bStartFlag

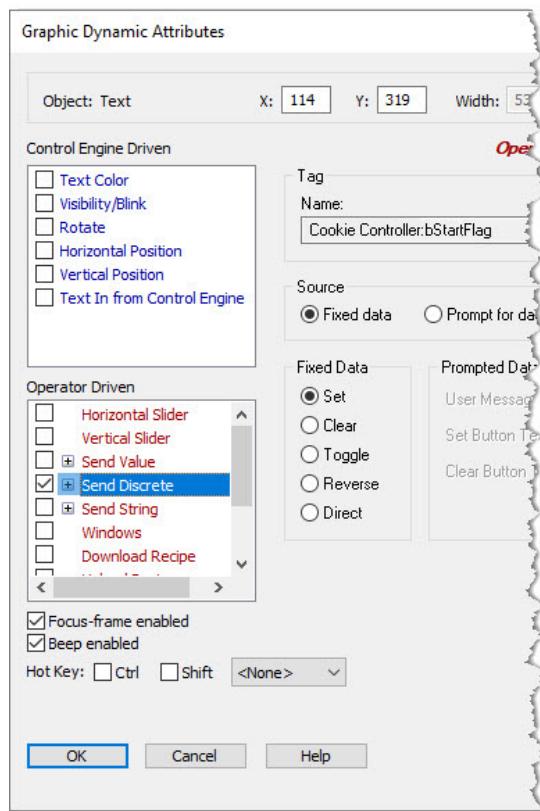
As you type, PAC Display filters the list of matching values, and the color of the attribute's name changes to green. This indicates that configuration is in progress and the *changes have not yet been saved*.



- c. When bStartFlag appears in the field, press Tab to advance to the Field / Bit field.
- d. In the Field / Bit , type: 1

## ADDING A GRAPHIC OBJECT

Then click the check box next to Send Discrete. If there are errors in your configuration, they are displayed for you to correct. If there are no errors, the green color disappears from the attribute's name.



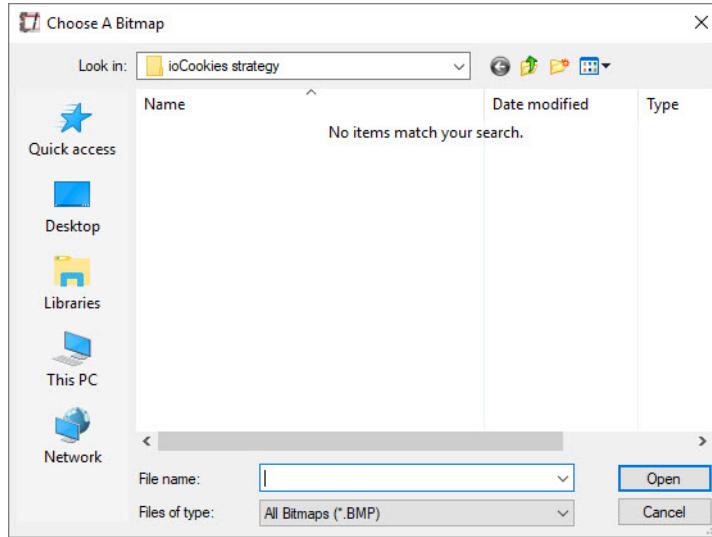
5. Click OK to complete adding the dynamic attribute and close the dialog box.

## ADDING A GRAPHIC OBJECT

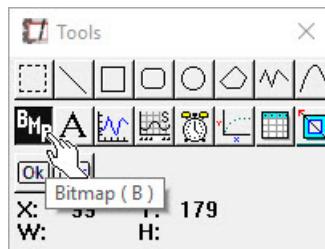
Now let's add a portion of cookie dough underneath the first tank. Rather than drawing our cookie dough, we're going to use a drawing of cookie dough saved as a bitmap graphics file (or bmp). This file is located in the Display directory.

1. Click File > Choose Bitmap.

The Choose a Bitmap dialog box appears.



2. Navigate to C:\Users\Public\Public Documents\Opto 22\PAC Project\Display Basic Examples\Display\ioCookies, and then double-click the Dough.bmp file.
3. Now choose the Bitmap tool in the PAC Display Configurator toolbox as shown below.



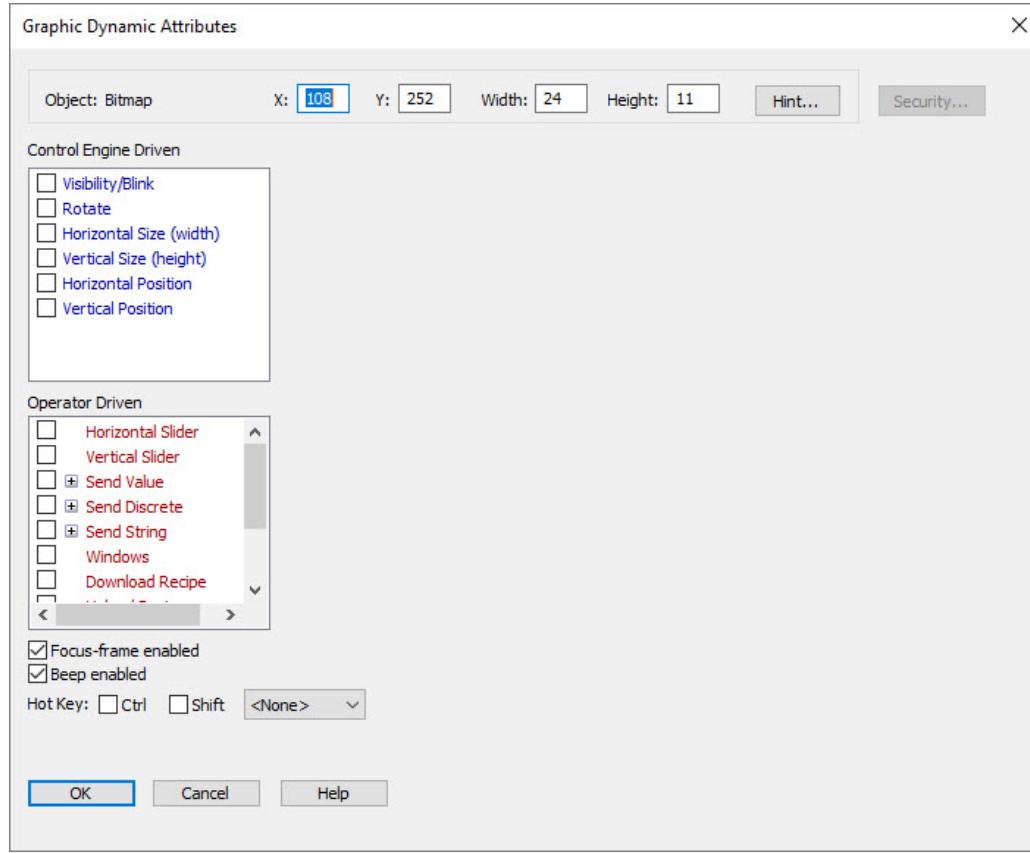
4. Click the cursor right above the conveyor belt and underneath the first vessel.  
If the graphic object is a little out of place, it can easily be moved to the correct position using the Select tool.
5. Choose the Select tool in the toolbox, and then click the bitmap graphic object to select it.  
Nine square sizing handles appear around the graphic object.
6. Put your cursor within the sizing handles, click your mouse, and drag the cookie dough to the correct position above the conveyor belt and underneath the first vessel.  
Besides visually placing the graphic object, you can also use the arrow keys on the keyboard or use the X: and Y: coordinates displayed in the toolbox to help you place the cookie dough. We suggest coordinate locations X:151 and Y:257, but your coordinates may differ.

Now let's give the bitmap graphic object some attributes to animate it. To make the cookie dough look like it's moving across the conveyor belt, we'll configure an attribute to affect its horizontal position.

7. Double-click the cookie dough bitmap graphic object.

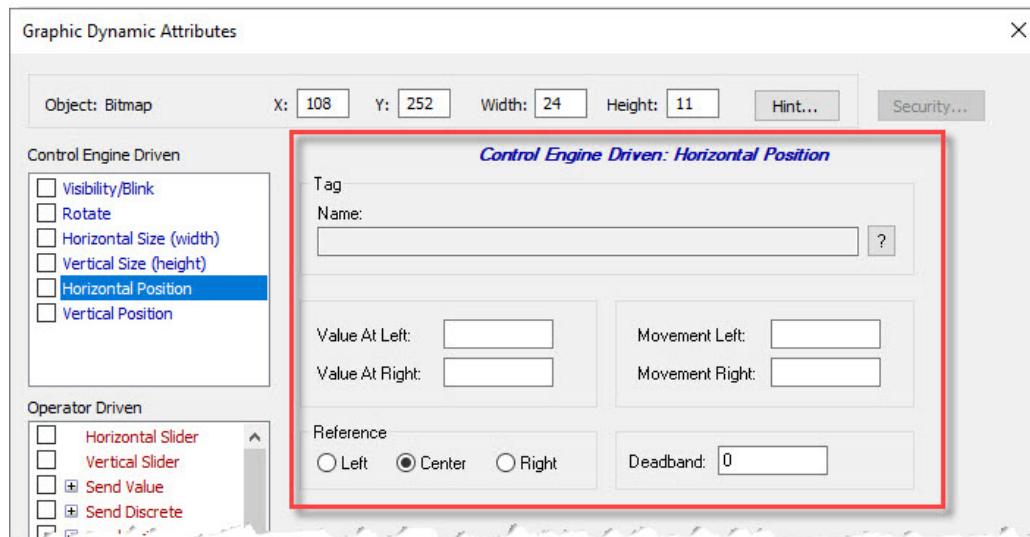
## ADDING A GRAPHIC OBJECT

The Graphic Dynamic Attributes dialog box opens.



8. In the Control Engine Driven list, click Horizontal Position (—its name, not its check box).

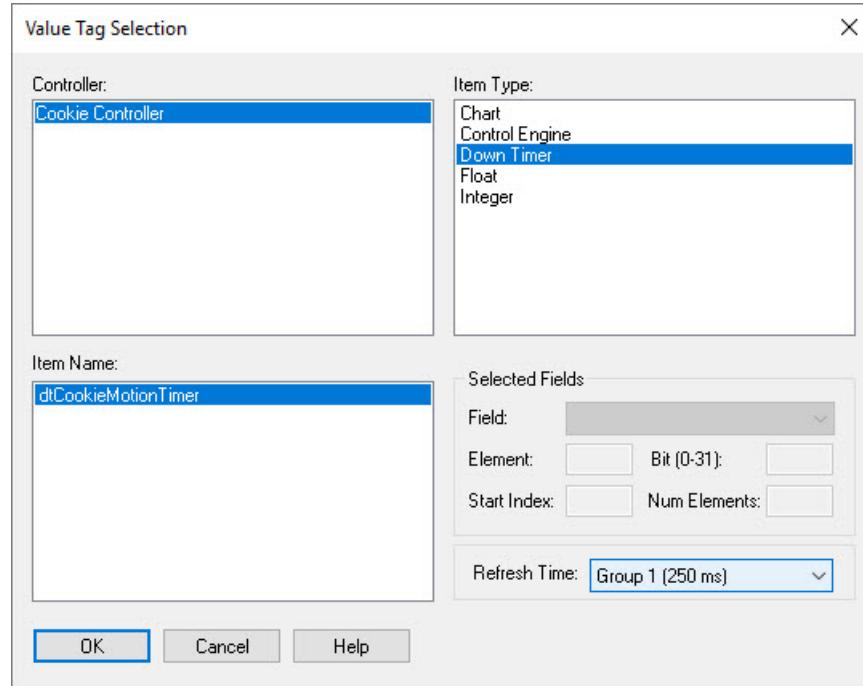
The Horizontal Position features are displayed in the center area of the dialog box.



9. We need to configure a tag to which we will connect the cookie dough bitmap graphic object. This time we'll connect it to a value PAC Display reads from the control engine.

We won't use Quick Tag entry because the Tag Selection dialog box has an additional field we want to use. Instead, click the Tag Selection button .

- a. In the Item Type field, select Down Timer.
- b. In the Item Name field, select dtCookieMotionTimer.
- c. In the Refresh Time drop-down list, select Group 1 (250 ms).



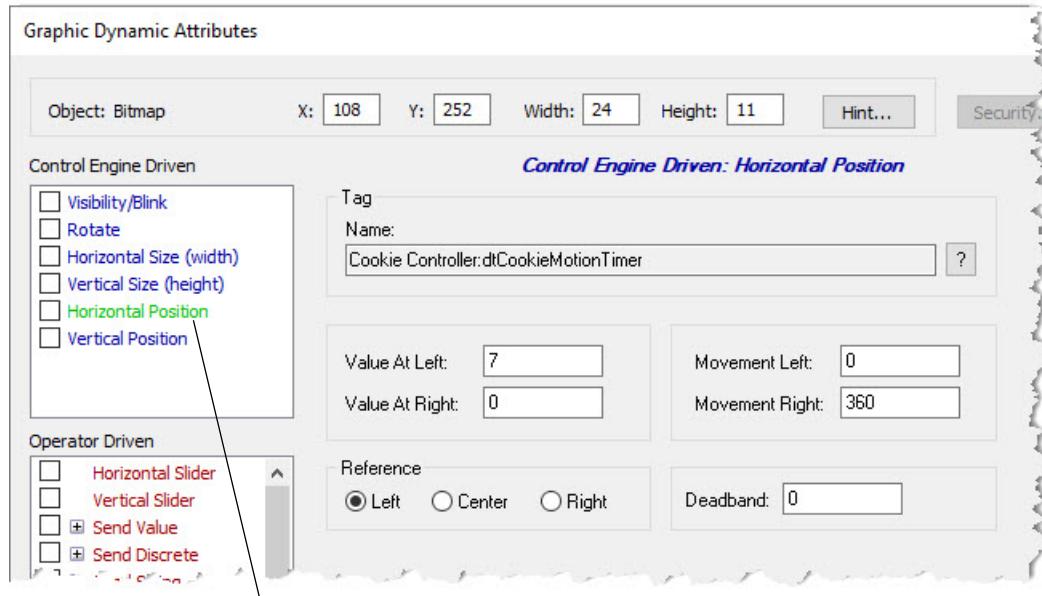
10. Click OK. The Graphic Dynamic Attributes dialog box is displayed again.

11. In the features area, enter these values:

- Value At Left: 7
- Value At Right: 0
- Movement Left: 0
- Movement Right: 360
- Reference: Left
- Deadband: 0

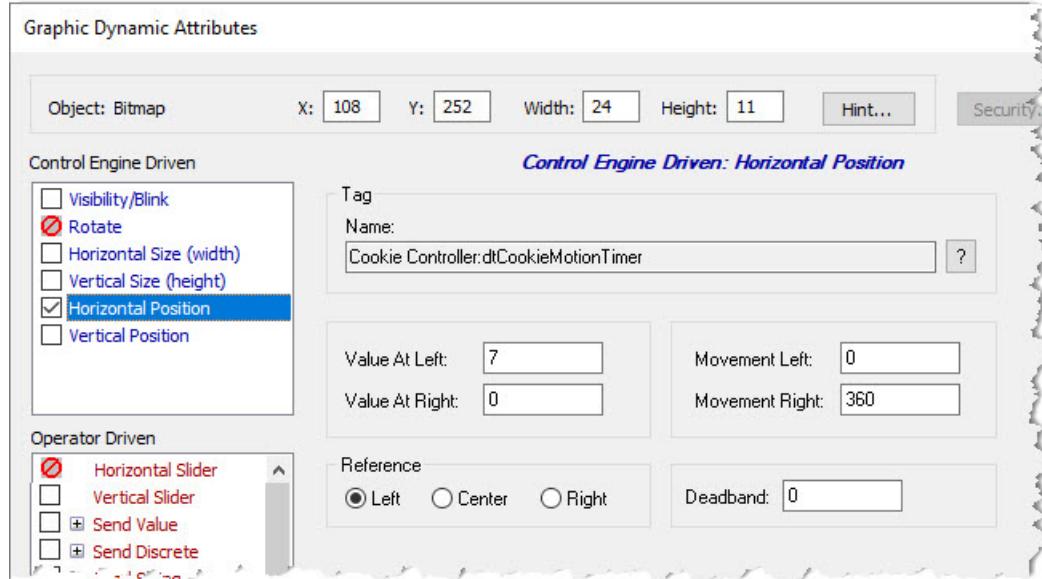
## ADDING A GRAPHIC OBJECT

The dialog box should look something like the example below.



The attribute's name is green because you haven't clicked its check box to save its settings.

12. Click the check box for Horizontal Position. Note that Not Available indicator appears next to Rotate and Horizontal Slider. That's because they aren't applicable when Horizontal Position is configured.



13. Later, we'll configure an attribute that will make the cookie dough appear to drop out of the first vessel. But for now, click OK to close the dialog box.
14. Save the project by selecting File > Save Project (or Ctrl+S).
15. Close PAC Display Configurator by clicking the Close button .

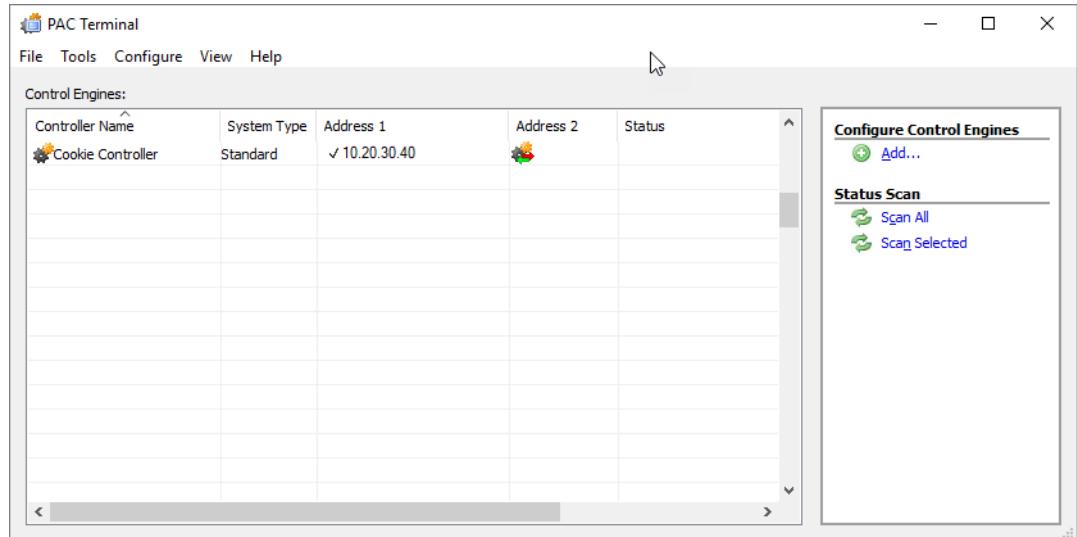
## DOWNLOADING TO THE CONTROL ENGINE

Let's try running our project and see if there's anything we need to change.

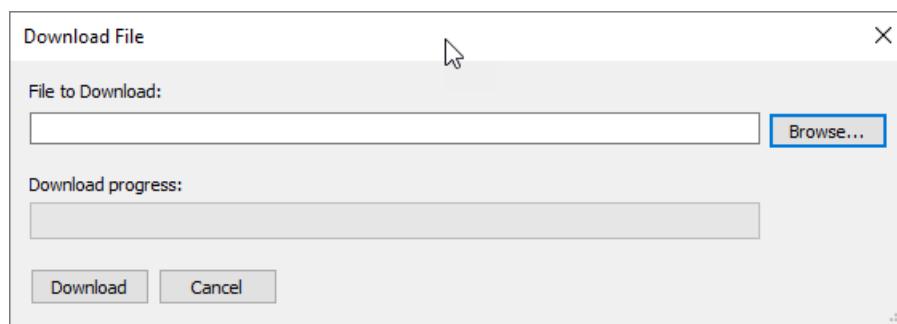
In order to see our animated display, we have to run the PAC Display Runtime program. But before we do that, we need to download our PAC Control strategy to the control engine.

*NOTE: PAC Control strategies are usually downloaded to a control engine for convenience using the PAC Control application. However, we'll download our PAC Control strategy using a PAC utility called PAC Terminal. To learn more about downloading strategies to a control engine, see the [PAC Control User's Guide](#) (form 1700).*

1. Start PAC Terminal.
    - In Windows, click the Windows Start button, and then click Opto 22 > PAC Terminal 10.5.
- The PAC Terminal window appears, displaying the name of our control engine.



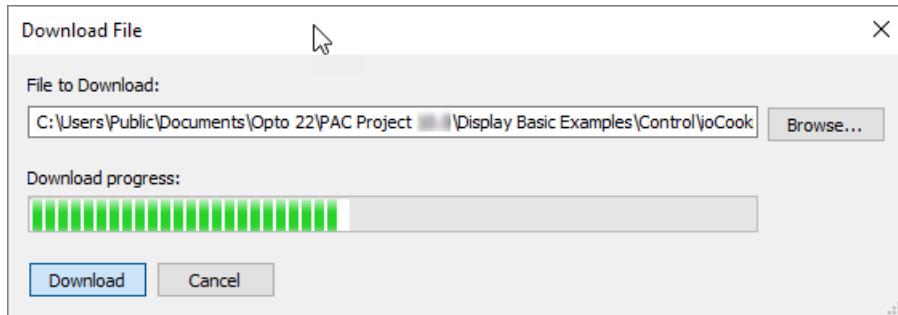
2. Select Cookie Controller, and then choose File > Download Control Engine Forth File to download the run file for our PAC Control strategy.
- The Download File dialog box opens.



3. Click Browse and change directories to C:\Users\Public\Public Documents\Opto 22\PAC Project\Display Basic Examples\Control\ioCookies strategy.
4. Select "Cookies.crn" and click Open.  
The file should be listed in the Download File dialog box.
5. Click OK to continue the download.

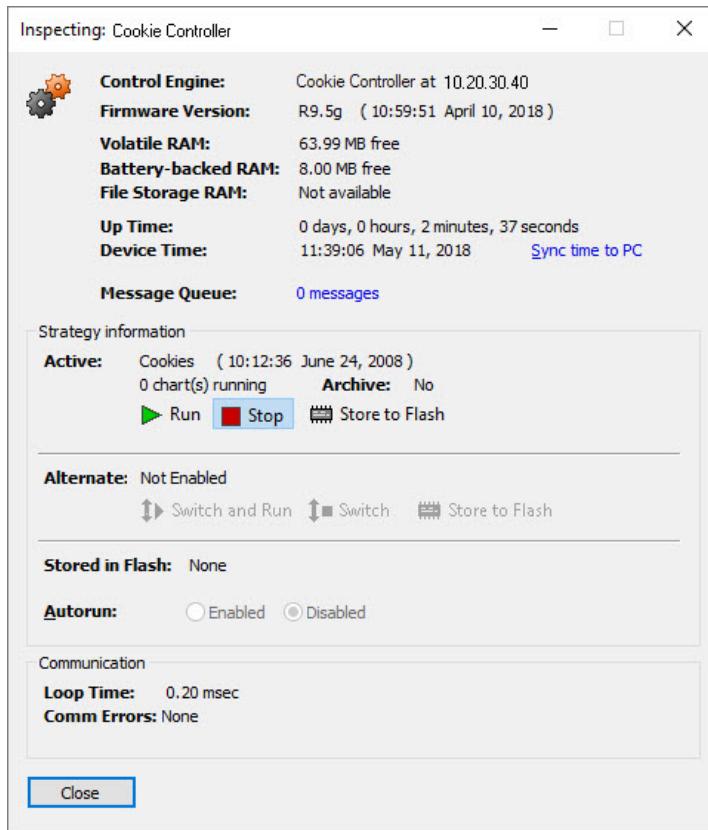
## DOWNLOADING TO THE CONTROL ENGINE

The download progress is shown.



After the strategy has downloaded to the control engine, we'll start the strategy running on the control engine. For convenience, we'll start the strategy using PAC Terminal's Inspecting dialog box. A more common method is to start the strategy while running PAC Control.

6. When the download is finished, double-click the control Engine, Cookie Controller.
- The Inspecting dialog box opens showing information about to the control engine.



In addition providing information about the control engine, this dialog box allows you to start or stop the active strategy.

7. Under Strategy information, click Run, and then click Yes on the confirmation dialog box.  
The strategy in our control engine is now running.
8. Close the Inspecting dialog box by clicking the Close.
9. Close PAC Terminal by clicking the Close button .

## RUNNING THE PROJECT

It's time to run the project and see what our display can do.

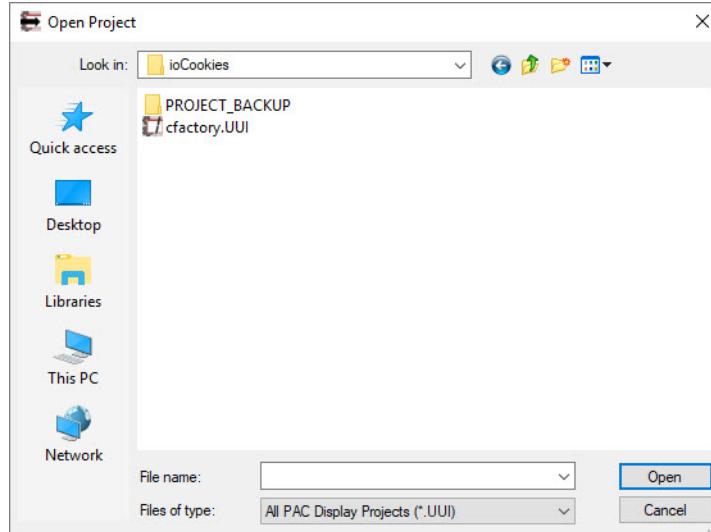
**1.** Start PAC Display Runtime:

- In Windows, press the Windows Start key , type **PAC Display Basic Runtime 10.5** and then press the Enter key.

The main window for PAC Display Runtime appears. The window is empty since we haven't loaded our project yet.

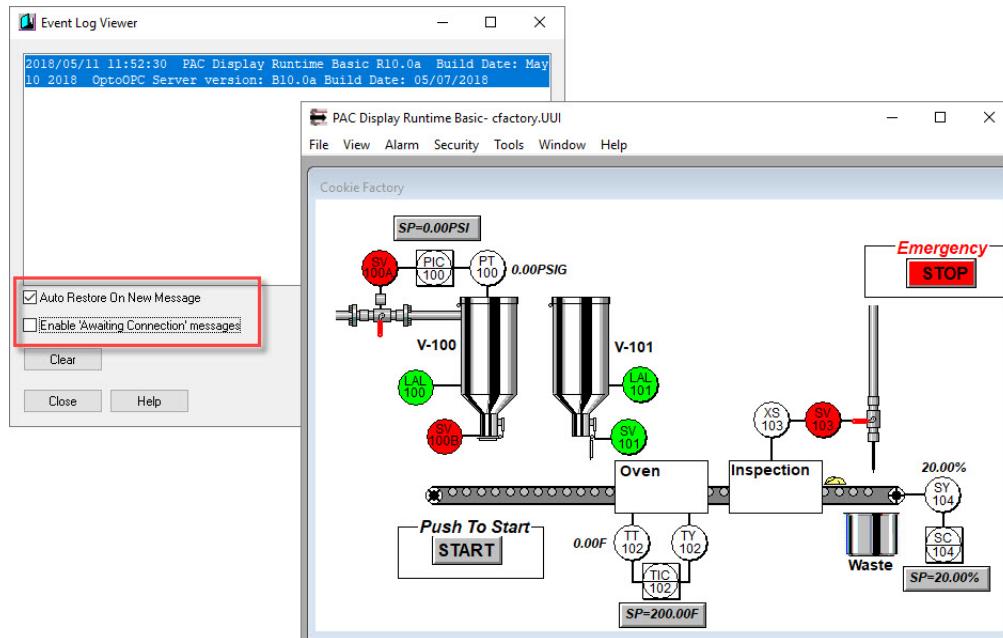
*NOTE: You can also start Runtime from within the Configurator. See "Using Runtime" on page 320.*

- 2.** In the Runtime window, choose File > Open Project, and then navigate to the C:\Users\Public\Public Documents\Opto 22\PAC Project\Display Basic Examples\Display\ioCookies directory.



- 3.** Double-click the cfactory.uui project.

PAC Display Runtime appears, displaying the project, and the Event Log Viewer window appears, displaying messages about the PAC Display Runtime session. You might see a message showing that the control engine is connecting to PAC Display's scanner.



At the bottom of the window, you'll see the Auto Restore on New Message option selected. This means anytime PAC Display Runtime issues a message (that is, an error or status message), the Event Log Viewer will become the active, or topmost, window on the Windows desktop. You'll also see the Enable "Awaiting Connection" Messages option, which lets you choose whether to display some startup messages.

4. Click the Close button to close the Event Log Viewer window.
5. Start the cookie factory by clicking the on-screen Start button.  
Watch the cookie dough drop out of the first tank and move down the conveyor. Notice that the cookie dough appears to move outside of the oven and inspection stations.
6. Close PAC Display Runtime by clicking the Close button .

### Fine-Tuning the Visuals

Remember how the cookie dough looked traveling in front of the oven and inspection stations? We'll quickly fix that by making the cookie dough bitmap graphic object the rearmost object on the screen. This way, when it travels by the stations, it will appear to go through them.

1. Start PAC Display Configurator.  
The Cookie Factory project should open automatically. If it doesn't, open the project file using the File menu.
2. With the Select tool, click the portion of dough on the conveyor belt.
3. Right-click the mouse, and from the pop-up menu that appears choose Z-Order > Send to Back.  
The graphic object will now appear to travel through the oven and inspection stations, not in front of them.
4. To save the project and start PAC Display Runtime to see the display working properly, click File > Save Project and Load Runtime.

There are a few more things you can explore on your own. Notice that when you pass your cursor over the setpoint boxes (SP), a black outline appears. Click one of the boxes and an attribute dialog box appears. You can go back to the Configurator and see how this attribute was set up. You might also want to look at the tank flap attributes.

## WHAT'S NEXT?

After stepping through this chapter, you should have a handle on how simple it is to use PAC Display. By taking the time up front to step through our short demo, you're now ready to explore the many possibilities available.

Proceed to "[Chapter 3: What Is PAC Display?](#)," to learn more about planning and designing an operator interface. You'll also find out more about the windows and menus that make up PAC Display Configurator and PAC Display Runtime.

At some point you may also want to take a look at the sample projects in the "Examples" folder under C:\Users\Public\Public Documents\Opto 22\PAC Project. You'll get ideas for how to use different PAC Display on-screen objects and learn about various graphic objects you can use within your own PAC Display projects.

WHAT'S NEXT?

# 3: What Is PAC Display?

## INTRODUCTION

This chapter provides a general overview of using PAC Display, including information on what it's used for, project structure and design, and general terms you'll encounter.

PAC Display is a software package used to create human-machine interfaces (HMIs), or operator interfaces, for monitoring control systems. You can use PAC Display to create an HMI that will monitor a PAC Control strategy running on an Opto 22 control engine, providing real-time and historical information to the operator about the performance of different parts of a control system.

PAC Display works with PAC Control, a flowchart-based control language for writing control applications. For more information on using PAC Control to create strategies, the *PAC Control User's Guide* (form 1700).

### In This Chapter

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PAC Display Terminology.....	page 32
Planning a Project.....	page 32
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## CONFIGURATOR AND RUNTIME APPLICATIONS

Two primary software applications make up PAC Display: PAC Display Configurator and PAC Display Runtime.

**PAC Display Configurator** Use PAC Display Configurator to define and configure the draw windows, graphic objects, dynamic attributes, logs, alarms, and sounds that make up your project, and then to connect these objects to the variables, I/O points, PID loops, and other items defined in your PAC Control strategy. The project also defines how the graphic objects' attributes change as this data changes.

**PAC Display Runtime** Use PAC Display Runtime to run the project created in PAC Display Configurator. PAC Display Runtime communicates with the control engine running the PAC Control strategy, and animates the operator interface by changing the attributes (for example, color, size, and position) of on-screen graphic objects based on how the values or states of linked items in the PAC Control strategy change. If controls such as buttons and sliders are part of the PAC Display project, the operator can use on-screen controls to change values that appear. This is how PAC Display is used to control processes as well as monitor them.

PAC Display also includes a separate "monitor-only" version of the PAC Display Runtime application. This version of PAC Display Runtime is functionally identical to the regular Runtime application, except that it cannot be used to send values to a control engine. This can be useful for industrial projects where no operator intervention is required.

The **Event Log Viewer**, which is part of PAC Display Runtime, starts automatically when PAC Display Runtime is started. The Event Log Viewer displays a window that posts messages about PAC Display communication activity. Typically, it pops up above all other windows when a message is posted, but this feature can be disabled.

## PAC DISPLAY TERMINOLOGY

**Project** A collection of draw windows, data logs, sounds, recipes, graphic objects, and all their attributes that has been developed with the PAC Display Configurator. When the project is saved, several files are created.

- The *main project file*, which has a .uui extension.
- *Draw window files* are created automatically for each draw window used to display graphic objects in a project. These files have sequentially numbered file extensions starting with an uppercase .W (for example, .W0001, .W0002, and so on). There is a limit of 5,000 draw windows per project.

These project files, together with PAC Display Runtime, present an animated graphic objects interface for a control system. See [Appendix , "C: PAC Display Files,"](#) for a complete list of the files that make up a PAC Display project.

**Windows** PAC Display projects have one or more draw windows inside the PAC Display main window. A *draw window* is essentially a blank page on which you place, draw, or edit graphic objects and other elements that will make up your operator interface. A draw window has static attributes of position, size, and color. It also has visual states of open, closed, or iconified. Your project design determines the number of draw windows and their contents.

A *main window* is the area of the display where you can view your application. Following the conventions used in most Microsoft Windows applications, a *main window* contains a menu bar that allows you to select various command options, and a title bar that displays the full project path.

**Objects** Objects include draw windows, graphic objects, alarm triggers, and trends (or graphs). There are two types of objects: *static* and *dynamic*. Static objects do not change while PAC Display Runtime is running. Dynamic objects change appearance, or cause the appearance of other PAC Display objects to change while the project is running.

**Tags** A *tag* refers to data items, such as variables, I/O points, or PID loops, from a PAC Control strategy. To access tags in a project, select the PAC Control strategies for the project. All tags in the selected strategies are then available to PAC Display. Tags are used to animate your operator interface through connections to graphic objects and their dynamic attributes. As the values of tags change through control engine- or operator-driven attributes, the appearance of the graphic objects change. Tags are also used as triggers to initiate system events such as sounds, data logging, and window configurations.

**Connections** A connection is made in PAC Display when a PAC Control tag is selected as either the source that will change a graphic object, or as the tag destination for any data changes entered by the operator.

## PLANNING A PROJECT

A PAC Display project is made up of a collection of windows and other elements you create and configure in PAC Display Configurator. You add graphic objects to the windows to create an operator interface, and then connect to I/O data and variables in the tag name database of the associated PAC Control strategy (the control program running on an Opto 22 control engine).

Once the windows, associated PAC Control strategy and Opto 22 control engine, and other attributes of the PAC Display project have been set up using PAC Display Configurator, you can run the project in PAC Display Runtime. When PAC Display Runtime is started, the project communicates with one or more control engines. As the strategy runs on the control engine, values and states of tag names in the PAC Control strategy database are continuously updated. This changing data in turn modifies the attributes (such as size and position) of the graphic objects that are connected to the tag names. The end result is an animated, continually updated display that shows the status of a control process.

## Project Design

The usefulness of your PAC Display project ultimately depends on how effective the display, or operator interface, is. To create an effective operator interface, you may want to consider these tips when you're designing your project:

- Know your control process, including both the theoretical operation of the process and the "hands-on" tasks required of the operator.
- Identify the information the end user of your project, the operator, needs to know at different points in time. Use this information to determine what will appear on the display.
- Consider the following ways to use and organize windows in a display:
  - A *single window* can display an overall picture of the control process, and is helpful in quickly assessing the general state of all operations.
  - *Individual windows* can display a closer look at the operations associated with different stations. The individual windows can contain detailed information and provide controls that would be difficult to present in a single window.
- Identify the parts of the operator interface where you may want to restrict access or change what appears on the window if the operator has a different level of authority over the control process.

## Project and Operator Interface Security

PAC Display supports several important security features, including operator authentication, encrypted logging of operator actions, and password protection for project files. You can configure your PAC Display project to:

- Allow or deny operator access to individual graphic objects, based on configured, authorized users and groups. (See "[Security Settings for Graphic Objects and Dynamic Attributes](#)" on page 176.)
- Allow operator access to the HMI, as well as log all HMI use and operator actions to an encrypted archive. (See "[Runtime Setup: Security Tab](#)" on page 297.)
- Assign a password to the PAC Display project to prevent unauthorized users from opening it in PAC Display Configurator. (See "[Protecting a Project with a Password](#)" on page 46.)
- Assign a password to individual windows in a PAC Display project to prevent unauthorized users from opening them. (See "[Modifying Draw or URL Windows](#)" on page 94.)
- View a list of the users currently logged in to PAC Display Runtime. (See "[Viewing Logged-In Users in Runtime](#)" on page 325.)

In order to design an effective security strategy for your project, review the guidance in XXXX, which introduces you to the user and group entities, at what phase in your development and level of UI you add security, and gives examples of situations.

## Window Design

When you create a new project, a project window and one or more draw windows will be available in the PAC Display main window. After deciding which windows you will use for your project, consider the design of individual windows and how they interact with other windows. This is where the organization of your

windows comes into play. For example, you could have the operator use the Runtime menu commands to view different windows, or you could design buttons to let an operator jump directly to related windows.

Keep in mind that the visual state of a window can affect the performance of PAC Display and the control engine. As more windows are opened or iconified, PAC Display will gradually start to update graphic objects more slowly. Window states (described below) also affect how the PAC Display Runtime software application scans the control engine and updates graphic objects.

- An *open* window causes Runtime to update graphic objects with data from the built-in scanner.
- An *iconified* window causes Runtime to continue requesting data from the scanner, but graphic objects in the iconified window are not updated.
- A *closed* window removes the associated tags from the scanner.
- *SuperTrends* within a window can be configured to have Runtime request data from the scanner or not.

Other choices you will have to make are whether a window should be pop-up or full-screen, whether a window's visual state is affected by another window, and whether a window should have scroll bars. (This last option is particularly useful when a project is displayed on monitors of different sizes; enabling scroll bars allows you and the operator to bring into view information that extends beyond the borders of a window.)

These and other aspects of configuring windows are covered in "[Chapter 6: Working with Graphic Objects](#)" on page 91 and "[Chapter 10: Configuring and Using PAC Display Runtime](#)" on page 289.

### Using Multiple Monitors

If your operator interface will run on a version of Microsoft Windows that supports multiple monitors connected to one computer, an additional project planning decision is whether to design your PAC Display project to use more than one monitor. The additional display space gained from using multiple monitors offers advantages such as being able to keep numerous windows open permanently. However, you should consider the additional hardware cost and extra desktop space a multiple monitor setup requires.

An important factor to also consider is that each window in a PAC Display project requires computer memory (RAM). If you plan to display several windows on multiple monitors, the computer running the PAC Display project may need to have additional memory installed.

Hardware and software requirements for using multiple monitors are described in "[System Requirements](#)" on page 4.

### Resetting Dialog Box Positions

If multiple monitors are used to develop a project and then the project is re-opened using just one monitor, a dialog box might open out of view off the edge of the screen. If you can't find a dialog box that you think should be open, select View > Reset Dialog Positions. This resets the following dialog boxes to appear in the middle of the active display window: Alarm Points, Application Managers, Control Engines, Historical Logs, Event Log Viewer, Sounds, Window Managers, and the Toolbox.

## CONFIGURATOR AND RUNTIME ENVIRONMENTS

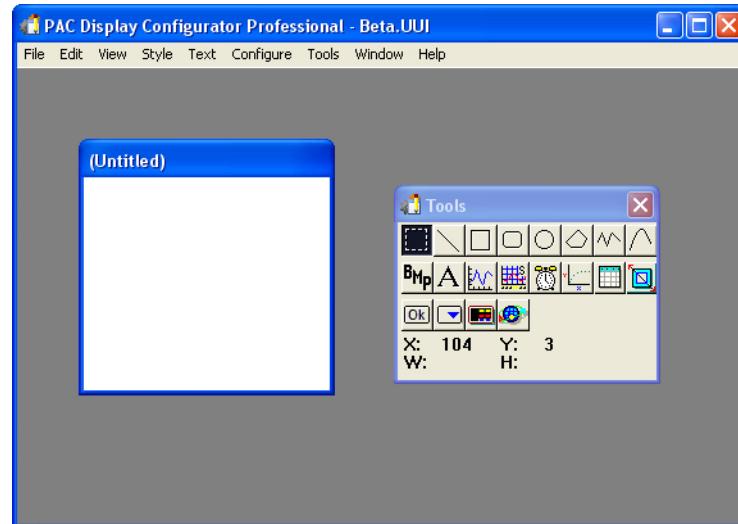
As mentioned previously, PAC Display is composed of two software applications, Configurator and Runtime. This means there are two environments in which you will use PAC Display. In learning about the windows that make up PAC Display, we will first discuss the main components of the Configurator environment, and then explore the Runtime environment.

PAC Display uses standard Microsoft Windows conventions, so as you use Configurator and Runtime, you'll recognize familiar window elements such as title bars and the menu bar, as well as controls such as the Minimize, Maximize, and Close buttons.

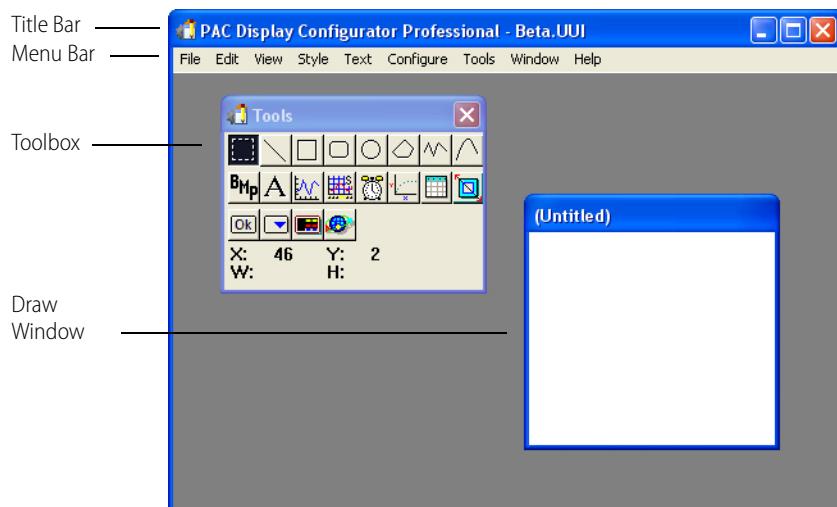
*NOTE: If you need more information on working with Microsoft Windows, refer to the documentation from Microsoft and your computer manufacturer.*

## Configurator Main Window

When you first start PAC Display Configurator and create a new project and select a control engine, your screen should look similar to this:



The Configurator main window consists of a title bar and a menu bar, along with other standard Windows elements, and contains the toolbox and one or more draw windows.



### Hiding the Menu Bar

If you need additional space to position draw windows, you can hide the menu bar to use the space it occupies. If you do this, note that you won't be able to access commands on the menu bar.

To hide the menu bar, do one of the following:

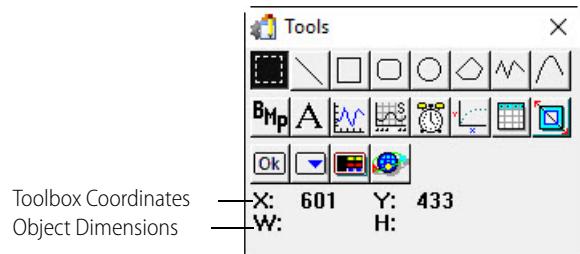
- Select View > Hide Menu Bar
- Press Esc on the keyboard.

To view the menu bar again, press Esc on the keyboard.

## Configurator Toolbox

The toolbox contains a set of graphical icons that represent tools you can use in the Configurator. Click any tool to select it, and then use it in the draw window. Also, below the graphical icons, the toolbox displays coordinates and object dimensions to aid you in your drawing tasks.

For descriptions of the tools and how to use shortcut keys, see "[Using the Graphic Tools and Shortcut Keys](#)" on [page 101](#). For more details about any tools available in the toolbox, see "[6: Working with Graphic Objects](#)" on [page 91](#).



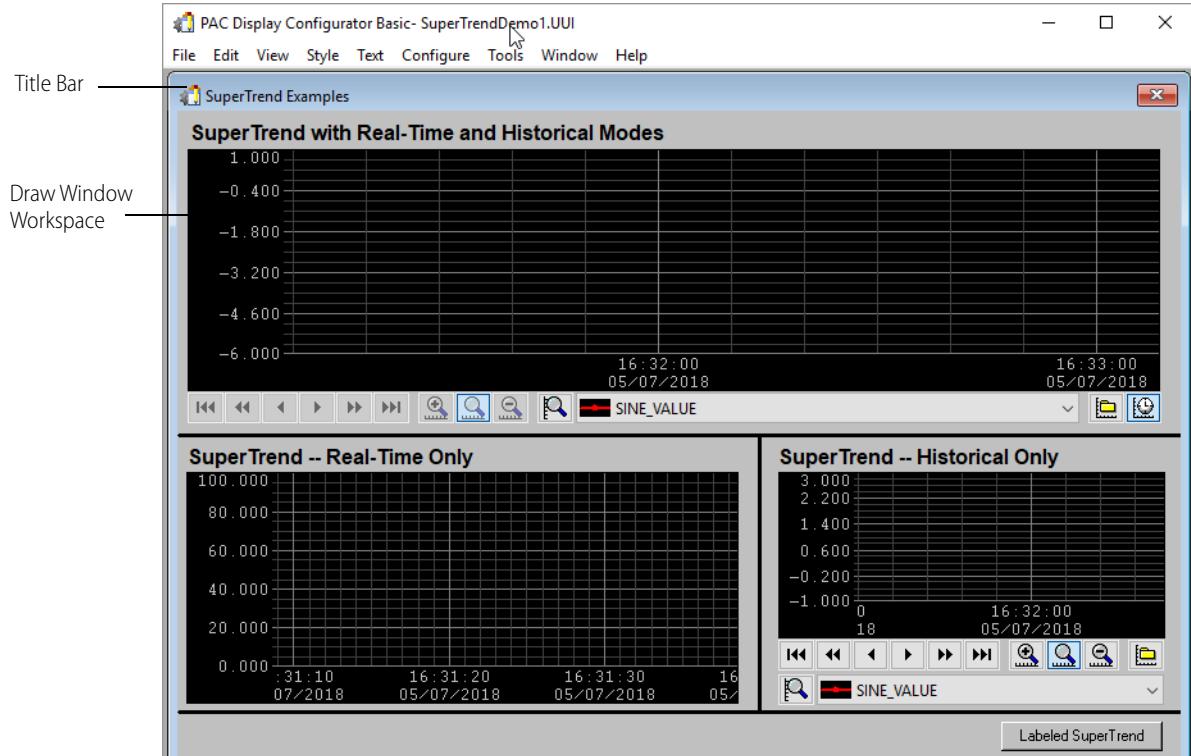
If you want to use the space the toolbox occupies, you can hide the toolbox by selecting View > Hide Toolbox. To open the toolbox again, select View > Show Toolbox.

### Toolbox Coordinates and Object Dimensions

Just underneath the tools, you can see the toolbox coordinates and object dimensions. The coordinates show the cursor's position (in pixels) when it is over a draw window. The X: and Y: coordinates are read with the axis zero-points at the top-left corner of the draw window. If you create an object, the object's dimensions (width and height) are shown next to W: and H:, respectively.

## Configurator Draw Windows

Configurator draw windows are where all graphic objects for your PAC Display project are drawn and edited. They contain the graphic objects and other elements you work with to create your display.

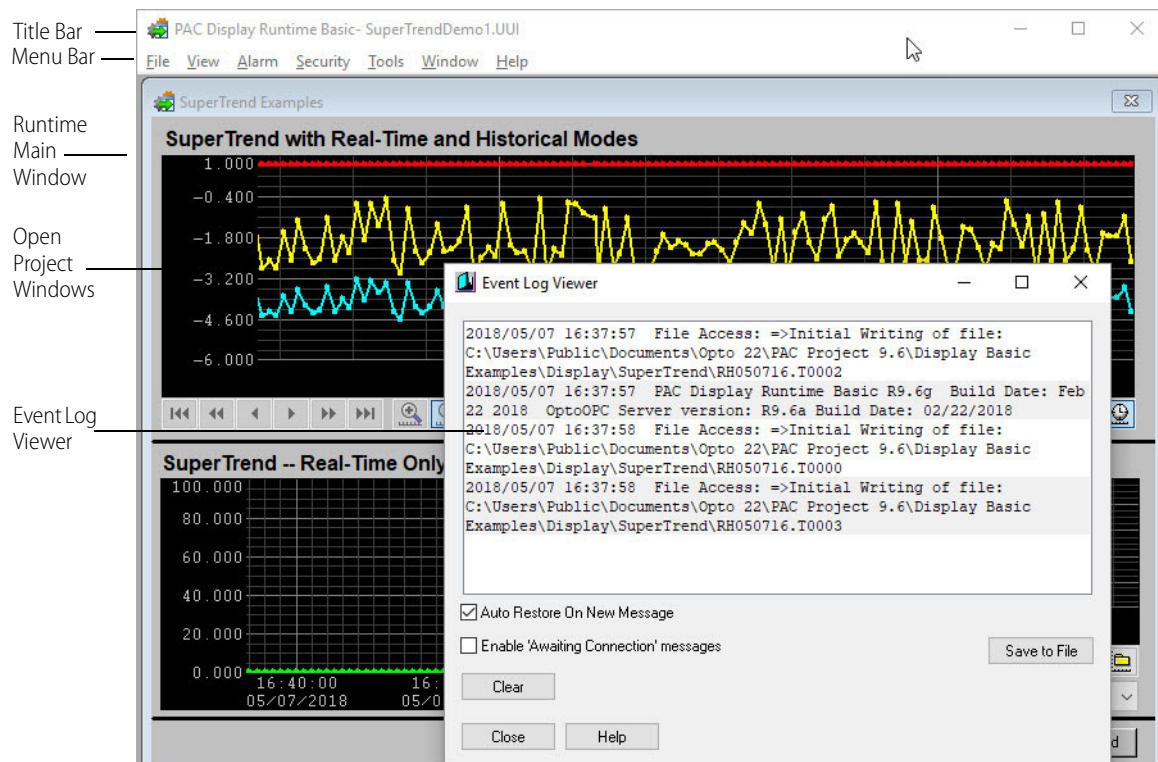


### Redrawing an Active Draw Window

You can redraw an active draw window in PAC Display Configurator by selecting View > Redraw. Incomplete graphic objects (such as an incomplete polygon) in the draw window are removed when you select this command.

### Runtime Main Window

When you start PAC Display Runtime, what appears on screen should look similar to this:



The Runtime main window consists of a title bar, a menu bar, other standard Windows elements, project windows, and the Event Log Viewer. Much like a frame, Runtime's main window contains all the elements and actions that occur during Runtime use.

If you need additional space to position project windows and other windows in Runtime, you can hide the menu bar to use the space it occupies. If you do this, note that you won't be able to access commands on the menu bar.

#### Changing How the Main Window Appears in Runtime

You can configure the main window so that it appears without a title bar or menu bar, and also change several other settings. See ["Chapter 10: Configuring and Using PAC Display Runtime" on page 289](#) to learn how to configure elements of the main window.

#### Hiding the Menu Bar

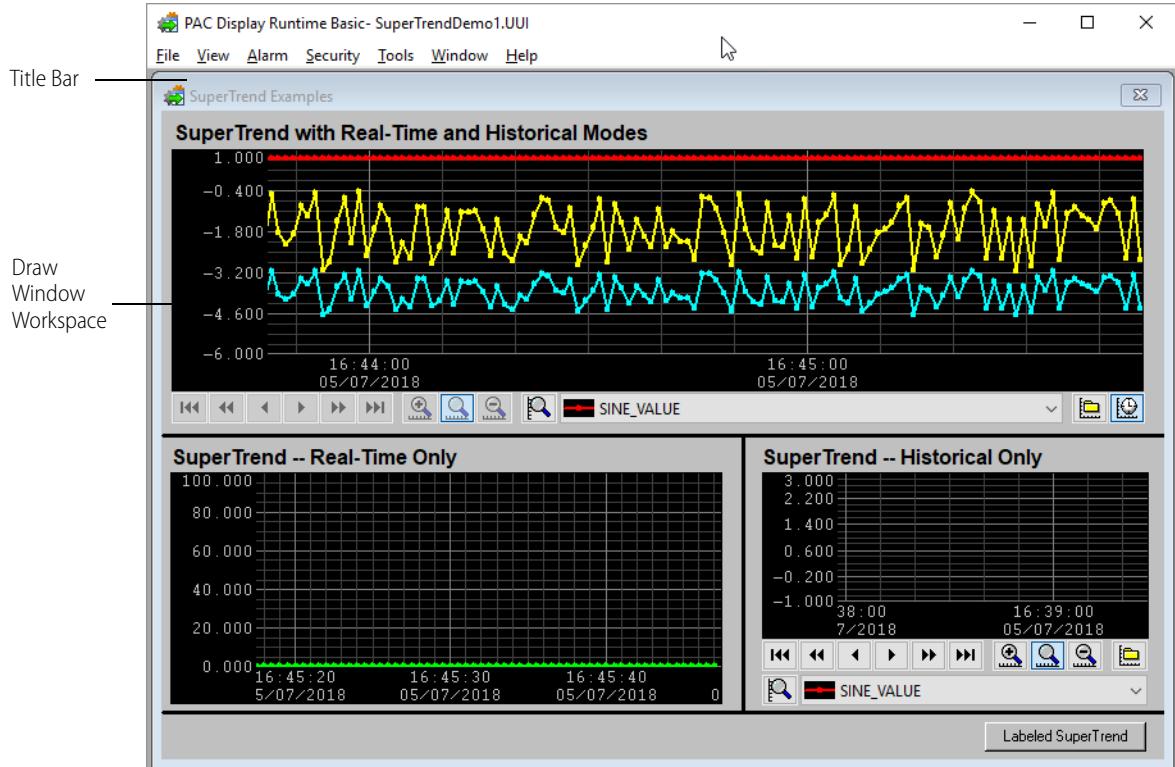
While working with a PAC Display project in Runtime, you can gain additional space on your screen by hiding the menu bar. To hide the menu bar, do one of the following:

- Select View > Hide Menu Bar.
- Press Esc on the keyboard.

To view the menu bar again, Press Esc on the keyboard.

#### Runtime Project Windows

After you've opened a project in Runtime, you see the project windows.



Project windows are the Configurator draw windows that you created for the project. Notice that when you launch your project in Runtime, these windows are the same size and in the same relative position as when you closed the Configurator project. (Depending on certain configuration options, the relative positions of the windows may differ slightly from those in the Configurator project.)

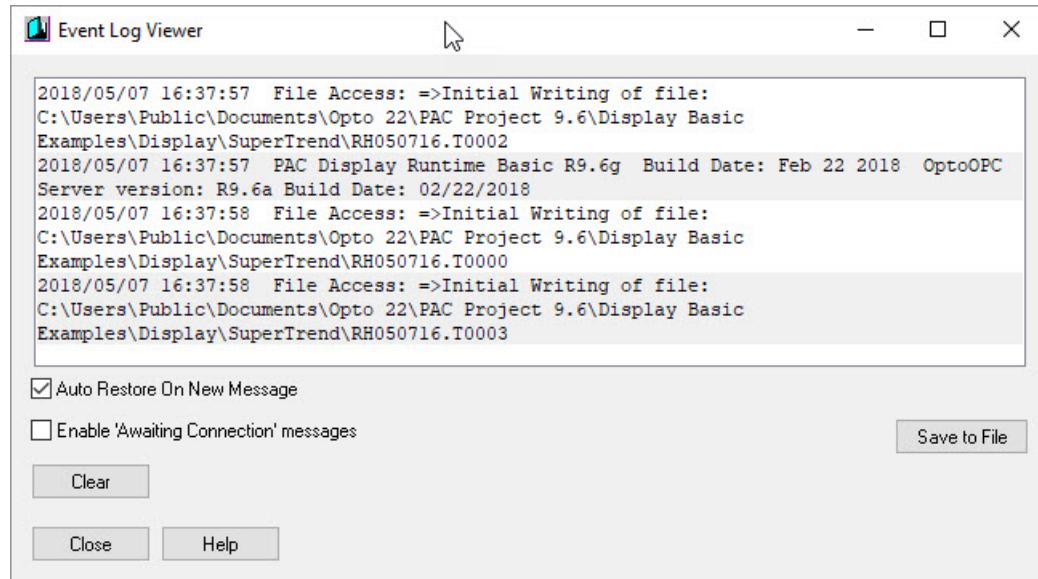
Project windows are composed of a title bar and a workspace. The title bar displays the name of the window, and the workspace contains all of the graphic objects work you did in the Configurator.

#### Configuring How Draw Windows Appear in Runtime

You can define how a draw window appears in PAC Display Runtime, including its visual state (closed, iconified, or open), relative position, and other settings. See “[Using Draw Windows and URL Windows](#)” on page 91 for instructions and more information.

## Runtime Event Log Viewer

The Event Log Viewer contains a list of system errors and messages that occur during Runtime. The most recent messages appear in the list, but when there are more messages than can reasonably fit, scroll bars appear so that you can view older messages.



You can also double-click any message to view its entire contents, if they are not already completely visible. The Event Log Viewer can be manipulated like any other standard window.

The Auto Restore on New Message option sets whether the Event Log Viewer dialog box automatically jumps to the foreground when a new event message is received. The Enable "Awaiting Connection" messages option is used to hide or display common startup messages.

# 4: Working with Projects

## INTRODUCTION

This chapter explains how to work with projects. You'll find out how project files are organized, and then learn how to create, open, and save a project. An optional, advanced procedure for customizing how PAC Display Configurator starts is also presented.

### In This Chapter

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Configuring Screen Snapshots .....	page 52
Combining PAC Display Projects .....	page 54
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## HOW PROJECTS ARE ORGANIZED

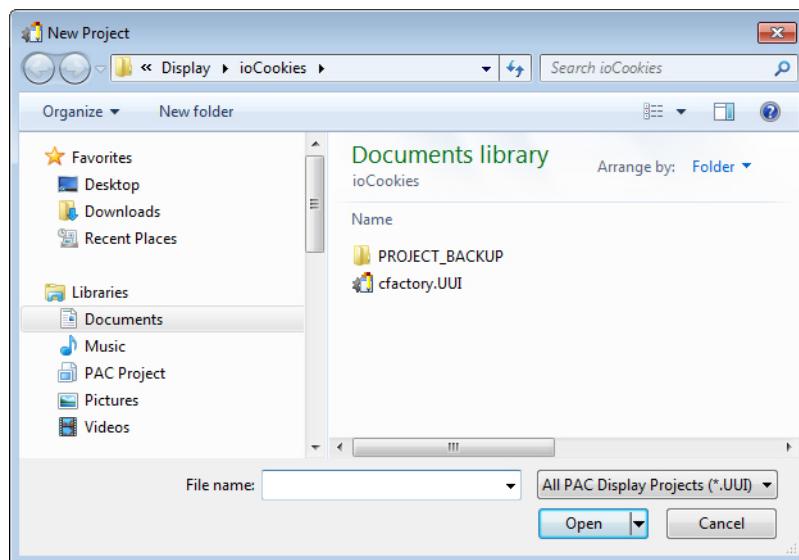
A PAC Display *project* is a collection of all the files created in PAC Display Configurator that define one operator interface. The project includes the windows you create, bitmaps that appear in them and their attributes, and any other elements you set up. See [Chapter 3: What Is PAC Display?](#) to learn more about the various components of a PAC Display project. Also see ["Appendix C: PAC Display Files"](#) for a complete list of files associated with PAC Display.

Each PAC Display project should be located in its own directory. You'll find that separate directories make keeping track of any one project's files easier, especially when you back up the project or copy the files to disk. Though not recommended, multiple projects can be stored in the same directory if necessary.

## CREATING A PROJECT

To create a new project:

1. Start PAC Display Configurator.<sup>1</sup>
  2. Click File > New Project (or press Ctrl+N).
- The New Project dialog box appears.



Dialog boxes in PAC Display follow common Microsoft Windows conventions, so you'll recognize familiar items such as the file list, the Up One Level button, and the File name field.

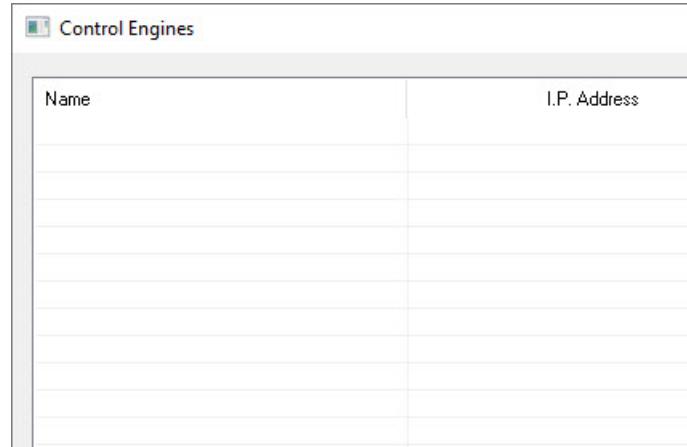
*NOTE: If you need more information on how to use dialog boxes or other common parts of Microsoft Windows, refer to the documentation from Microsoft and your computer manufacturer.*

3. Type a project name in the File name field.  
When you're done creating the new project file, this name is automatically appended with the suffix .uui, indicating a PAC Display project file.
4. If you want to save your project in a new directory, follow the sub-steps below, and then continue with the next step.
  - a. Click the Create New Folder button.  
The new folder you created appears in the list of files and folders. The name of the new folder should be highlighted, meaning you can enter a new name for the folder.
  - b. Type a new name for the folder, preferably one that includes the project name.
  - c. Double-click the new folder to open it.
5. Click Open to create the project.

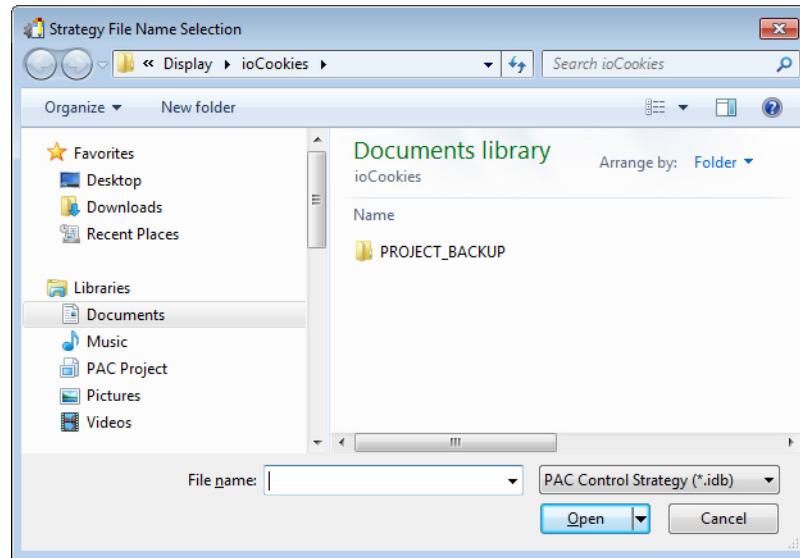
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<sup>1</sup>For instructions to start PAC Display Configurator, see [page 7](#).

Normally, the Control Engines dialog box opens next. However, if you have selected a directory that already includes a project, a warning message appears, and you'll be allowed to try again.



- In the Control Engines dialog box, click Add to locate a PAC Control strategy running on the control engine you want to connect to.



- In the Strategy File Name Selection dialog box that opens, navigate to the PAC Control strategy that is running on the control engine you plan to select.

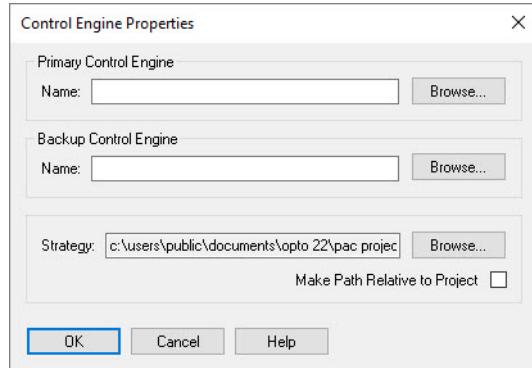
**(Pro only)** To locate a legacy OptoControl strategy, click the drop-down menu in the Files of Type dialog box and select "OptoControl Strategy \*.cdb".

*NOTE: The next few steps are for PAC Display Basic. To configure the control engine using PAC Display Professional, see "Final Controller Configuration with PAC Display Professional" on page 65.*

- Select the strategy file and click Open.

**Pro**

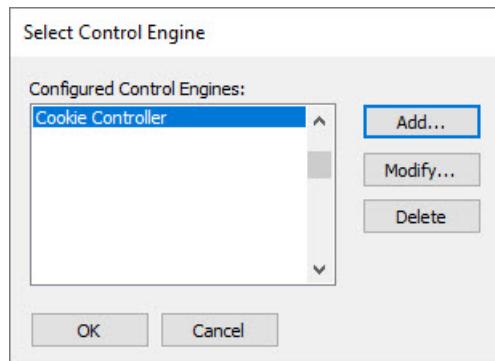
The strategy you selected appears in the Strategy field of the Control Engine Properties dialog box.



Now you need to select the primary control engine from which PAC Display will receive I/O point information. *Remember that this control engine must be running the strategy you selected.*

9. Click the Browse button in the Primary Control Engine group.

The Select Control Engine dialog box appears.

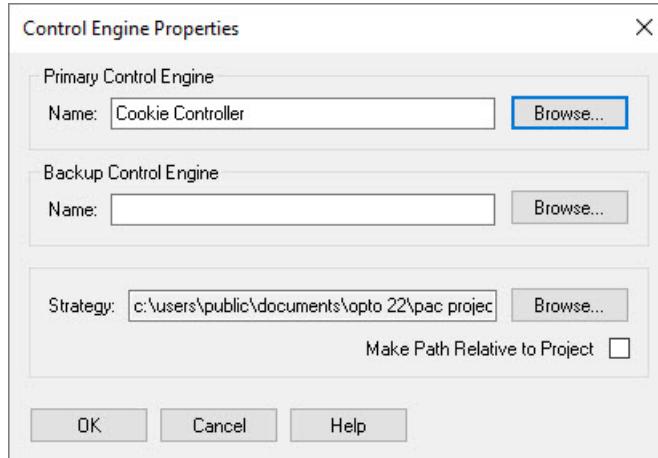


All control engines that have been configured to connect to your PC are listed, whether or not they are associated with your strategy. If you previously configured a control engine for use with PAC Control, for example, it would appear here, even if it didn't appear earlier when you opened the Control Engines dialog box.

*NOTE: If the control engine you want to use doesn't appear in the Select Control Engine dialog box, you must connect and configure this control engine to make it available. Instructions for adding, modifying, and deleting control engines appear in Chapter 4, "Working with Control Engines," in the PAC Control User's Guide (form 1700).*

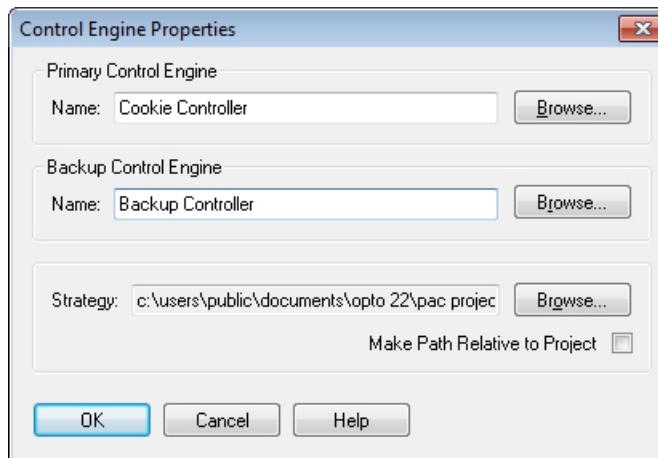
10. To choose a control engine that connects with PAC Display, select its name and click OK.

The primary control engine you have added appears in the Control Engine Properties dialog box.



- To designate a backup control engine, click Browse in the Backup Control Engine group, choose a control engine from the list and click OK.

The backup control engine you have added appears in the dialog box.



A backup control engine is used automatically in case the primary control engine fails or becomes unavailable. Control remains on the backup controller until the backup controller goes offline; control is not automatically returned to the primary control engine when it becomes available again.

- To change the path of the strategy to be relative to the current PAC Display project, select Make Path Relative to Project.

This allows the project to be more easily transferred to other PCs that don't have the exact same file structure.

- When all the parameters in the Control Engine Properties dialog box are correct, click OK to save your settings and close the dialog box.

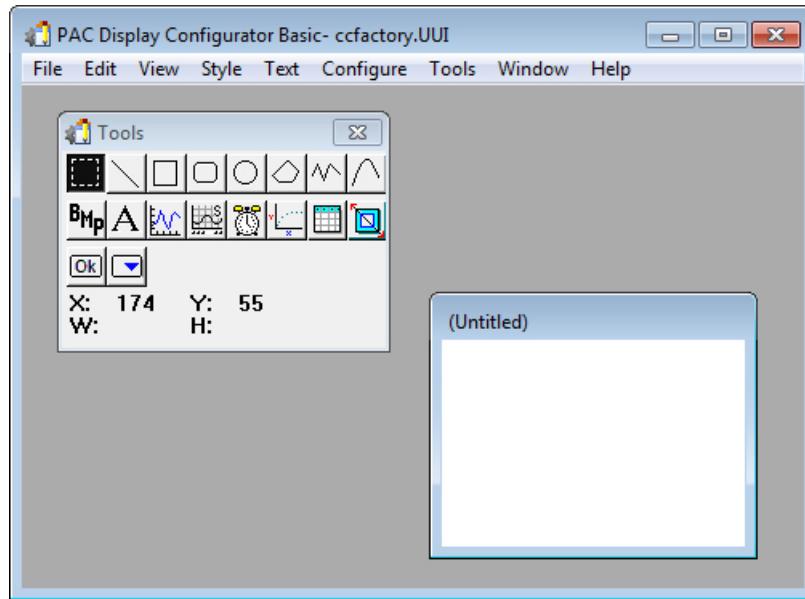
The control engine appears in the Control Engines dialog box.

*NOTE: To complete setting up the control engine, you need to select primary and secondary scanners. For more information, see "Configuring the Scanner" on page 67.*

- Click OK.

## PROTECTING A PROJECT WITH A PASSWORD

When you click OK in the Control Engines dialog box, the project is created, and a draw window and toolbox appear within the Configurator's main window.



The untitled draw window is where you will begin drawing your operator interface. The toolbox contains several icons representing graphic object drawing tools. For more information, see ["Chapter 6: Working with Graphic Objects" on page 91](#).

## Extending a Project Across Multiple Monitors

If you are designing your PAC Display project to use multiple monitors connected to the same computer, after creating the project simply extend PAC Display Configurator's main window across the monitors you want to use.

## PROTECTING A PROJECT WITH A PASSWORD

NOTE: For additional security features, see:

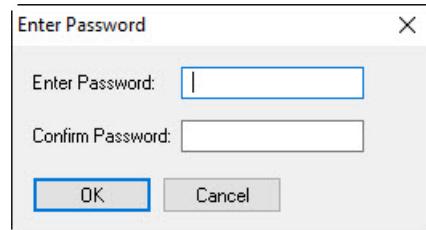
- ["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#) to allow or deny operator access to individual graphic objects, based on configured, authorized users and groups.
- ["Modifying Draw or URL Windows" on page 94](#) to assign a password to individual windows in a PAC Display project to prevent unauthorized users from opening them.
- ["Runtime Setup: Security Tab" on page 297](#) to allow operator access to the HMI, as well as log all HMI use and operator actions to an encrypted archive.
- ["Viewing Logged-In Users in Runtime" on page 325](#) to view a list of the users currently logged in to PAC Display Runtime.

You can protect your PAC Display project with a password to prevent others from opening and modifying the project using PAC Display Configurator. (The project can still be opened and run in PAC Display Runtime.) The maximum length for a project password is 255 characters.

**CAUTION:** Make sure to keep your password in a safe place. If you forget your password, you will not be able to open your project in PAC Display Configurator.

To protect your project with a password, do the following:

1. Click File > Password Protect Project.  
The Enter Project Password dialog box opens.



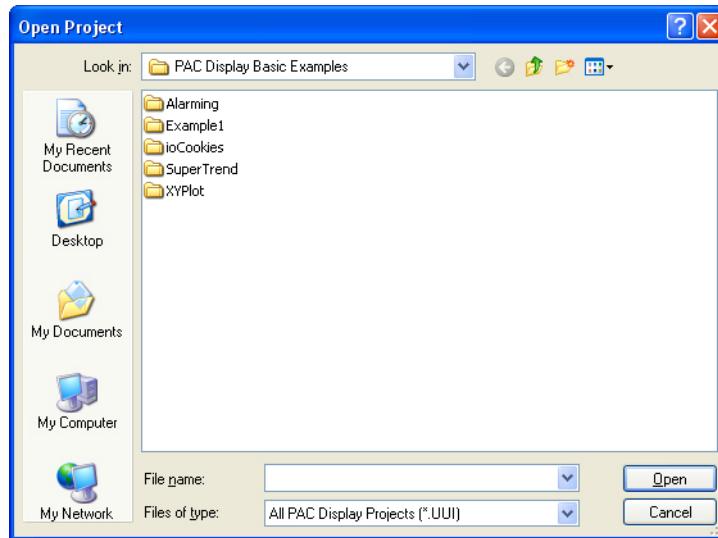
2. Type a password in the Enter Password field.
3. Type the same password a second time in the Confirm Password field.
4. Click OK.

Now, your PAC Display project cannot be opened in PAC Display Configurator without first entering the password.

## OPENING A PROJECT

To open an existing project in PAC Display Configurator or PAC Display Runtime, follow these steps:

1. Click File > Open Project.  
(Configurator only) If you already have an open project, you will be asked if you want to save it. Click Yes or No, or click Cancel to close the Save Project dialog box.  
The Open Project dialog box appears.



2. Navigate to the folder where your project is located.
3. Double-click the file in the list to open the project. (You can also select the file, and then click Open.)  
The project opens with any windows positioned just as you last left them.

*NOTE: If the project has been protected with a password, the Enter Password dialog box appears. Type the password for the project, and then click OK.*

**Pro**

## Converting an Older Project to PAC Display

A project created in Opto 22's earlier OptoDisplay software can be converted into a PAC Display project using conversion utility software included with PAC Display. Converting an OptoDisplay into PAC Display can save much time and effort that would otherwise be needed to recreate your older project in PAC Display. For converting an OptoDisplay project to PAC Display, see the [FactoryFloor to PAC Project Migration](#) technical note (form 1692).

## SAVING A PROJECT

There are three options for saving a project in PAC Display Configurator: [Save Project](#), [Save Project As](#), and [Save Project and Load Runtime](#).

### Save Project

To save your project to the same file name you opened or created, click File > Save Project (or Ctrl+S). If there have been no changes to the project since you last saved it, no messages appear when this save occurs.

### Save Project As

1. To save the project with a new name, click File > Save Project As (or Shift+Ctrl+S).
2. In the Save As dialog box, type a project name in the File name field.  
When you're done saving the project file with a new name, this name is automatically appended with the suffix .uui, indicating a PAC Display project file.
3. If you want to save your project in a new directory, follow the sub-steps below, and then continue with the next step.
  - a. Click the Create New Folder button.  
The new folder you created appears in the list of files and folders. The name of the new folder should be highlighted, meaning you can enter a new name for the folder.
  - b. Type a new name for the folder, preferably one that includes the project name.
  - c. Double-click the new folder to open it.
4. Click Save to save the project with a new file name.

### Save Project and Load Runtime

To save your project to the same file name you opened or created, and then start the project in PAC Display Runtime, click File > Save Project and Load Runtime. This option is particularly useful when you are testing a project and switch often between the Configurator and Runtime components.

## SAVING VERSIONS OF A PROJECT

When developing a PAC Display project, you can save progressively numbered versions of the project files (for example, MyProject\_01, MyProject\_02, etc.). Having these saved versions of your project as you develop it can be valuable if you need to return to an earlier version, or need to trace the steps you took while building the PAC Display project.

To automatically create a numbered version of modified PAC Display project files each time you save the project, click File > Configurator Options. Then, in the Configurator Options dialog, select Auto Increment Version on Save. Project (.UUI) and window (.WXX) files will be copied, renamed with a version number, and

placed in the same directory as the current project. Other project files such as background bitmap images and similar graphic objects are not copied.

## ARCHIVING A PROJECT

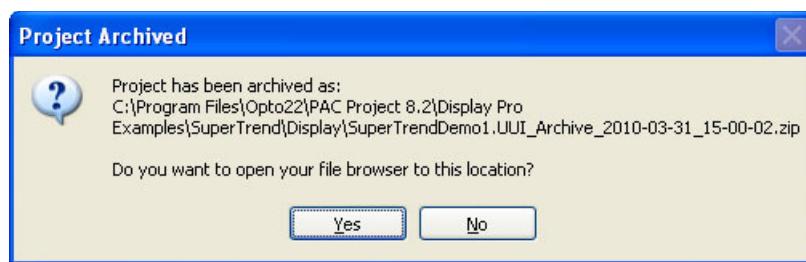
To archive the current project:

1. Click either File > Archive Project or File > Archive Project and Email to Opto 22.

The project is archived to the current project directory with all the files necessary to transfer the project to another computer.

If you choose Archive Project and Email to Opto 22, the project is attached automatically to an email addressed to Opto 22 Product Support. In order for Product Support to better assist you, a message will advise you to use PAC Control to archive the strategy files to submit along with the PAC Display archive.

When the archiving is finished the following dialog box appears.



2. Click Yes to open the archive's directory.

*NOTE: PAC Control strategy files referenced by the project are NOT automatically archived. Use PAC Control to archive the strategy files.*

A project archive file uses the following naming convention:

XXX\_Archive\_Year-Month-Day\_Hour-Minute-Second.zip

where XXX = name of the PAC Display project.

Example: SuperTrendDemo1.UUI\_Archive\_2008-03-31\_15-00-02.zip

This represents a project named SuperTrendDemo1 archived on March 31, 2008 at 3:00:26 pm.

## EXPORTING A PROJECT

If you want to compare one project to another—perhaps to see what has changed—you can export each project to a text file and then use a file comparison utility (such as WinMerge) to compare the files.

Each exported text file is formatted for easy reading and includes all the information about the project, including windows, graphic objects, dynamic attributes, alarm points, data logs, recipes, and so on.

1. Click File > Export Project.
2. In the Export Project As dialog box, navigate to the destination folder and enter a name for the file.
3. Click Save.
4. Repeat the steps for the next project, and then open the text files in your file comparison utility.

## CLOSING A PROJECT

To close the current project you have open, click File > Close Project. If you've modified the project since it was last saved, you will be asked if you want to save those changes before closing the project.

Only one project can be open at any one time in PAC Display. Creating or opening a project automatically closes any currently open project first. When this happens, you will be asked if you want to save changes if they haven't been already saved.

## CUSTOMIZING PROJECT PROPERTIES

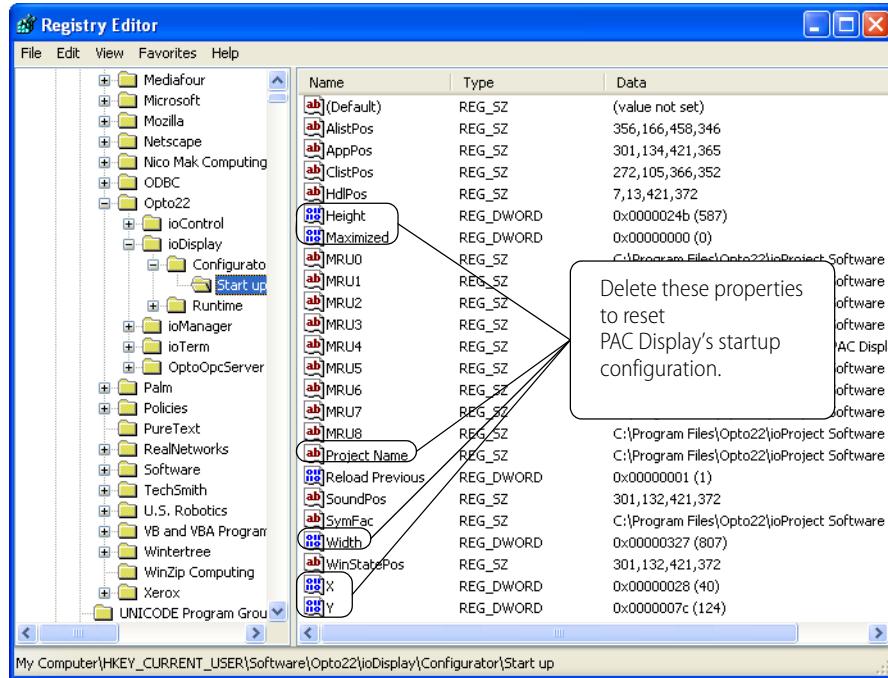
*NOTE: This procedure is not required to run PAC Display Configurator or Runtime, or to open projects.*

After you've loaded a project for the first time, you'll notice that every time you start PAC Display Configurator, the application knows which project to load, what sizes the windows are, and several other startup conditions. At some point, you may want to change these initial PAC Display conditions. To do so, you can run the Windows system Registry Editor utility to modify these conditions.

*CAUTION: Use the Windows Registry Editor carefully. It is strongly recommended that you make a backup copy of your Windows Registry before continuing with this procedure. Without a backup copy, if you delete the wrong properties and cannot return the Registry to its original state, application and system files can become unusable and will have to be reinstalled.*

1. From the Windows Start menu, select Run.  
The Run dialog box appears.
2. In the Open field, type `regedit` and then press Enter.  
The Registry Editor window appears. You should see several folders listed under My Computer.
3. Open the HKEY\_CURRENT\_USER folder, and then continue to open each of the following sub-folders as they appear:
  - Software
  - Opto22
  - PAC Display
  - Configurator or Runtime
  - Start up

In the Start up folder you'll see several properties defined, as shown below.



**4.** Select the following properties:

- Height
- Maximized
- Project Name
- Width
- X
- Y

**Do not select the (Default) property.**

5. Click Edit > Delete, or press Delete on the keyboard.
6. Click Registry > Exit to close the Registry Editor.

PAC Display has now been initialized to its original startup conditions, and will open as if no project had ever been loaded.

## CREATING A BATCH FILE TO START AND RUN A PROJECT

You can use a batch file to start PAC Display Runtime and run a project. The batch file you create can be associated with an icon on the Windows desktop. This is a convenient way for an operator to quickly start a PAC Display project without having to search for the project file in a dialog box.

To create a batch file that opens a project in PAC Display Runtime, do the following:

1. Open an empty text file using Windows Notepad or another text editor.
2. Type Windows command prompt commands that perform the following tasks:
  - Change drives to the drive containing the project.
  - Change directories to the directory containing the project.
  - Start PAC Display Runtime.

## CONFIGURING SCREEN SNAPSHOTS

3. Save the file using the .bat file extension.

### Example Batch File

```
C:  
cd "C:\Program Files\Opto22\PAC Project 10.5\"  
start DisplayR.pro.exe "c:\Opto 22\Projects\myproject.UUI" 10
```

Here's what each line of the batch file does:

- The first line changes drives to the C: drive.
- The second line changes the current directory to C:\Program Files\Opto22\PAC Project 10.5\
- The third line starts PAC Display Runtime and loads the project located at C:\Opto 22\Projects\myproject.UUI.  
The number 10 at the end of the third line delays the start of PAC Display for 10 seconds.  
This can be helpful when you want to make sure some other process or program is running before PAC Display starts.

Once you have created the batch file, you can make a Windows shortcut for your batch file and place it on the Windows desktop for easy access. Alternately, you can place the shortcut in the Windows Startup folder so the project starts to run when the computer starts up.

## CONFIGURING SCREEN SNAPSHOTS

A Snapshot is a whole-screen capture saved as a bitmap file. You can use snapshots to review what occurred in Runtime over a period of time, or to capture a triggered event. Snapshots are taken according to a time interval that you configure. You can use triggers to start and stop the process.

There are four basic ways to configure snapshots:

**Time Interval Only:** With no start or stop trigger, snapshots start to be taken when Runtime has fully loaded the project and starts displaying data. Snapshots continue to be taken at the specified interval until Runtime closes the project or it is shut down.

**Start Trigger Only:** When the start trigger is activated, snapshots are taken at the specified interval until Runtime closes the project or it is shut down.

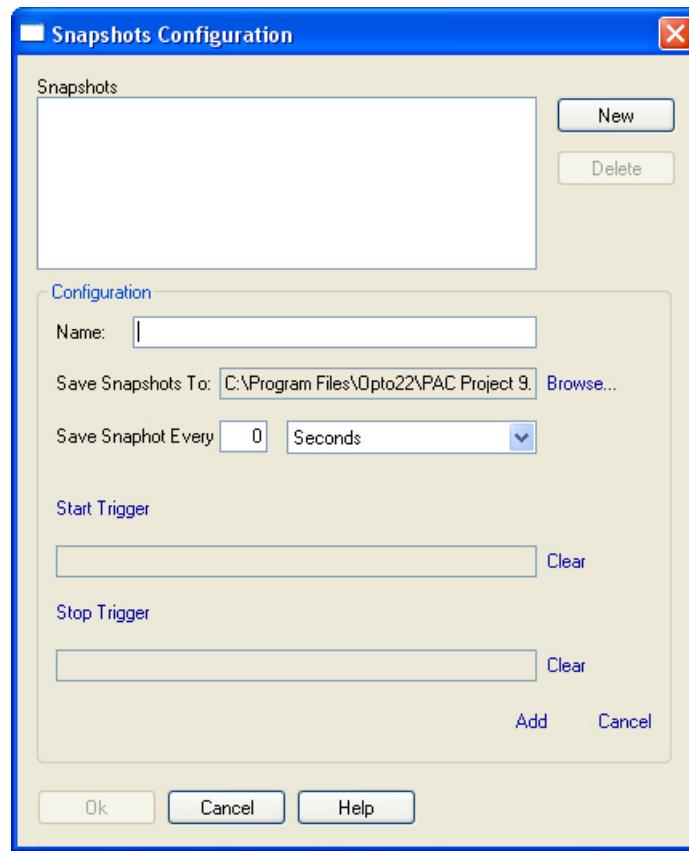
**Stop Trigger Only:** With no start trigger, snapshots start when Runtime has fully loaded the project and starts displaying data. Snapshots continue to be taken at the specified interval until the stop trigger is activated.

**Start Trigger and Stop Trigger:** Once the start trigger is activated, snapshots are taken at the specified interval until the stop trigger is activated.

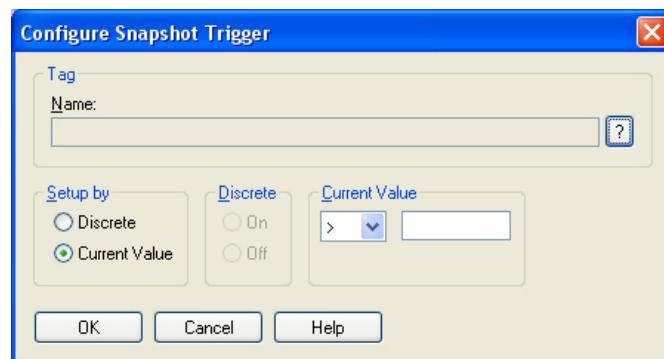
To configure snapshots:

1. Click Configure > Snapshots.

2. In the Snapshots Configuration dialog box, click New.



3. Enter a name for the snapshot.
4. For Save Snapshots To, choose the location where the snapshots will be placed. Use either the default setting (the Project directory), or click Browse to choose a different location.
5. For Save Snapshot Every, enter a time interval for the snapshots in the range of 1 – 255 Seconds, Minutes, or Hours.  
If no start or stop trigger is configured, snapshots will be taken at the specified interval beginning when Runtime has fully loaded the project and starts displaying data until Runtime closes the project or the project is shut down.
6. If you want to use a trigger to activate snapshots, click Start Trigger to launch the Configure Snapshot Trigger dialog box.



- Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC controller name tag.
  - Select Discrete or Current Value in the Setup By group.  
Discrete sets, clears, or toggles the tag's on or off state. Current Value sets the tag value. To set a Current Value, select Set or Offset in the Current Values group and then enter a tag value.
  - Click OK to close the dialog box.
7. If you want a stop trigger, click Stop Trigger, and then configure the stop trigger in the same manner as for the Start Trigger.
8. On the Snapshots Configuration dialog box, click Add.  
The Snapshot configuration appears in the list.
9. Repeat the previous steps for each snapshot configuration you want to create.
10. Click OK to close the dialog box.

### Modifying a Snapshot

To modify an existing snapshot, click its name in the list, and make your changes. When finished, click the Modify link to accept the changes, or click Cancel to cancel any changes

### Snapshot Files in Runtime

In Runtime, the snapshot files are saved with the following format:

[Snapshot Name]\_YYYY\_MM\_DD\_HH\_MM\_SS.bmp

where:

YYYY = year  
MM = month  
DD = day  
HH = hour  
MM = minute  
SS = second.

If the name of the snapshot contains an illegal characters (such as "&"), the illegal character is replaced with an underscore. For example, "Tank & Level 10 seconds" becomes "Tank\_Level 10 seconds."

## COMBINING PAC DISPLAY PROJECTS

If you want to combine PAC Display projects, first archive each of the PAC Control strategies and PAC Display projects to your hard drive as described below. This allows you to recover the original versions if there are problems at some point. Then use the import and export features in PAC Display to combine projects. If you are integrating multiple PAC controllers into a single system, make sure that each control engine and each strategy has a unique name.

The best way to share data between multiple PAC controllers is with the scratch pad using the I/O Unit—Scratch Pad Commands. For more information, see "Programming with Commands" in the [PAC Control User's Guide](#) (form 1700).

### Archiving and Renaming Multiple PAC Control Strategies

*NOTE: See also, Archiving Strategies in the [PAC Control User's Guide](#) (form 1700).*

1. Click File > Archive Strategy to archive each strategy.

2. Make sure each strategy has a unique name.  
To re-name a strategy, open it in PAC Control and click File > Save Strategy As.
3. Make sure each control engine has a unique name to distinguish it from other controllers.  
To rename a control engine, open a strategy in PAC Control and click Configure > Control Engines.
4. If you change the name of a strategy or control engine, you'll need to point the PAC Display project to the new strategy name or control engine name as follows:
  - a. Start PAC Display in Configure mode and click Configure > Control Engine(s).
  - b. Select the control engine, click the Replace button, and then click OK.
  - c. Click Tools > AutoCorrect Tags.
  - d. When you download the updated PAC Control strategy, you will need to run the updated PAC Display project. It is important to keep your PAC Display project in sync with the strategies that are running on the control engines.

*NOTE: For more information, see “Configuring Control Engines” on page 61.*

5. Click File > Archive Strategy to manually archive the strategy.

*NOTE: In PAC Control you can automatically archive a strategy to your hard drive or to the controller. This helps you track changes during development and provides a backup in case of a failure on the control engine or computer. For more information, see the [PAC Control User’s Guide](#) (form 1700).*

## Archiving and Combining PAC Display Projects

1. Open your project in PAC Display Configurator and click File > Archive Project.
2. Click Tools > AutoCorrect Tags to identify any existing problems.
3. Fix any problems in your project before proceeding. If you make changes in the project, save it and then make another archive.
4. Open the main project (the one you are adding other projects to), and then add each of the other control engines and strategies.  
In order to do this, each strategy and control engine must have a different name as described in the previous section.
5. Save the main project.
6. To combine your projects, see “[Using Draw Windows and URL Windows](#)” on page 91 and “[Importing, Exporting, and Saving Windows](#)” on page 98.  
Make sure to run Auto Correct tags and the save the project with each window you import.
7. When you have finished combining projects, run AutoCorrect Tags again to check for any problems.

## CONFIGURING AN ODBC DATA SOURCE



**(Pro only)** Before you can exchange SuperTrend, historical, Runtime operator data, or recipe data with a database, you must use Windows to configure one or more ODBC connectors. Then, in PAC Display, you select the ODBC connector to use for the project.

ODBC connectors tell PAC Display and Windows how to send data to and from a database. Supported databases include MySQL, Microsoft Access, and Microsoft SQL Server. If your database is Microsoft Access, see also “[Granting Privileges in Microsoft Access](#)” on page 58.

Also see the following sections:

- “[Saving a SuperTrend to a Database](#)” on page 208
- “[Logging Historical Data to a Database](#)” on page 220
- “[Configuring a Runtime Operator Log Database](#)” on page 314

## CONFIGURING AN ODBC DATA SOURCE

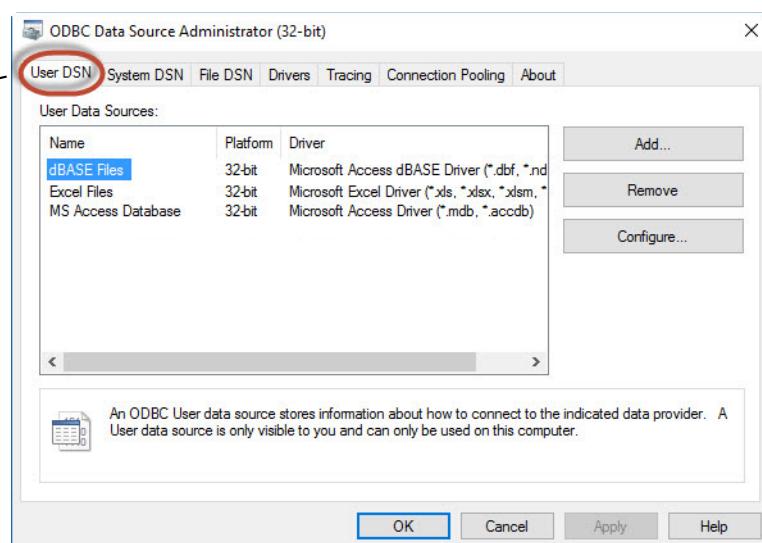
- “Logging a Recipe File to or from a Database” on page 257

To configure an ODBC connector in Windows and an ODBC data source in PAC Display:

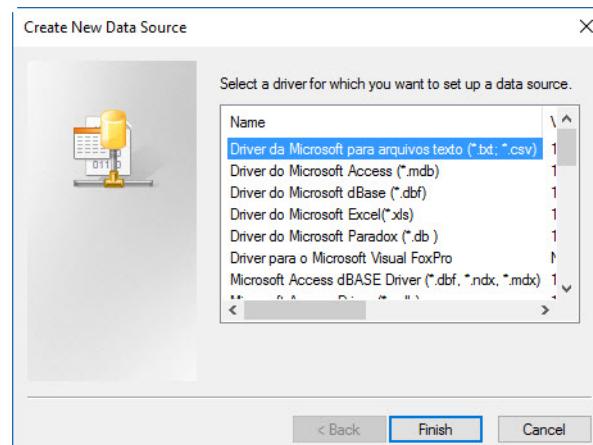
### 1. In Windows:

- Press the Windows Start key , type ODBC Data Sources (32-bit) and then press the Enter key to open the Windows ODBC Data Source Administrator (32-bit).

Configure ODBC  
connectors on the  
User DSN tab.



- On the User DSN tab, click Add to open the Create New Data Source dialog box.

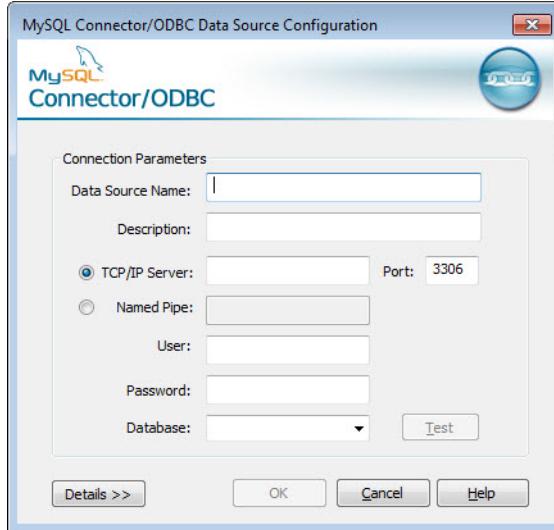


- Highlight the appropriate driver for your data source, and then click Finish. A dialog box opens for configuring the ODBC connector. To configure the driver, you may need to refer to the driver's user documentation.

*NOTE: If you're using Microsoft Access and you don't see the Access driver in the list, you'll need to download the driver and then install it.*

- For Access 2007, download the driver from:  
<https://www.microsoft.com/en-us/download/details.aspx?id=23734>
- For Access 2010 or higher, download the driver from:  
<https://www.microsoft.com/en-us/download/details.aspx?id=13255>

For example, here's a dialog box for the MySQL connector:



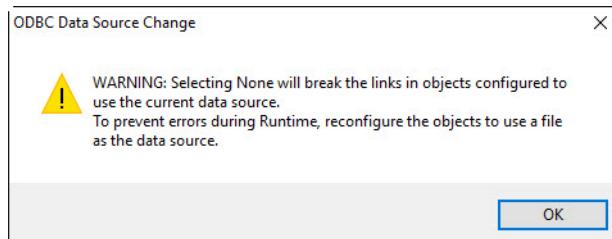
- d.** When you've finished configuring the driver, click OK to save the settings.
- 2. In PAC Display Configurator:**
- a.** In the menu bar, click Configure > ODBC Data Source.  
The Select ODBC Data Source dialog box opens.  
The field below "ODBC Data Source" shows the data source configured for the project.  
If no ODBC data source is configured, the field shows "None."



- b.** Under ODBC Data Source, select the ODBC connector that is configured for the target database.
- c.** Enter any required username and password.
- d.** To test the connection to the ODBC Data Source, click the Test button.  
If the ODBC connector is set up properly, a pop-up message says, "Successfully connected to Database!"
- e.** Click OK to save the settings and close the dialog box.

*TIP: When you configure an ODBC data source, PAC Display creates an internal link between the project and the ODBC connector. If you ever need to temporarily or permanently disassociate your PAC Display project from the ODBC data source, select "None" as the data source.*

A warning message reminds you to find all objects in the project that are configured to use the data source, and then reconfigure the object to use a file as the source (or destination, as the case may be). Otherwise, if the data source isn't accessible during Runtime, an error message will be written to the Event Log.



## How PAC Display Handles Database Connections

Each time you open a project, PAC Display checks to see if an ODBC database source has been configured. If so, PAC Display writes to the Event Log a message stating which ODBC data source it's monitoring. (For more information about the Event Log, see ["Enabling the Event Log Viewer" on page 312](#) and ["Using the Event Log Viewer" on page 325](#).)

When an object configured to send data to (or receive data from) a database is triggered during Runtime, PAC Display Runtime attempts to connect to the database.

- If the attempt is successful, Runtime writes the data to (or from) the database.
- If the attempt fails, Runtime performs a series of actions to recover:
  - First, it writes a message to the Event Log that contains the error message it received about the failure.
  - Then, it will keep trying to connect until either the connection is established or Runtime is shut down.
  - When the connection is established, it writes another message to the Event Log, along with the time the connection was established.

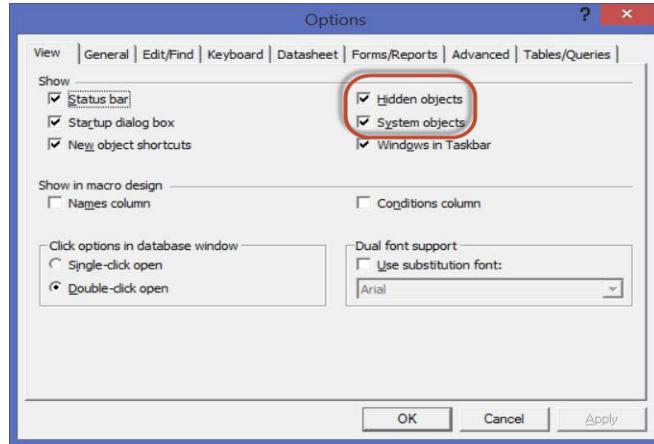
## Granting Privileges in Microsoft Access

If you plan to load recipe files to or from a Microsoft Access database, you must also grant administrator privileges to the MSysObjects table. How you do this depends on your version of Microsoft Access.

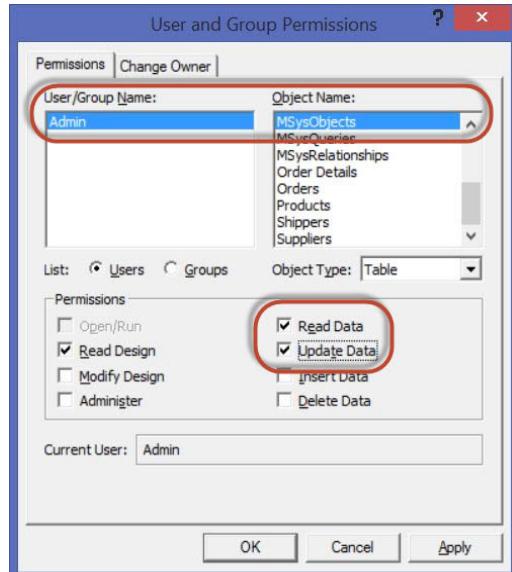
### Microsoft Access 2000

1. Open the target database in Microsoft Access, and then click the menu bar's Tools > Options. The Options dialog box opens.

- On the View tab, select Hidden Objects and System Objects.



- Click OK to close the dialog box.
- In Microsoft Access's menu bar, click Tools > Security > User and Group Permissions. The User and Group Permissions dialog box opens.
- In the User/Group Name pane, select Admin. In the Object Name pane, select MSysObjects. In the Permissions area, select the Read Data and Update Data check boxes.



- Click OK to close the dialog box.

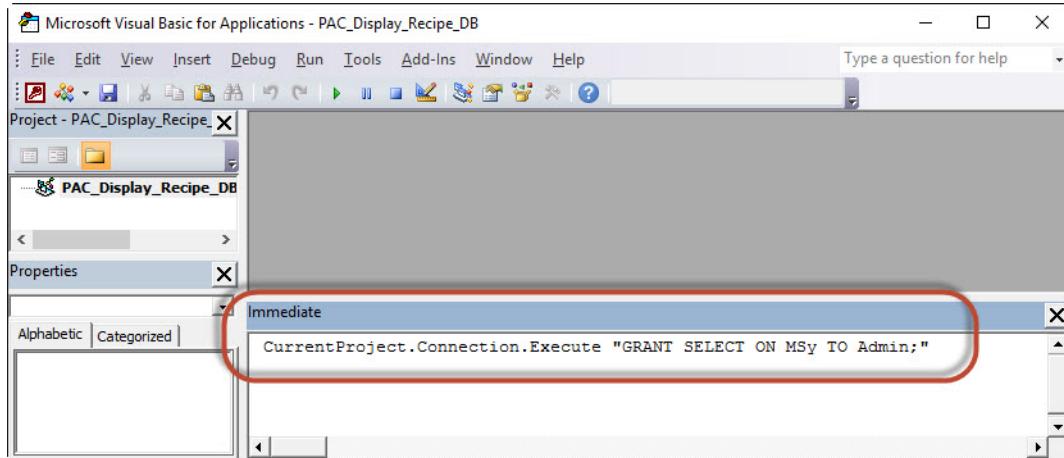
#### Microsoft Access 2002 and higher

- Open the target database in Microsoft Access, and then press Ctrl+G. The Microsoft Visual Basic for Applications window opens.
- In the Immediate pane, type the following command:  

```
CurrentProject.Connection.Execute "GRANT SELECT ON MSysObjects TO Admin;"
```
- Press Enter.

## CONFIGURING AN ODBC DATA SOURCE

Microsoft Access does not display any messages, but it does grant access to the table.



Now you're ready to log data to an ODBC database. For more information, see the following sections:

- ["Saving a SuperTrend to a Database" on page 208](#)
- ["Logging Historical Data to a Database" on page 220](#)
- ["Configuring a Runtime Operator Log Database" on page 314](#)
- ["Logging a Recipe File to or from a Database" on page 257](#)

# 5: Configuring Control Engines and Tags

## INTRODUCTION

This chapter shows how to define the connections to Opto 22 control engine and I/O points, or “tags,” that PAC Display requires. PAC Display uses the data values a control engine receives from I/O points and integer, float, and string variables to change the attributes of on-screen graphic objects. (I/O points are defined when you create a PAC Control strategy; for more information, see the [PAC Control User’s Guide](#), form 1700.) For a PAC Display project to receive this information on individual I/O points (called *tags*), you must first define a connection to an Opto 22 control engine.

**Pro** PAC Display can also connect to an Opto 22 controller running an OptoControl strategy. Tags in the OptoControl strategy will be available in your PAC Display project the same way PAC Control tags are.

*NOTE: PAC Display can access any PAC Controller or ioControl controller (Ultimate or LCE) as long as each controller has firmware 7.0 or newer. Therefore, if you are using one integrated project that accesses multiple Opto 22 systems of varying vintages, in order to ensure proper communication to each component, make sure each controller has firmware 7.0 or newer.*

### In This Chapter

<a href="#">Configuring Control Engines</a> .....	<a href="#">page 61</a>
<a href="#">Configuring the Scanner</a> .....	<a href="#">page 67</a>
<a href="#">Configuring Tags</a> .....	<a href="#">page 74</a>
<a href="#">Correcting Tags from a Strategy</a> .....	<a href="#">page 83</a>
<a href="#">Configuring a Project with No Control Engine</a> .....	<a href="#">page 86</a>

## CONFIGURING CONTROL ENGINES

Follow these steps to select and configure a control engine:

1. Start PAC Display Configurator.<sup>1</sup>
2. Open a project that will be associated with the control engine.
3. Click Configure > Control Engine.

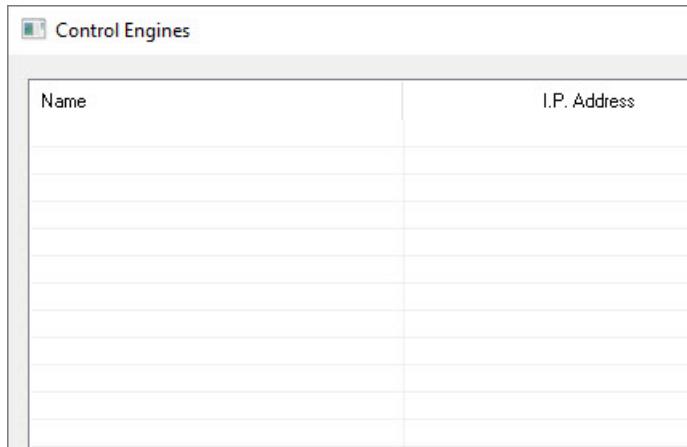
The Control Engines dialog box opens.

---

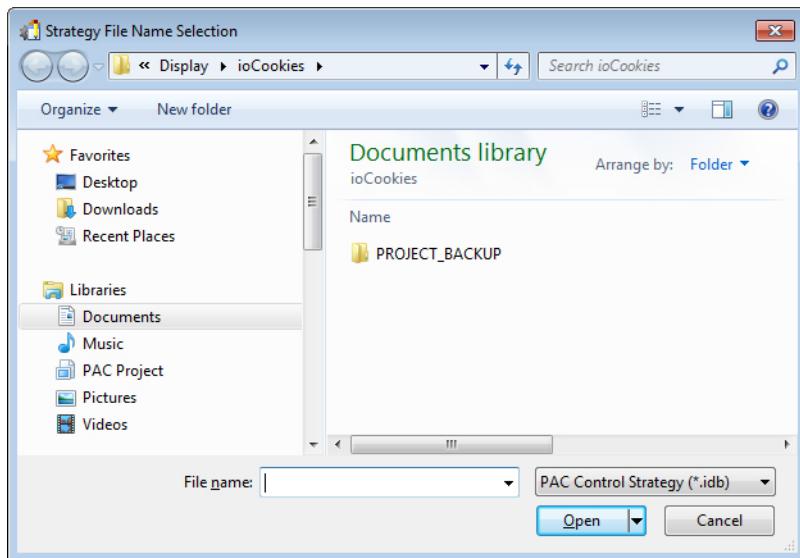
<sup>1</sup>For instructions to start PAC Display Configurator, see [page 7](#).

## CONFIGURING CONTROL ENGINES

If you have not previously configured a control engine for the PAC Display project you opened, the Name list is empty and only the Add button is available.



4. To locate a PAC Control strategy running on the control engine you want to connect to, click Add.



5. In the Strategy File Name Selection dialog box that opens, navigate to the PAC Control strategy that is running on the control engine you plan to select.  
To locate an OptoControl strategy, click the drop-down menu in the Files of Type dialog box and select "OptoControl Strategy \*.cdb".
6. If you have PAC Display Basic, see "[Final Controller Configuration with PAC Display Basic](#)" on page 62 to complete controller configuration. If you have PAC Display Professional, see "[Final Controller Configuration with PAC Display Professional](#)" on page 65.

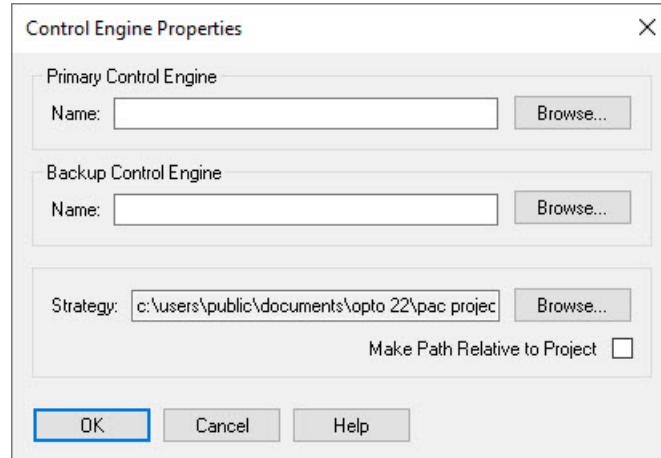


### Final Controller Configuration with PAC Display Basic

*NOTE: The next few steps differ between PAC Display Basic and PAC Display Professional. Follow the set of instructions for your version of PAC Display.*

1. Select the strategy file and click Open.

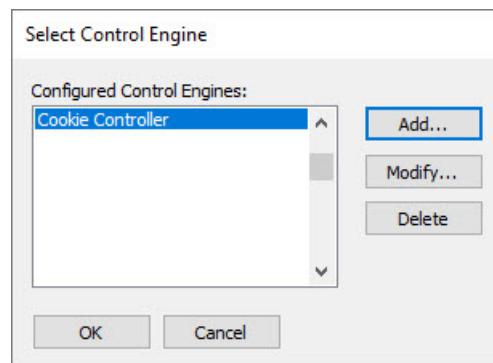
The strategy you selected appears in the Strategy field of the Control Engine Properties dialog box.



Now you need to select the primary control engine from which PAC Display will receive I/O point information. *Remember that this control engine must be running the strategy you selected.*

2. Click the Browse button in the Primary Control Engine group.

The Select Control Engine dialog box appears.



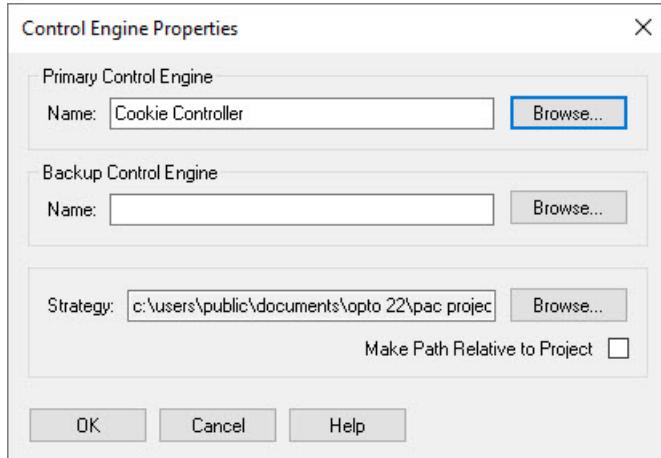
All control engines that have been configured to connect to your PC are listed, whether or not they are associated with your strategy. If you previously configured a control engine for use with PAC Control, for example, it would appear here, even if it didn't appear earlier when you opened the Control Engines dialog box.

*NOTE: If the control engine you want to use doesn't appear in the Select Control Engine dialog box, you must connect and configure this control engine to make it available. Instructions for adding, modifying, and deleting control engines appear in Chapter 4, "Working with Control Engines," in the [PAC Control User's Guide](#) (form 1700). [OptoControl User's Guide](#)*

3. To choose a control engine that connects with PAC Display, select its name and click OK.

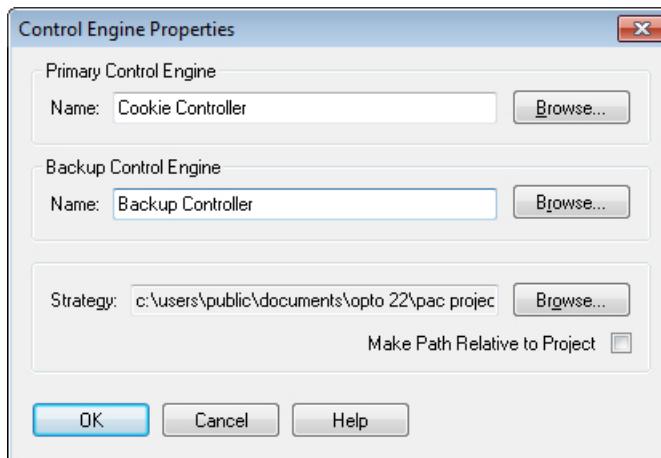
## CONFIGURING CONTROL ENGINES

The primary control engine you have added appears in the Control Engine Properties dialog box.



4. To designate a backup control engine, click Browse in the Backup Control Engine group, choose a control engine from the list and click OK.

The backup control engine you have added appears in the dialog box.



A backup control engine is used automatically in case the primary control engine fails or becomes unavailable. Control remains on the backup controller until the backup controller goes offline; control is not automatically returned to the primary control engine when it becomes available again.

5. To change the path of the strategy to be relative to the current PAC Display project, select Make Path Relative to Project.
- This allows the project to be more easily transferred to other PCs that don't have the exact same file structure.
6. When all the parameters in the Control Engine Properties dialog box are correct, click OK to save your settings and close the dialog box.

*NOTE: When you configure the control engine in PAC Display, you should also designate a local or remote scanner. In PAC Display, a scanner is a software component that manages all communications with one or more control engines. By default, the scanner runs on the same PC running the PAC Display project, but your application may benefit from configuring a remote scanner. See "[Configuring the Scanner](#)" on page 67 for more information.*

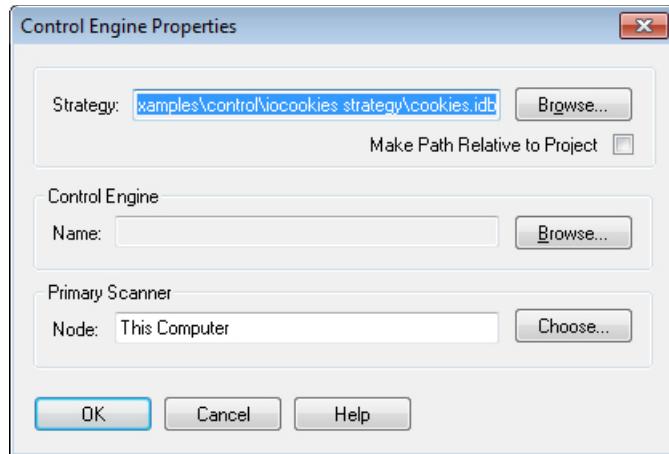


## Final Controller Configuration with PAC Display Professional

In PAC Display Pro, final configuration includes selecting the control engine and the primary scanner. If you also want to set up a secondary scanner, see “[Configuring a Remote Scanner in PAC Display Pro](#)” on page 69.

1. Select the strategy file and click Open.

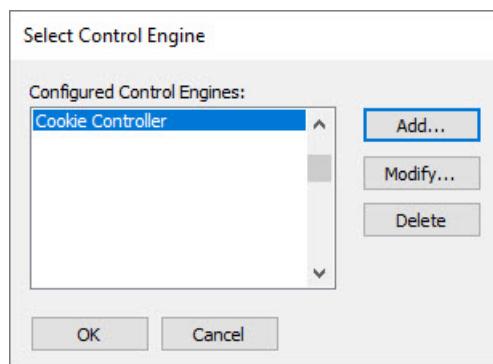
The strategy you selected appears in the Strategy field of the Control Engine Properties dialog box.



Now you need to select the primary control engine from which PAC Display will receive I/O point information. *Remember that this control engine must be running the strategy you selected.*

2. Click the Browse button in the Primary Control Engine group.

The Select Control Engine dialog box appears.



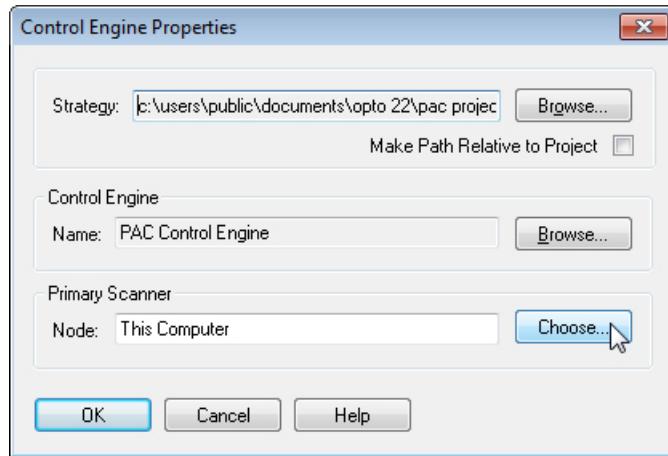
All control engines that have been configured to connect to your PC are listed, whether or not they are associated with your strategy. If you previously configured a control engine for use with PAC Control, for example, it would appear here, even if it didn’t appear earlier when you opened the Control Engines dialog box.

*NOTE: If the control engine you want to use doesn’t appear in the Select Control Engine dialog box, you must connect and configure this control engine to make it available. Instructions for adding, modifying, and deleting control engines appear in Chapter 4, “Working with Control Engines,” in the [PAC Control User’s Guide](#) (form 1700). [OptoControl User’s Guide](#)*

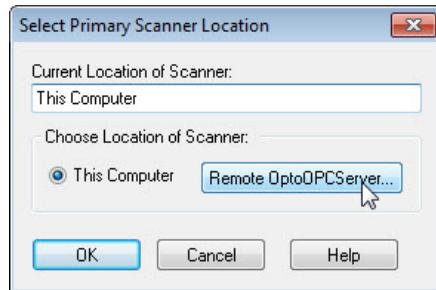
3. To choose a control engine that connects with PAC Display, select its name and click OK.

## CONFIGURING CONTROL ENGINES

The primary control engine you have added appears in the Control Engine Properties dialog box.

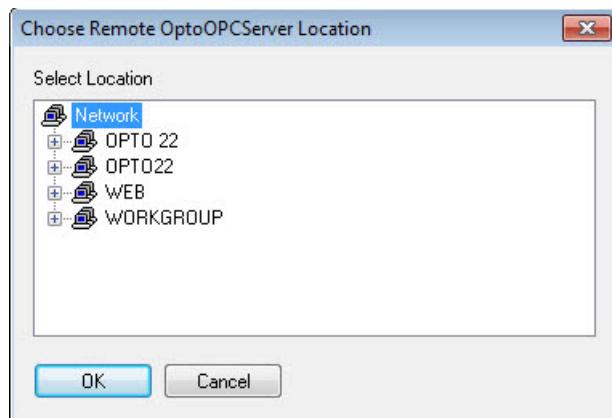


4. To select a primary scanner, click the Choose... button.



5. To use the local computer as the primary scanner, select This Computer and then click OK to exit the dialog box and finish the configuration.

However, to designate a different computer as the primary scanner, click the Remote OptoOPCServer button.



*In the list of computers that appears, navigate to the PC that has OptoOPCServer software installed and configured. Select the computer and click OK.*

**IMPORTANT:** To successfully use OptoOPCServer on a remote computer with PAC Display, Windows user and application permission settings on both local and remote computers must be correctly configured. For detailed instructions for configuring OptoOPCServer and OPC clients for network operation, see the OptoOPCServer User's Guide (form 1439), included with the purchase of OptoOPCServer.

6. Click OK to close the dialog box and save your settings.

To set up a secondary scanner, see "[Configuring the Scanner](#)" on page 67.

## Ethernet Link Redundancy

**NOTE:** If you have configured redundant controllers for your control system, the Ethernet link redundancy feature described in this section cannot be used. For more information on using redundant controllers, see the [SNAP PAC Redundancy Option User's Guide](#) (form 1831).

The two Ethernet interfaces on a SNAP PAC controller allow you to have redundant Ethernet network links for your control system. Using PAC Manager, you assign a different IP address for each interface—a primary and a secondary address. Then, using PAC Control, you assign the two addresses to the control engine.

Once this has been set up, you can use the primary and secondary IP addresses in a PAC Display project to access data from the PAC Control strategy running on the control engine.

In a system with link redundancy, one address is always active. If the primary address is unavailable, then the secondary address becomes the active address and PAC Display will automatically shift to the secondary address. If the secondary address fails, then the primary address becomes the active address and it will automatically try the primary address again. If communication to the active address fails and the control engine is not able to switch to the other address, then communication to the I/O unit becomes disabled. Communication is tested on each valid address that is enabled (any address other than 0.0.0.0) when a strategy is started or when communication to an I/O unit is changed from disabled to enabled.

On a **SoftPAC controller**, the PC running SoftPAC must have two network interface cards (NICs) configured with static primary and secondary IP addresses on different subnets.

To set up Ethernet link redundancy:

1. Using PAC Manager, assign the primary and secondary IP addresses to the control engine.  
For details, see "[Configuring Devices](#)" in the [PAC Manager User's Guide](#) (form 1704).
2. Using PAC Control, configure link redundancy for the control engine.  
For details, see "[Using Ethernet Link Redundancy in PAC Control](#)" in the [PAC Control User's Guide](#) (form 1700).

Once you have set up link redundancy for the control engine you are using in your PAC Control strategy, it works automatically in PAC Display.

To view which control engine is currently running, click View > Configuration in Runtime.



## CONFIGURING THE SCANNER

PAC Display exchanges information with one or more Opto 22 controllers using a software component called a *scanner*. This scanner is automatically installed on the same computer as PAC Display software, but can also run on a different computer. See "[Using OptoOPCServer as a Remote Scanner](#)" below.

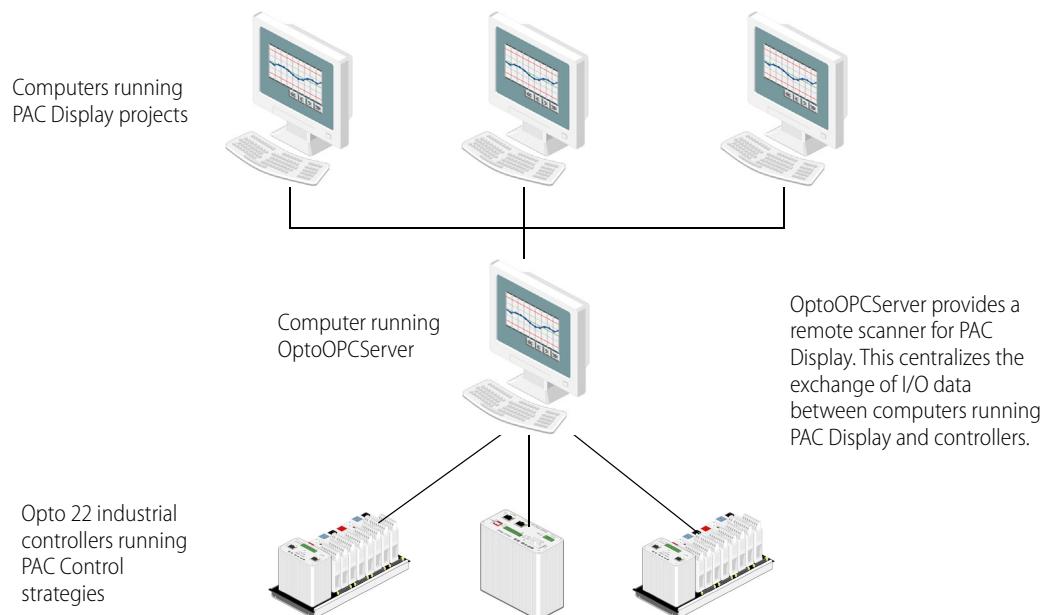
**NOTE:** No configuration is needed to run the scanner on the same computer as PAC Display.

When a PAC Display project is running, PAC Display periodically checks to see if the scanner is operating. If the scanner is not operating, an error message is displayed in the Runtime Error Log. Configuring how often the scanner is checked is described in "[Setting Scanner Heartbeat Interval](#)" on page 72.

## Using OptoOPCServer as a Remote Scanner

Different PAC Display projects—or copies of the same project—can run on multiple computers which are connected on a network. For example, for supervisory reasons you may need to run several monitor-only versions of PAC Display projects on office computers in addition to using regular monitor-and-control versions of PAC Display at operator workstations.

If you need to run multiple instances of PAC Display on separate computers, use Opto 22's OptoOPCServer software as a centralized scanner. Running on a PC or network server, OptoOPCServer centralizes communications with Opto 22 control engines. This greatly increases the efficiency with which computers running PAC Display can exchange information with control engines. OptoOPCServer software is sold separately from PAC Display, and is available from Opto 22 and local Opto 22 distributors.



*NOTE: PAC Display software can communicate only with its built-in scanner or with OptoOPCServer software. PAC Display is not a generic OPC client, and cannot be used with third-party OPC servers.*

In addition to serving as a remote scanner for PAC Display, OptoOPCServer supports third-party SCADA, HMI, data collection, and other OPC-client software. For these third-party OPC clients, OptoOPCServer can supply I/O point data from SNAP PAC systems that is not supported by PAC Display.

*IMPORTANT: OptoOPCServer must be correctly installed and configured on a network server or workstation before a PAC Display project can use it as a scanner. For detailed information on installing OptoOPCServer and configuring it for network operation (including DCOM), see the OptoOPCServer User's Guide (form 1439), included with the purchase of OptoOPCServer.*

For Basic, see "[Configuring a Remote Scanner Location in PAC Display Basic](#)" below.

For Pro, see "[Configuring a Remote Scanner in PAC Display Pro](#)" on page 69.

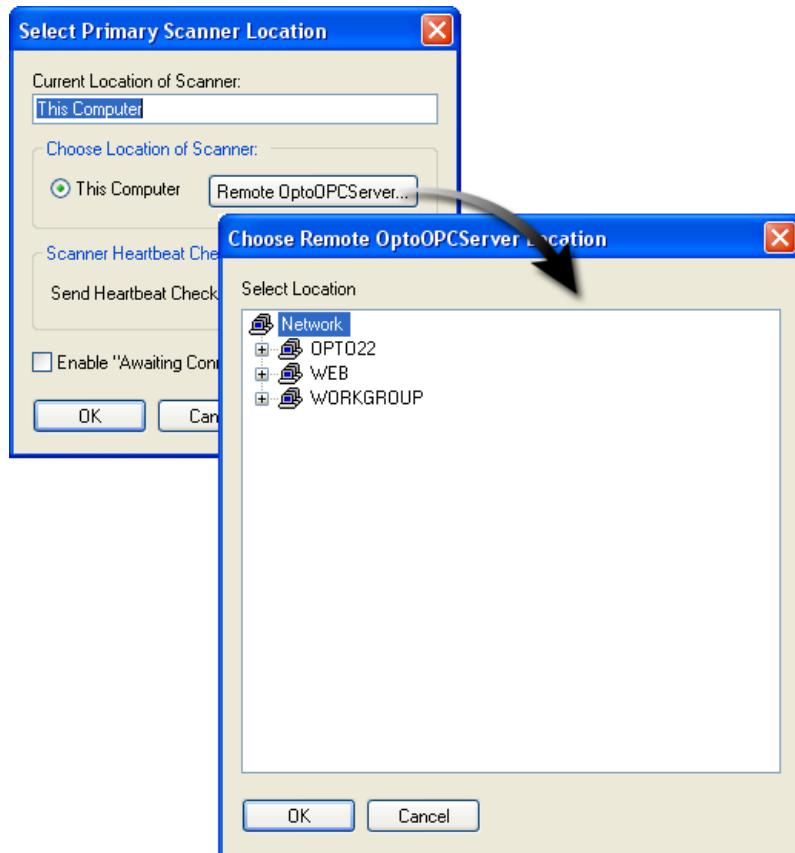


### Configuring a Remote Scanner Location in PAC Display Basic

To use a remote computer running OptoOPCServer as a scanner:

1. Start PAC Display Configurator.<sup>2</sup>

2. In the menu bar, click Configure > Scanner Location.
3. In the Select Scanner Location dialog box that opens, click Remote OptoOPCServer.



4. In the list of computers that appears, navigate to the PC that has OptoOPCServer software installed and configured. Select the computer and click OK.

*IMPORTANT: To successfully use OptoOPCServer on a remote computer with PAC Display, Windows user and application permission settings on both local and remote computers must be correctly configured. For detailed instructions for configuring OptoOPCServer and OPC clients for network operation, see the OptoOPCServer User's Guide (form 1439), included with the purchase of OptoOPCServer.*

5. Click OK to close the dialog box and save your settings.



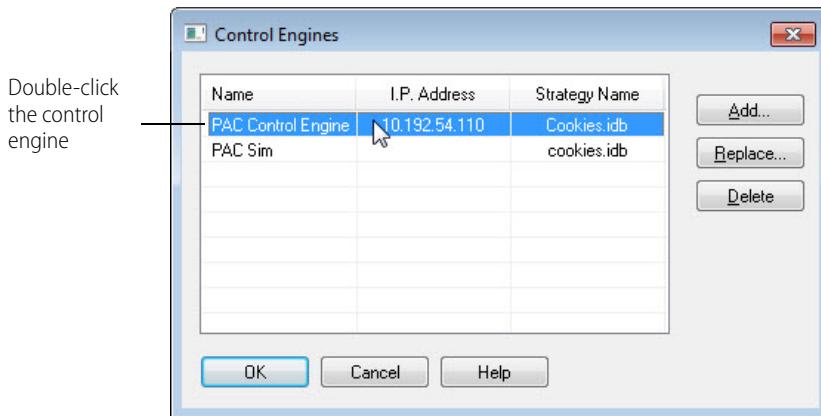
#### Configuring a Remote Scanner in PAC Display Pro

1. Click Configure > Control Engine(s).
2. In the Control Engines dialog box, double-click the control engine you want to configure.

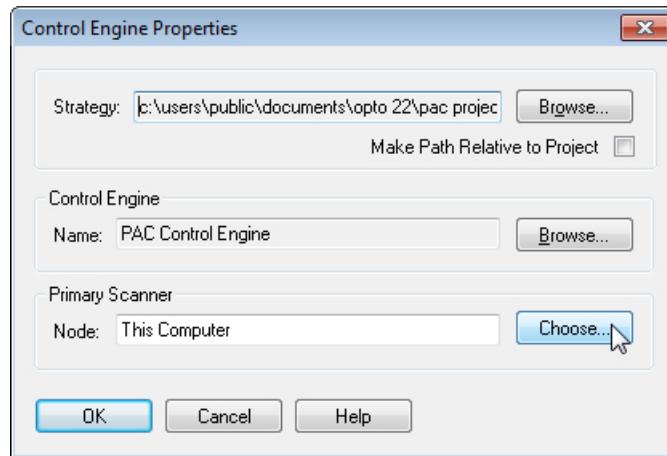
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<sup>2</sup>For instructions to start PAC Display Configurator, see page 7.

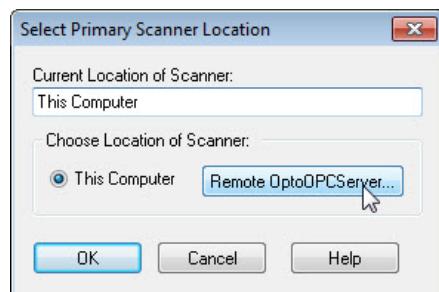
## CONFIGURING THE SCANNER



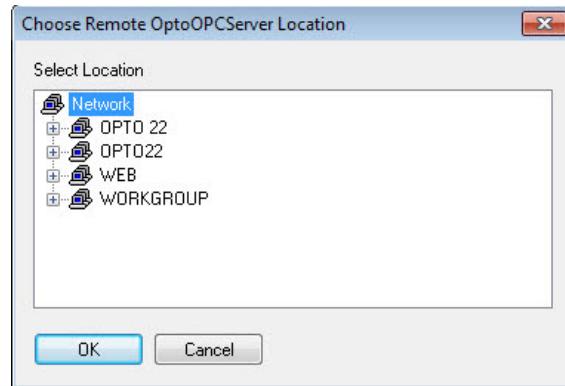
3. In the Control Engine Properties dialog box, click the Choose... button.



4. Click the Remote OptoOPCServer button.



- In the list of computers that appears, navigate to the PC that has OptoOPCServer software installed and configured. Select the computer and click OK.



**IMPORTANT:** To successfully use OptoOPCServer on a remote computer with PAC Display, Windows user and application permission settings on both local and remote computers must be correctly configured. For detailed instructions for configuring OptoOPCServer and OPC clients for network operation, see the OptoOPCServer User's Guide (form 1439), included with the purchase of OptoOPCServer.

- Click OK in each open dialog box to save your changes.

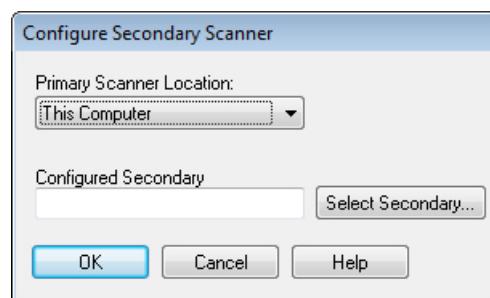
To set up a secondary scanner, see the next section, “Configuring a Secondary Remote Scanner in PAC Display Pro.”

#### Configuring a Secondary Remote Scanner in PAC Display Pro

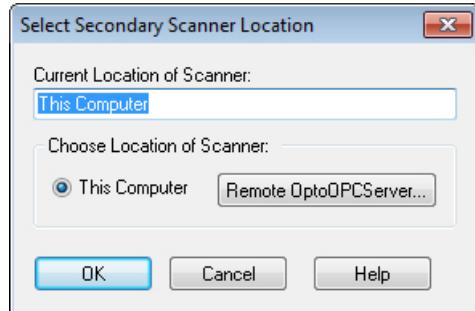


For each local or remote scanner the PAC Display project uses, you can set up a secondary scanner that will be used when the primary scanner is not available.

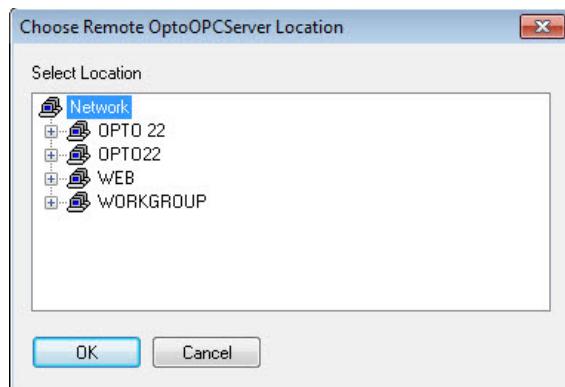
- In PAC Display Configurator, click Configure > Secondary Scanner Location. The Configure Secondary Scanner dialog box appears.



2. Make sure the correct computer is selected for Primary Scanner Location and then click Select Secondary.



3. In the Select Secondary Scanner Location dialog box, click Remote OptoOPCServer and select a computer from the list tree that you want to use for the remote secondary scanner. Click OK when done.



*IMPORTANT: To successfully use OptoOPCServer on a remote computer with PAC Display, Windows user and application permission settings on both local and remote computers must be correctly configured. For detailed instructions for configuring OptoOPCServer and OPC clients for network operation, see the OptoOPCServer User's Guide (form 1439), included with the purchase of OptoOPCServer.*

4. Click OK to save your changes and close the Select Secondary Scanner Location dialog box.
5. In the Configure Secondary Scanner dialog box, click OK to save your changes.

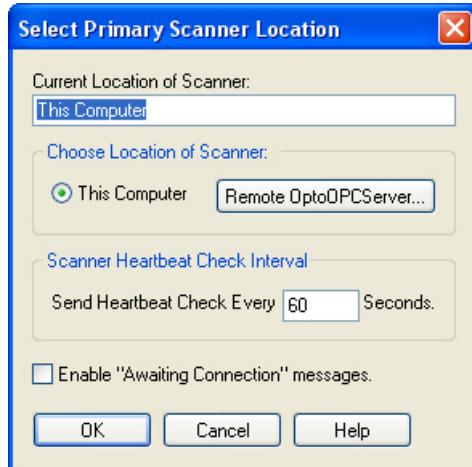
### Setting Scanner Heartbeat Interval

When a PAC Display project is running, PAC Display periodically checks to see if the scanner is operating. If the scanner is not operating, an error message is displayed in the Runtime Error Log. The Scanner Heartbeat Check Interval is the interval in seconds at which PAC Display will check to see if the scanner is operating.

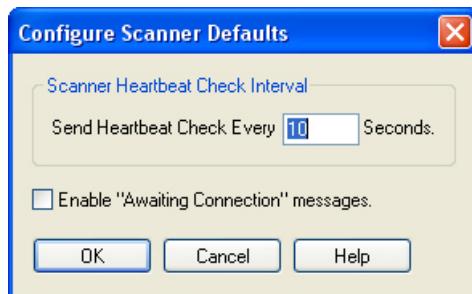
To set how often PAC Display checks the operation of the scanner:

1. In PAC Display Configurator Basic, select Configure > Scanner Location.  
In Pro, select Configure > Scanner Defaults.

For Basic, the Select Scanner Location dialog box appears.



For Pro, the Configure Scanner Defaults dialog box appears.



2. In Scanner Heartbeat Check Interval, enter the interval in seconds at which PAC Display will check to see if the scanner is operating.  
You can enter a value between 1 and 3600 seconds (integer values only). The default value of 10 seconds is suitable for most applications. If there is a slow communications link between the computer running the PAC Display project and the computer running the scanner, use a longer heartbeat interval to reduce network traffic.
3. Click OK to close the dialog box and save your settings.

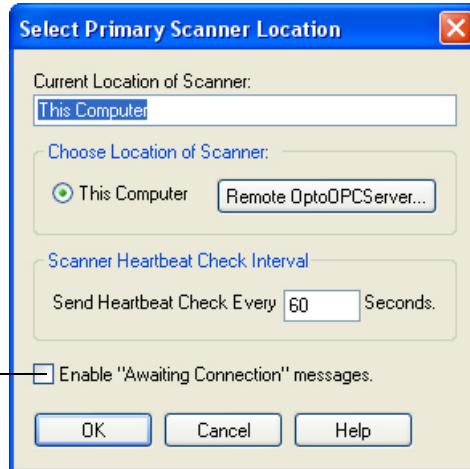
### Hiding or Displaying Runtime Startup Messages

When a PAC Display project starts in Runtime, multiple “Bad Quality” or “Not Connected” messages often appear in the Event Log Viewer. These startup messages appear when the PAC Display scanner has not yet connected to a control engine specified in the project. To hide or display these Runtime startup messages, do the following:

1. In PAC Display Configurator Basic, select Configure > Scanner Location.  
In Pro, select Configure > Scanner Defaults.

## CONFIGURING TAGS

The Select Scanner Location dialog box appears.



Select the Enable "Awaiting Connection" Messages check box to display all startup messages. Deselect this check box to hide Bad Quality and Not Connected startup messages.

2. Select or deselect the Enable "Awaiting Connection" Messages check box to display or hide any "Bad Quality" or "Not Connected" messages that may occur when the PAC Display project starts.
3. Click OK to close the dialog box and save your settings.

## CONFIGURING TAGS

Graphic objects in PAC Display can be linked directly to the values of PAC Control tags, so you will configure tags quite often as you develop PAC Display projects. (For detailed information on item types and names in PAC Control strategies, see the [PAC Control User's Guide](#) (form 1700).

There are two ways to configure tags:

- The Tag Selection dialog box
- Quick Tag Entry

If you aren't familiar with the tag names in your PAC Control strategy, use the Tag Selection dialog box ([page 76](#)). This option displays all of the tag names (filtered by type), so you can scroll down to find the one you want.

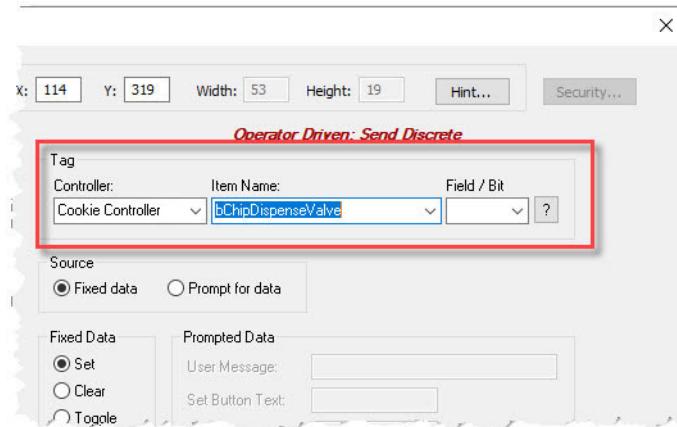
If you know at least the first few letters of the tag name, the Quick Tag Entry method is fast and easy ([page 74](#)).

### Using Quick Tag Entry

To access Quick Tag Entry:

1. Click anywhere in the Tag Name field of a Dynamic Attribute dialog box.

Quick Tag Entry appears.



2. In each text box, start typing the value you want. As you type, PAC Display filters the list of matching values. When the value you want appears, press Tab to save the value and advance to the next field.

*TIP: In a long list of values, start typing the value you want, and then press the down-arrow key to scroll through the list of matching values.*

3. After you select a value in the last field, press Tab to save your selections and close Quick Tag Entry.

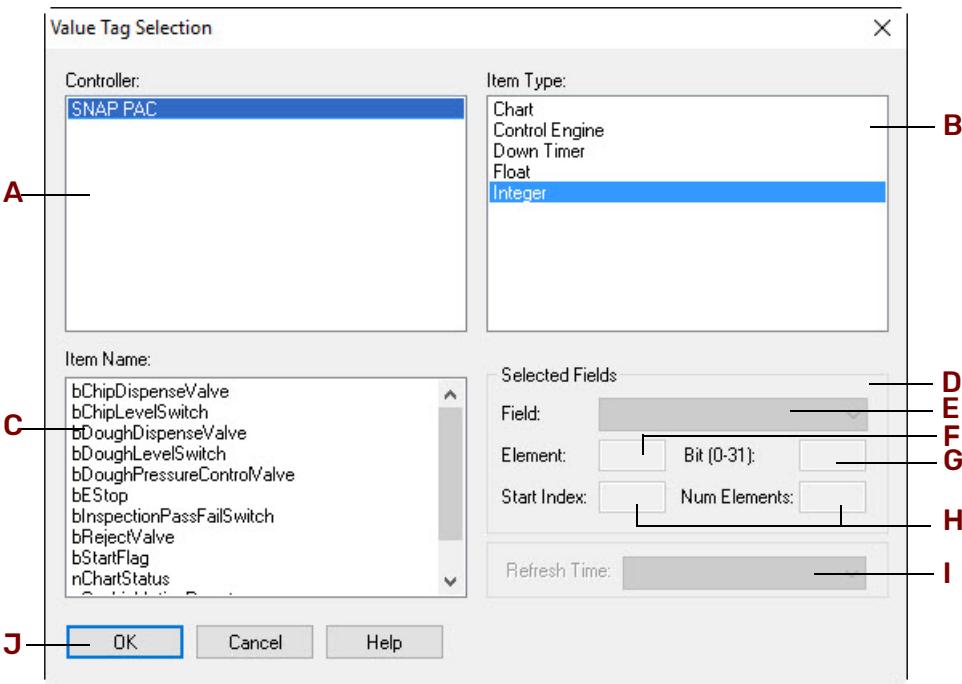
### Using the Tag Selection Dialog Box

You access the Tag Selection dialog box from many dialog boxes in PAC Display Configurator by clicking the Tag Selection button .

The tags that appear in the Tag Selection dialog box are actively filtered; rather than display all possible item types and item names, only the item types available for the selected control engine appear in the Item Type list, and only the item names available for a selected item type appear in the Item Name list.

To configure a tag, complete the fields as described in ["Tag Selection Dialog Box"](#) below.

Tag Selection Dialog Box



**(Pro only)(A) Controller.** Select the control engine that contains the tag you wish to use. If only one control engine is available, it is automatically selected. Choosing a control engine updates the Item Type list (B) so that it displays only the PAC Control data types available in that control engine's PAC Control strategy.

**(B) Item Type.** Select the type of data you wish to use. The list contains the data types available in the selected control engine's PAC Control strategy. (The data types that appear depend on which data type was selected in the "Setup by" field in the preceding dialog box.) When you select a specific item type, a list of all the tags of that selection type appears in the Item Name list box (C). Your Item Type selection also determines the options available in the Selected Fields group (D).

PAC Display can access tags for most types of variables and other information in a PAC Control or OptoControl strategy. See the [PAC Control User's Guide](#) (form 1700) or the [OptoControl User's Guide](#) (form 724), for information on a specific type of variable.

*NOTE: In order to get the value referenced by a pointer, use the variable's actual type, such Integer, Float, and so on. You cannot use a variable from a Pointer Table.*



PAC Display can also access memory-map-based Scratch Pad variables in SNAP Ultimate controller/brains, the SNAP-LCE controller, and SNAP PAC controllers; see ["Selecting Tags for I/O Unit Scratch Pad Variables"](#) on page 80 for information on configuring Scratch Pad variables in the Tag Selection dialog box.

See also, ["Tag Types You Can Save to a Historical Data Log"](#) on page 216.

**(C) Item Name.** This is an alphabetical list of the available PAC Control tags of the type specified in the Item Type list. Select the tag you want to use from this list.

**(D) Selected Fields.** The item type of the tag you select determines which of these fields, if any, need to have contents specified. If an entry is not needed, then the option is not available.

*IMPORTANT: There are differences in how some tags are configured in this dialog box.*

If SNAP high-density digital modules are used in your I/O system, see “[Tag Selection Dialog Box \(High Density Digital Tag Type\)](#)” on page 79 for more information.



If the Scratch Pad feature available in some SNAP brains is used to store bit, integer, floating point, or string values, see “[Selecting Tags for I/O Unit Scratch Pad Variables](#)” on page 80 for more information.

**(E) Field.** Specifies the data that is associated with the selected tag. For example, if the selected tag is of Item Type Digital Input Point, the available field is State. If the tag Item Type is Float, the Field list box is disabled.

For the **Send String** tag type:

- *Time* returns the control engine’s current time.
- *Date* returns the control engine’s current date.
- *Strategy Date* returns the date stamp of the strategy file in the control engine.
- *Strategy Time* returns the time stamp of the strategy file in the control engine.

For the **PID Loop** tag type:

- *Auto/Manual Flag* This option is not recommended; it is available only for backward compatibility. It is not available for non-Ethernet PID tags. If PAC Display is configured to scan I/O tags from the I/O unit (the default), this option determines if the PID loop is in manual mode (Manual = True (1) = Discrete ON; Auto = False (0) = Discrete OFF). However, if PAC Display is configured to scan I/O tags through the controller, it will determine whether the PID loop is in Auto (Auto = True (1); Manual = False (0)). For all new development, use the Is Manual? option instead.
- *Is Manual?* This is the recommended option and should be used for all new development. It is not available for non-Ethernet PID tags. It determines if the PID loop is in manual mode. When in manual mode, the value will be True (1); when in Auto mode, the value will be False (0). It is consistent whether PAC Display is configured to scan the I/O tags through the controller or directly from the I/O unit.
- If the PID loop is in manual, it will return a discrete ON. If the PID loop is in Auto, it will return a discrete OFF.
- To put the loop in Auto, set the Is Manual? option to discrete OFF. To put the loop into manual, set it to discrete ON.

*NOTE: To set whether tags are retrieved directly from the I/O unit or through the controller, go to Configure > Runtime and choose the I/O Unit Tags tab. If an I/O unit is checked, the tags are retrieved directly through the I/O unit. If unchecked, the tags are retrieved through the controller. For more information, see “[Runtime Setup: I/O Unit Tag Tab](#)” on page 319*

- *Configuration Flags* PID 0: Configuration flags:  
1 = Enable square root of Input.  
2 = Force output when Input is out of range.  
4 = Switch to manual mode when input goes out of range.

**(F) Element.** If the selected Item Type is one of the Table types and only a single element of the table is desired, enter the index of that element in this field.

**(G) Bit.** If the base type is Integer, a specific bit in the range specified may be selected from the integer.

For configuring a Discrete control engine-driven dynamic attribute, if you are configuring an integer tag type and do not specify a bit index and the integer value is 0, the tag will evaluate to FALSE. Any non-zero value will be considered TRUE. However, if you do specify a bit and the bit is OFF, the tag will evaluate to FALSE; if the bit is ON, the tag will evaluate to TRUE.

For configuring the Send Discrete operator-driven dynamic attribute, if you specify a bit, the following message will appear: “No bit index is specified. All bits will be set. OK to continue?” However, if you select a bit index, then only that bit will be modified.

For more information, see “[Dynamic Attributes and Their Features](#)” on page 140.

**(H) Start Index.** To select multiple elements from Item Type Table, use the Start Index to specify the first element and Num Elements to specify how many.

**(I) Refresh Time.** If a control engine-driven attribute is being edited, select the refresh time group to be used for scanning. All tags that are defined as part of the same refresh time group are scanned at the same time. A time group with a refresh time of 0 seconds is scanned as quickly as the speed of the communications link permits.

**(J) OK.** Click OK to save your settings. (Click Cancel to close the dialog box without making any changes.)

## Selecting Tags for SNAP High-Density Digital Modules

For high-density digital points configured in PAC Control *with a name*, you can select tags in the same manner as for standard density digital modules, or you can use the High Density Digital tag type in the Tag Selection dialog box. For high-density digital points *without a name*, use the High Density Digital tag type in the Tag Selection dialog box. See “[Tag Selection Dialog Box \(High Density Digital Tag Type\)](#).”

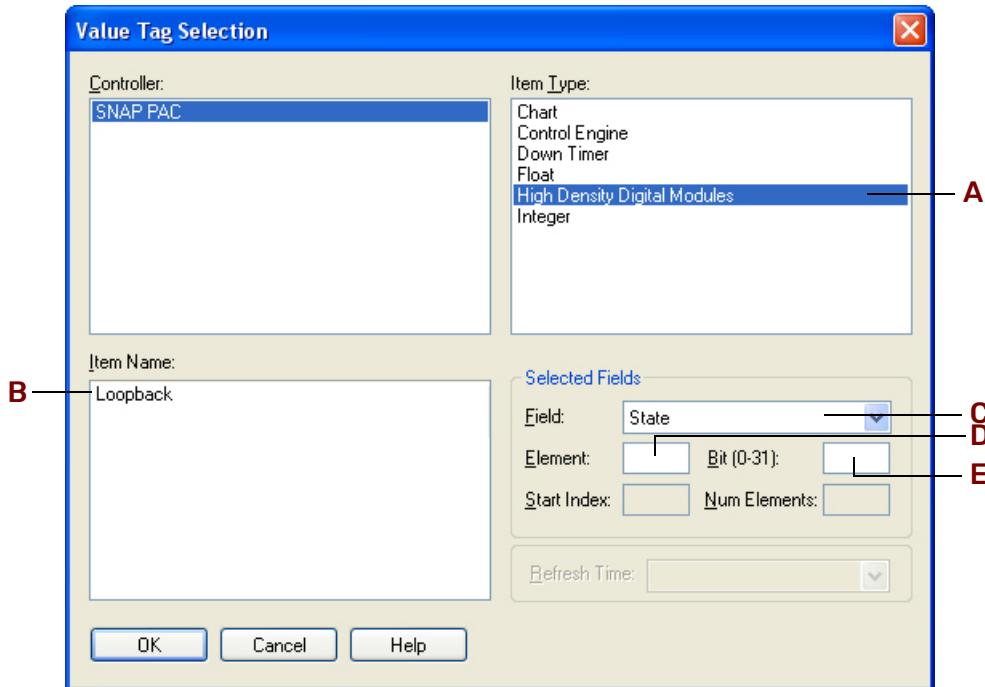
*NOTE: Points configured in PAC Control 7.1 or earlier are not named. To select tags for these points, you must use the High Density Digital tag type.*

Using the High Density Digital tag type, it is possible to configure a tag that refers to either a named high-density digital point or to one that is not named. For example, if a high-density digital point named HDDI\_A has been configured at module 0, channel 15, you can configure a tag for this point using one of the following methods in the Tag Selection dialog box:

- Select Digital Input Points as the Item Type. Under Item Name, select HDDI\_A.
- Select High Density Digital as the Item Type. Then under Selected Fields, enter 0 in the Module field and 15 in the Point field.

High-Density digital modules provide 32 digital input or output points in one SNAP module. See the [PAC Control User’s Guide](#) (form 1700) for information on using these modules in a PAC Control strategy. For more information, see the [SNAP High-Density Digital Module User’s Guide](#) (form 1547).

### Tag Selection Dialog Box (High Density Digital Tag Type)



**(A) Item Type.** Select the item type “High Density Digital” to see all I/O units configured in the PAC Control strategy for your PAC Display project.

If the PAC Control strategy has at least one configured I/O unit, “High Density Digital” always appears in the Item Type list, even if a SNAP high-density digital module is not used in your I/O system.

**(B) Item Name.** Select the name of the I/O unit where the SNAP high-density digital module you want to use is installed.

**(C) Field.** Choose a field based on the type of dynamic attribute (control engine-driven or operator-driven), and whether you want to work with a single point on the high-density module or all 32 points. One or more of the following fields will be available:

Field	Dynamic Attribute	Tag	Description	Must specify:	
				Module	Point
State	Control engine-driven	Discrete	Returns on/off status of specified point.	●	●
		Value	Returns a 32-bit integer indicating status of all 32 points.	●	n/a
	Operator-driven	Discrete	Sends a true/set to set state and a false/clear to clear state.	●	●
		Value	Sends a 32-bit integer to set states of all 32 points.	●	n/a
Counts	Control engine-driven	Discrete	n/a	n/a	n/a
		Value	Returns a 32-bit integer for a single point.	●	●
	Operator-driven	Discrete	See “Read and Clear” on page 151.		
		Value	See “Read and Clear” on page 151.		

Field	Dynamic Attribute	Tag	Description	Must specify:	
				Module	Point
<b>Latch (ON)</b>	Control engine-driven	Discrete	Returns Latch (ON) status of specified point.	●	●
		Value	Returns a 32-bit integer indicating status of all 32 points.	●	n/a
	Operator-driven	Discrete	Clears ON latch. Choose "Set" to clear latch if "prompt for value" dialog box is used.	●	●
		Value	Sends a 32-bit integer to clear ON latches of all 32 points.	●	n/a
<b>Latch (OFF)</b>	Control engine-driven	Discrete	Returns Latch (OFF) status of specified point.	●	●
		Value	Returns a 32-bit integer indicating status of all 32 points.	●	n/a
	Operator-driven	Discrete	Clears OFF latch. Choose "Set" to clear latch if "prompt for value" dialog box is used.	●	●
		Value	Sends a 32-bit integer to clear OFF latches of all 32 points.	●	n/a

**(D) Module.** Enter the position (0–16) where the high-density digital module is installed on the mounting rack.

**(E) Point.** Enter the number (0–31) of the module's digital input or output point.



### Selecting Tags for I/O Unit Scratch Pad Variables

Opto 22 SNAP PAC controllers have a section of memory called the Scratch Pad where bit, integer, floating point, and string values can be stored and accessed. The Scratch Pad is convenient for making information available to other Ethernet-enabled Opto 22 brains and controllers, as well as Opto 22 software and custom software applications written using Opto 22's OptoMMP Communication Toolkit.

See the [PAC Manager User's Guide](#) (form 1704) and the [PAC Control User's Guide](#) (form 1700) for information on using bit, integer, floating point, and string Scratch Pads.

*NOTE: The SNAP controller or brain using the Scratch Pad must be defined as an I/O unit in the PAC Control strategy that the PAC Display project is using.*

In PAC Display, tags for Scratch Pad *integer* and *floating point* values are configured the same way as tags for a PAC Control numeric table variable. Like a table variable, for these Scratch Pads you must specify an index number and the number of elements to be read. Scratch Pads for integer and floating point values can have up to 10,240 elements, but unlike PAC Control table variables, the elements in these Scratch Pads are non-contiguous. This means that when you specify a range that exceeds 1024 elements (indexes 0–1023), the range must be divided between two tags as shown below.

Item Name in Tag Selection Dialog Box	Description	First Element	Last Element
<i>IO_Unit_Name:SP_INT</i>	Scratch Pad integer value	0	1023
<i>IO_Unit_Name:SP_INT_EXT</i>	Scratch Pad integer value, extended	1024	10239
<i>IO_Unit_Name:SP_FLOAT</i>	Scratch Pad floating point value	0	1023
<i>IO_Unit_Name:SP_FLOAT_EXT</i>	Scratch Pad floating point value, extended	1024	10239

**Example:** The I/O unit labeled “Station\_01” has floating point values stored in elements 0 to 2047. To display all these values using, for instance, PAC Display’s Table object you would need to do the following:

1. Create one table control, which can display up to sixteen separate Table objects.
2. In the Tag Selection dialog box for the first table object, select the Item Name “Station\_01:SP\_FLOAT.”
3. For the Start Index value, enter 0, and for Number of Elements, enter 1024.
4. In the Tag Selection dialog box for the second table object, select the Item Name “Station\_01:SP\_FLOAT\_EXT.”
5. For the Start Index value, enter 1024, and for Number of Elements, enter 1024.

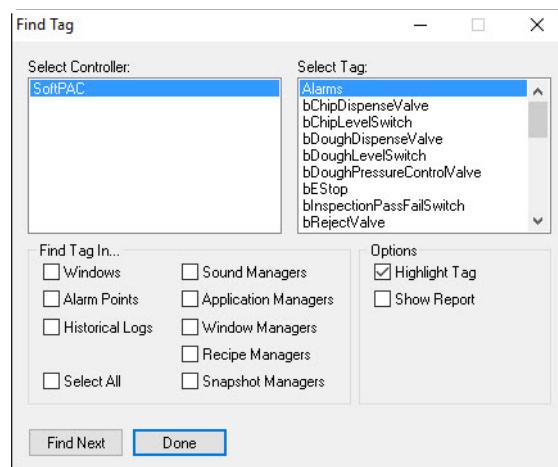
When the project is run in PAC Display Runtime, the first table will show floating point values in indexes 0 through 1023, while the second table will show values in indexes 1024 through 2047.

## Searching for Tags in a PAC Display Project

See also, [“Finding and Replacing Tags in a PAC Display Project”](#) below.

You can search a PAC Display project to find where a PAC Control tag has been used.

1. Click View > Find Tag. The Find Tag dialog box appears.
2. Highlight the tag you want to find.



3. Under Find Tag In, choose where to search for the tag.  
To quickly select all “Find Tag In” options, click Select All.
4. Under Options, select how to display the results.
5. Click Find Next to find the tag.
6. Click Done to close the dialog box.

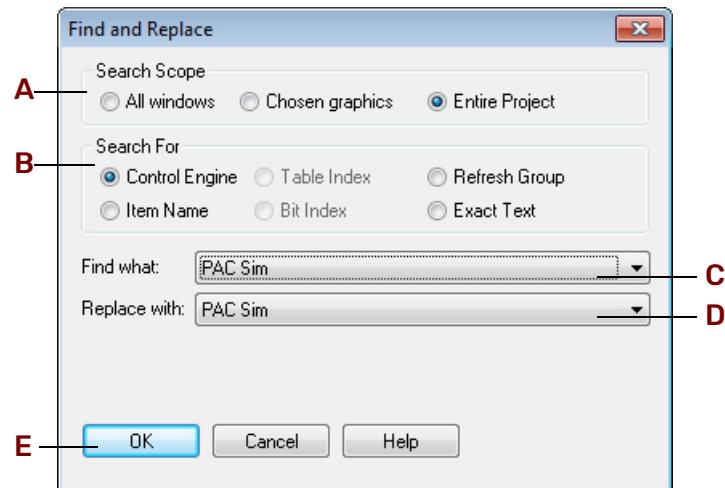
## Finding and Replacing Tags in a PAC Display Project

You can find and replace tags in an entire PAC Display project, or just in one or more selected graphic objects. This find and replace feature works with tags for a control engine, item name, table index, or bit index.

1. In a draw window in PAC Display Configurator, select the graphic objects you want to search and replace tags in. To search graphic objects in the entire PAC Display project, select at least one object on the screen.
2. Click Edit > Replace. (You can also right-click a graphic object and select Replace from the pop-up menu.)

The Find and Replace dialog box appears.

## Find and Replace Dialog Box

**(A) Search Scope.** Select one:

- All windows to search and replace in all windows in the PAC Display project.
- Chosen graphics to search and replace tags in just the graphic objects you've selected.
- Entire Project to search and replace tags in all parts of the PAC Display project.

**(B) Search For.** Select the type of tag to search and replace.

**Refresh Group:** A refresh time group determines how often the tag is scanned. To change all tags in the search scope from one refresh group to another, in Find what (**C**), enter the number of the refresh group to change from. In Replace with (**D**), enter the number of the refresh group to change to. The numbers must be in the range 0–13. For more information, see “[Scanning to Update Graphic Objects](#)” on page 182.

**Offset By:** If you select Table Index or Bit Index, the Offset By option appears. To offset a bit or table index, either enter the value or use the up and down arrows.

Find what:	<input type="text"/>
Replace with:	<input type="text"/>
Offset By:	<input type="text" value="0"/>

This feature allows you to select one or several graphic objects and change the index easily. For example, if you want to copy a set of graphic objects so that the second set of objects looks at a different table or bit index than the first set, rather than manually changing all the tags, you can just select all the objects in the new set and use Offset By to change all the table or bit indexes at once.

**NOTE:** If you enter a value in either the Find what or the Replace with field, the Offset By controls are disabled.

**Exact Text:** Search and replace text in tag names, button text, labels, trend pens, refresh group text, combo box entries, and so on. Choose from the following options to further define the scope of the search.

- Tags: Searches tags, triggers, and notifications.
- Text on Window Objects: Searches labels, button text, combo box text, and so on. It does not search/replace the names of the windows themselves.
- Everywhere: Searches for both Tags and Text on Window Objects. It does not search recipe files.

**(C) Find What.** Enter the name of the tag to find. If either Control Engine or Item Name is selected in Search For (**B**), you can choose the item from a drop-down menu. For Item Name, you can also enter the exact name of the item directly in the text field. For all other tag types, enter in the text field the name of the tag exactly as it appears in the PAC Control strategy.

**(D) Replace With.** Enter the name of the tag to replace the tag found in Find What (**C**). The replacement item must be the same kind of item as the item being searched for. If either Control Engine or Item Name is selected in Search For (**B**), you can choose the item from a drop-down menu. For Item Name, you can also enter the exact name of the item directly in the text field. For all other tag types, enter in the text field the name of the tag exactly as it appears in the PAC Control strategy.

**(E) OK.** Click OK to start the search, or click Cancel to close the dialog box without any changes.

## CORRECTING TAGS FROM A STRATEGY

When you select a PAC Control strategy to use with your PAC Display project, PAC Display automatically imports that strategy's tag name database. This is unlike most other HMI software applications, which require you to create a separate SCADA database in addition to the strategy or control program itself.

This tight connection with the strategy's tag name database, however, can sometimes cause problems when the current PAC Control strategy used by a PAC Display project is modified. PAC Display may incorrectly read the tags associated with the resulting strategy. PAC Display Configurator includes a feature called AutoCorrect Tags that fixes most tag errors that may occur this way.

The AutoCorrect Tags feature works by comparing all tag names, IDs, and table index references that are used with dynamic attributes in the PAC Display project. If discrepancies are found between the items in the tag name database and the PAC Display project, the errors that can be corrected are fixed. Both corrected tags as well as those that could not be corrected are listed in the results report AutoCorrect Tags generates.

### When to Use AutoCorrect Tags

It's generally advisable to use the AutoCorrect Tags option after making any changes to the PAC Control strategy associated with your PAC Display project. Specifically, you should run AutoCorrect Tags in the following situations:

- If you use a PAC Display project that contains objects you imported or copied from an OptoDisplay project. (OptoDisplay is the HMI authoring tool for Opto 22's FactoryFloor Software Suite.)
- If you import a window created in a different PAC Display project. (Window files can be exported from a PAC Display project, saved as files, and imported into another project. See "[Importing, Exporting, and Saving Windows](#)" on page 98 for information.)

There are some tag errors in a PAC Display project that AutoCorrect Tags cannot fix. These errors include if you do either of the following:

- Delete a tag from a strategy
- Shorten the length of a table in a strategy

You may also get unreliable results if you delete a tag from a strategy, and then create a new tag with the same name.

### Using AutoCorrect Tags

*IMPORTANT: Always save changes to your PAC Display project before using the AutoCorrect Tags option.*

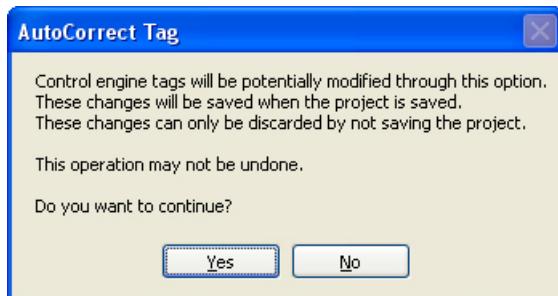
If you don't want to use the corrections made by AutoCorrect Tags, simply close the project without saving. Remember that not saving the project means you will lose any other changes you have made to the project.

## CORRECTING TAGS FROM A STRATEGY

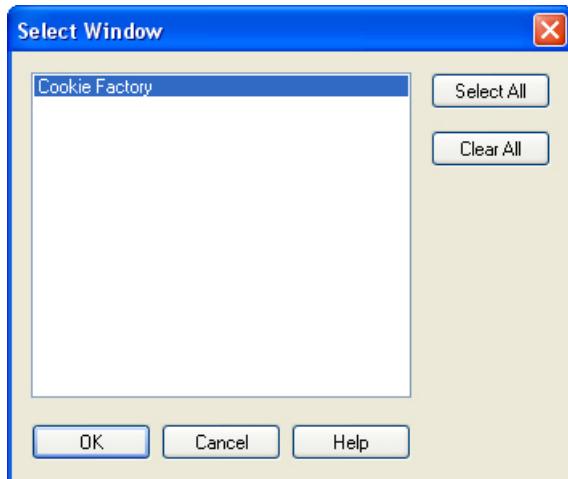
Follow these steps to correct tags in your PAC Display project:

1. Click Tools > AutoCorrect Tags.

The following warning appears.



2. Click Yes. The Select Window dialog box appears.



3. Select one or more windows to run AutoCorrect Tags on.

This is useful for large PAC Display projects that may contain hundreds of windows, but have only a few windows that have been modified or imported.

4. If PAC Display finds any problems with the tags and can fix them, it will do so. The changes, however, won't become a permanent part of your project until you actually save the project.

5. To correct tags, click Yes. (Click No to close the window and not make any changes.)

The Windows application WordPad launches, displaying a results file that describes any problems AutoCorrect Tags may have found with the tags from the strategy. The results file has a name of the form Opton.\$\$\$, where **n** is an arbitrary number.

The following sample file shows the results created by AutoCorrect Tags:

```
Title:PAC Display AutoCorrect Tags Results File
Project:C:\Opto22\PAC Display\Examples\Factory.uui
A— File:C:\Temp\Opto2.$$$
B— Date:2001/10/03
Time:13:05:58
Comment:This file is not deleted automatically.
Summary information is provided at the end of this file.
C— Table length changed in strategy (tag corrected):
    Tag name: Marvin138:Float Table.RecipeFloatTbl(1)
    Old Length: 5
    New Length: 3
    Location: Window - master, Ellipse at 38,159, DynAttrColor
D— Tag not found in strategy (cannot correct):
    Tag name: Marvin138:Integer.HistoricLogTrigger2
    Location: Historical Log - Mass Storage, Start Trigger
E— Name changed in strategy (tag corrected):
    Old Tag Name: Marvin138:Integer.DOWNLOAD_TRIGGER
    New Tag Name: Marvin138:Integer.ACTIVATE_DOWNLOAD
    Location: Recipes - Peanut Butter Cookies, Trigger
F— Name changed in strategy (tag corrected):
Table length changed in strategy (tag corrected):
Index into table out of bounds (cannot correct):
    Old Tag Name: Marvin138:Integer Table.RecipeIntegerTbl(4)
    New Tag Name: Marvin138:Integer Table.RecipeIndex(4)
    Old Length: 5
    New Length: 3
    Location: Recipes - Peanut Butter Cookies, Notification
-----
G— Number of tags changed: 4
Number of tags not found: 1
Number of tags index into tables out of bounds: 1
```

Here's an explanation of what the results file contains:

**(A).** Name and location of the results file created by AutoCorrect Tags.

**(B).** Date and time the file was created.

**(C).** Warning message that reports that the table length of RecipeFloatTbl changed from an old length of five elements to a new length of three elements. "Location" shows where the tag was used in the PAC Display project. In this example, it was found in a window called "master," attached to an ellipse at x: and y: coordinates of 38 and 159, with the color dynamic attribute.

**(D).** Error message that the tag "HistoricLogTrigger2" is no longer part of the PAC Control strategy, and this could not be corrected by the AutoCorrect Tags tool. The tag was used as the start trigger for a data log called "Mass Storage."

To fix this error, you'll have to assign another tag in your PAC Display project to use as the start trigger for this log. (Note that PAC Display won't recreate the connection to the tag if you open your PAC Control strategy and add the old tag name again. Internally, PAC Display can't correlate the old tag name and the new, similarly named tag.)

## CONFIGURING A PROJECT WITH NO CONTROL ENGINE

**(E).** Warning message that the tag name “DOWNLOAD\_TRIGGER” changed to “ACTIVATE\_DOWNLOAD” in the strategy. The old and new tag names are reported, and the PAC Display project is corrected to use the new tag name. The tag was used in a recipe called “Peanut Butter Cookies” as its trigger.

**(F).** Warning message that multiple errors have been found for one tag name:

- The table name “RecipeIntegerTbl” changed to “RecipeIndex,” and its length changed from five elements to three elements. The PAC Display project is updated with this change.
- An “index into table out of bounds” error was detected and couldn’t be corrected. Specifically, the project tried to use the fifth element of the table (RecipeIntegerTbl[4]), but the fifth element no longer exists. To correct this problem you must specify a valid index. The tag was used in a recipe called “Peanut Butter Cookies.” When the recipe is successfully downloaded, PAC Display writes a value to this notification tag.

**(G).** The final tally of all the warnings and errors found by AutoCorrect Tags is reported here.

Note that if you run AutoCorrect Tags again, you will see only those errors that were reported as “cannot correct.” The other reported errors have been corrected.

When you no longer need the Opton.n\$\$\$ file, you can delete the file from your hard drive.

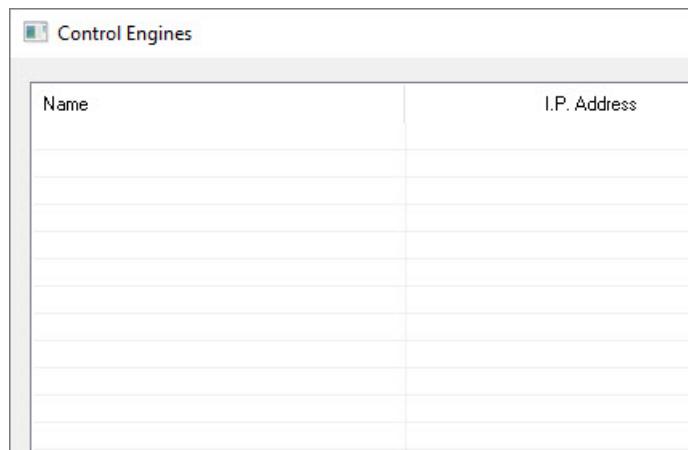
## CONFIGURING A PROJECT WITH NO CONTROL ENGINE

If you have a system with Ethernet I/O but no control engine, you can configure your PAC Display project to access your Ethernet I/O units. This requires creating a PAC Control strategy and configuring your I/O units and points as well as a control engine with an IP address that does not exist on the network.

Before you begin, make sure that you have created a PAC Control strategy that has properly configured I/O units and points, which PAC Display will use for its tag database. The strategy does not need to have any logic. For information on creating a PAC Control strategy, see the [PAC Control User’s Guide](#) (form 1700).

1. Start PAC Display Configurator<sup>3</sup>, and then open a project that will be associated with the control engine.
2. Click Configure > Control Engines.

The Control Engines dialog box opens.



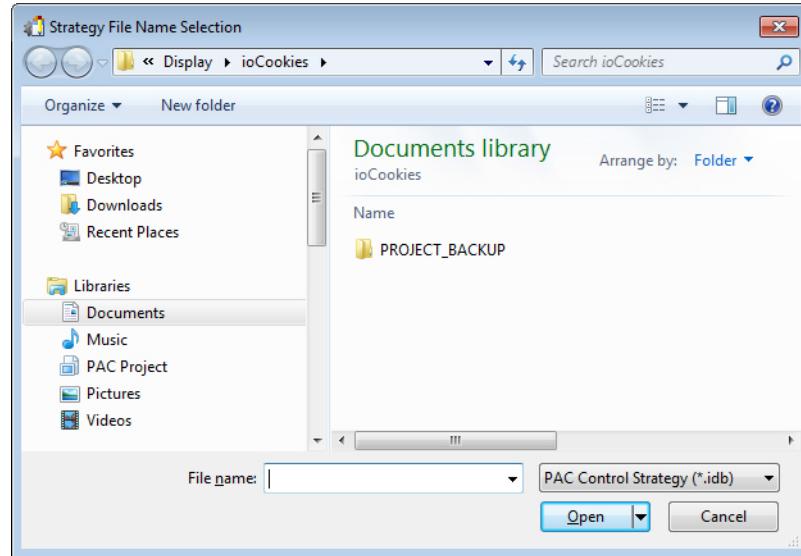
If you have not previously configured a control engine for the PAC Display project you opened, the Name list is empty and only the Add button is available.

3. To locate a PAC Control strategy, click Add.

---

<sup>3</sup>For instructions to start PAC Display Configurator, see [page 7](#).

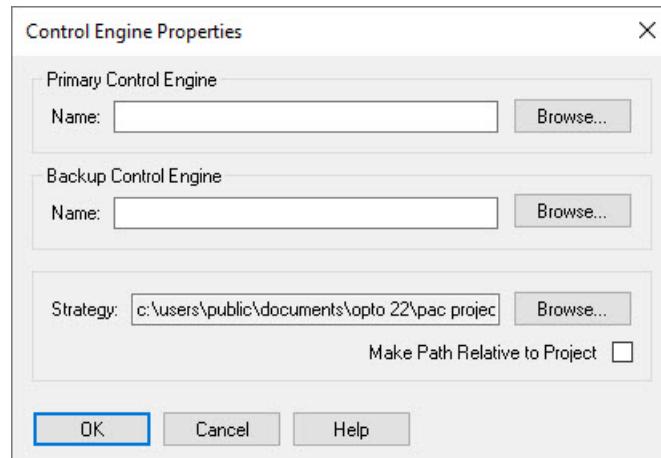
The Strategy File Name Selection dialog box appears.



*NOTE: PAC Display gets its tag database from a PAC Control strategy that you provide with properly configured I/O units and points. The strategy does not need to have any logic. For information on creating a PAC Control strategy, see the [PAC Control User's Guide](#) (form 1700).*

4. Navigate to the PAC Control strategy, select the strategy file and click Open.

The strategy you selected appears in the Strategy field of the Control Engine Properties dialog box.



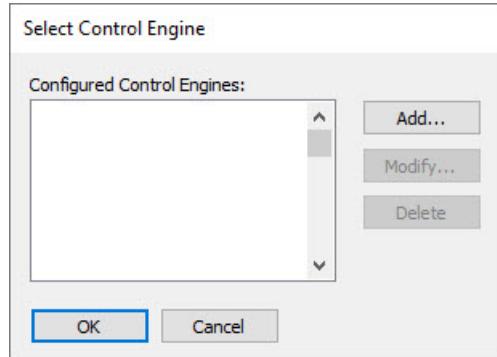
*NOTE: This dialog box is slightly different in PAC Display Professional, but the Strategy section and corresponding Browse button are the same.*

5. Click the Browse button in the Primary Control Engine group. You do not need to define a Backup Control Engine.

**Pro**

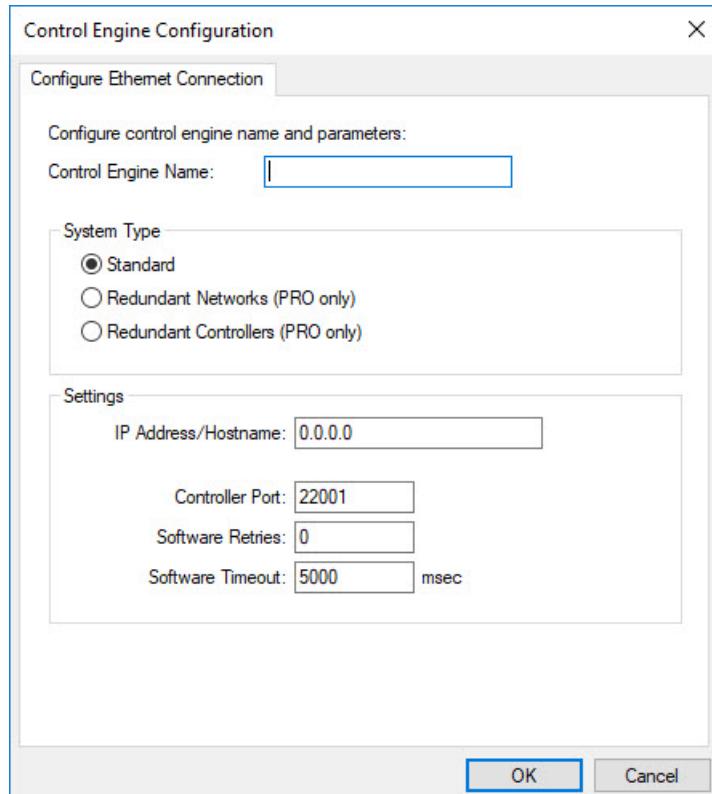
## CONFIGURING A PROJECT WITH NO CONTROL ENGINE

The Select Control Engine dialog box opens.



6. Click Add to add a control engine.

The Control Engine Configuration dialog box appears.

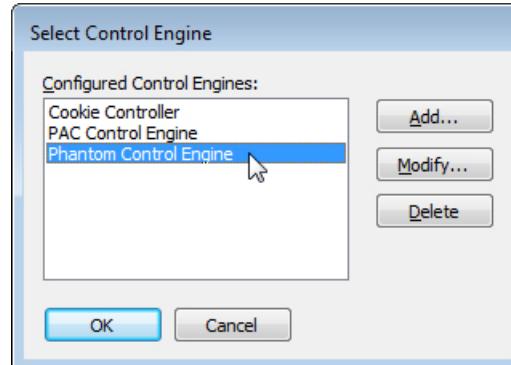


7. Enter a Control Engine Name.

The name can contain letters, numbers, spaces, and most other characters except colons and square brackets. Spaces cannot be used as first or last characters.

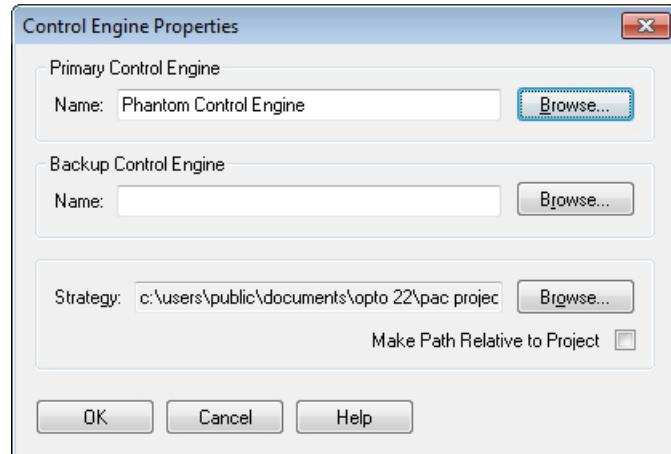
8. Enter a valid IP address that does not exist on the network. For assistance, ask your system administrator.
9. Make sure that you have not changed the values in the Port, Retries, and Timeout, and then click OK.

The non-existent control engine appears in the Select Control Engine dialog box.



10. Click the new control engine to select it, and then click OK.

The Control Engine Properties dialog box appears with the new control engine listed in the Primary Control Engine group.



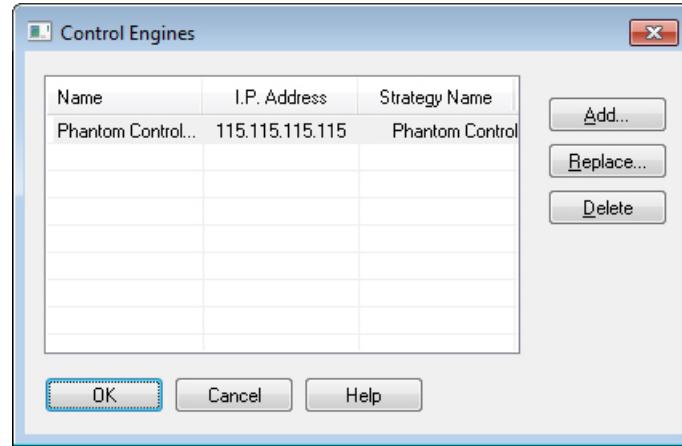
11. To change the path of the strategy to be relative to the current PAC Display project, select Make Path Relative to Project.

This allows the project to be more easily transferred to other PCs that don't have the exact same file structure.

12. Click OK.

## CONFIGURING A PROJECT WITH NO CONTROL ENGINE

The Control Engines dialog box appears with the new control engine.



13. Click OK to finish configuring the control engine.

# 6: Working with Graphic Objects

## INTRODUCTION

This chapter describes how to use PAC Display Configurator to create and edit graphic objects, and how to import images. It also describes how to configure the windows in which these items appear.

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<a href="#">Selecting Graphic Objects</a> .....	<a href="#">page 103</a>
<a href="#">Grouping and Locking Graphic Objects</a> .....	<a href="#">page 105</a>
<a href="#">Applying or Changing Line Attributes</a> .....	<a href="#">page 105</a>
<a href="#">Applying or Changing Fill Attributes</a> .....	<a href="#">page 107</a>
<a href="#">Importing Graphics</a> .....	<a href="#">page 107</a>
<a href="#">Saving Objects as Bitmaps</a> .....	<a href="#">page 109</a>
<a href="#">Copying, Duplicating, and Pasting</a> .....	<a href="#">page 109</a>
<a href="#">Moving and Resizing Graphic Objects</a> .....	<a href="#">page 110</a>
<a href="#">Changing Stacking Order</a> .....	<a href="#">page 113</a>
<a href="#">Deleting Graphic Objects</a> .....	<a href="#">page 115</a>
<a href="#">Aligning Graphic Objects</a> .....	<a href="#">page 115</a>
<a href="#">Rotating Objects</a> .....	<a href="#">page 116</a>
<a href="#">Flipping Objects</a> .....	<a href="#">page 118</a>
<a href="#">Applying Transparency to Graphic Objects</a> .....	<a href="#">page 118</a>
<a href="#">Working with Text</a> .....	<a href="#">page 119</a>
<a href="#">Adding a Windows Button or a PID Button</a> .....	<a href="#">page 121</a>
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## USING DRAW WINDOWS AND URL WINDOWS

Draw windows in PAC Display Configurator are “blank pages” in a PAC Display project where you place and edit graphic objects (including Trend, SuperTrend, and alarm objects). When you create a draw window, you can define its size, position, and color, as well as its behavior (child window or popup window) when the project opens in Runtime.

**(Pro Only)** In addition to draw windows, you can configure URL window, which are a simplified browser window that opens a specific URL. For example, you can use a URL window to display information at a



particular website, or display a web-based interface such as Opto 22's *groov* (see "[Adding a groov URL Window](#)" on page 93). When you create a URL window, you can define its size and position, as well as its behavior (child or popup) when the project opens in PAC Display Runtime. Forward and back buttons are provided for navigation. There is no keyboard support for static web pages in a URL window. See also, "[Adding a URL Control](#)" on page 131.

Draw windows and URL windows can be protected with a password, and be set up to open when an alarm is triggered. You can also configure whether menus, borders, scroll bars, and other standard window elements appear.

### Creating and Deleting Windows

When you create a new PAC Display project, one draw window appears in the main project window. To create additional draw windows, you can create a new window, or copy an existing window and its attributes.

#### Making a New Window

1. In Basic, click Window > New.  
In Pro, click Window > New > Graphic Window (or URL Window).  
The New Window dialog box opens.
2. Enter a name for the window, and configure other settings as necessary.  
See "[Modifying Draw or URL Windows](#)" below for instructions on configuring windows.
3. Click OK when done.  
The new window appears in the project window.

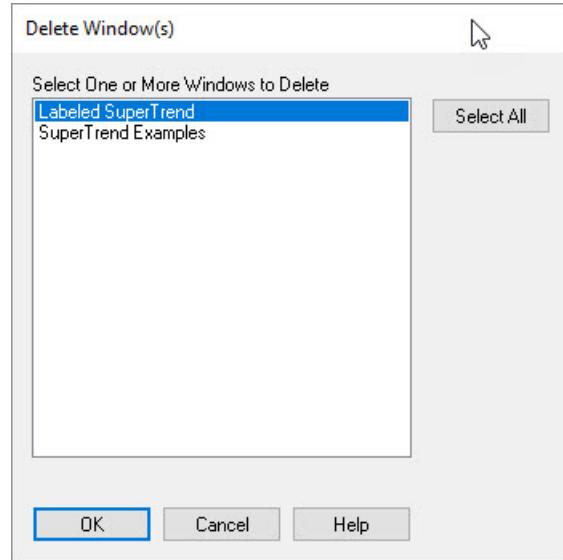
#### Copying an Existing Window

1. Click Window > Copy.  
The Copy Window dialog box opens.
2. Enter a new name for the window, and configure the existing settings if necessary.  
See "[Modifying Draw or URL Windows](#)" below for instructions on configuring windows.
3. Click OK when done.  
The new window appears in the project window.

#### Deleting Existing Draw Windows

1. Click Window > Delete.

The Delete Window(s) dialog box appears.

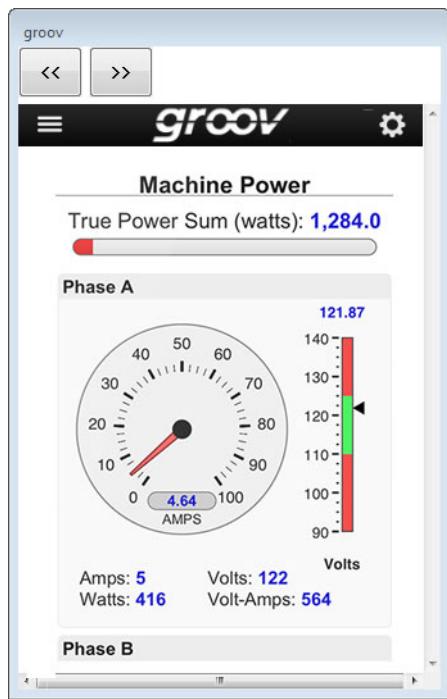


2. Select a single window, or select multiple windows by clicking Select All or by holding down the Ctrl key while selecting windows.
3. Click OK.  
If you selected more than one window, a message warns that deleting the windows cannot be undone.
4. Click Yes in the message box that appears to confirm the deletion.

### Adding a *groov* URL Window

If you have Opto 22's *groov* on your network, you can access your *groov* project in Runtime by creating a URL window that points to *groov*. When you create the window, make sure to enter the exact same URL for *groov* as you would in a regular browser including "https://".

Because *groov* is a web application rather than a static web page, you can use all of *groov* features from within a PAC Display URL window. For more information about *groov*, see the [groov Build and View User's Guide](#) (form 2027). Also see, "Adding a *groov* URL Control" on page 133.



## Modifying Draw or URL Windows

NOTE: For additional security features, see:

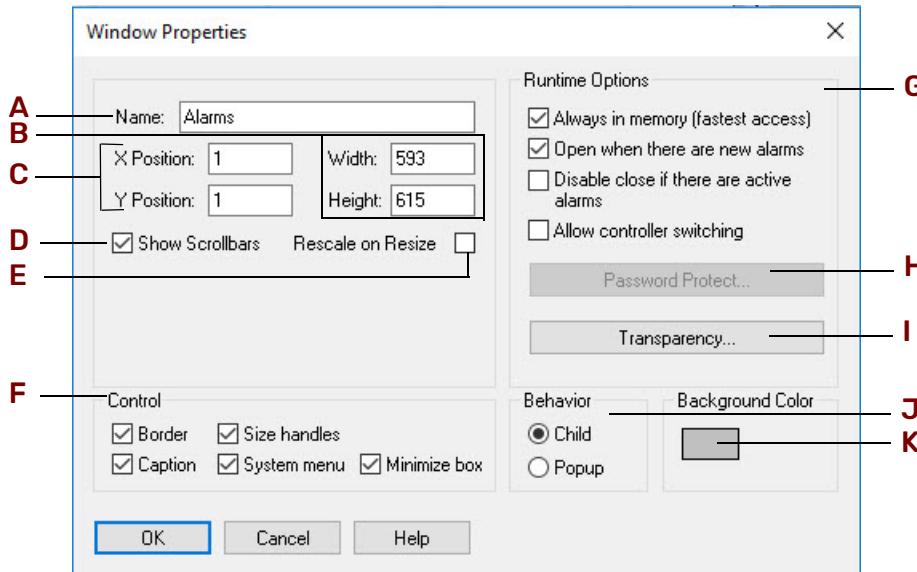
- ["Protecting a Project with a Password" on page 46](#) to assign a password to the PAC Display project to prevent unauthorized users from opening it in PAC Display Configurator.
- ["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#) to allow or deny operator access to individual graphic objects, based on configured, authorized users and groups.
- ["Runtime Setup: Security Tab" on page 297](#) to allow operator access to the HMI, as well as log all HMI use and operator actions to an encrypted archive.
- ["Viewing Logged-In Users in Runtime" on page 325](#) to view a list of the users currently logged in to PAC Display Runtime.

You can change many properties of a new or existing window, such as the window's position and behavior, among others. These properties are set in the Window Properties dialog box. To open this dialog box, do one of the following:

- Create a new window or copy an existing one.
- Click a window to select it, and then choose Window > Properties.

The Window Properties dialog box appears.

Window Properties Dialog Box



**(A) Name.** Enter the name of the window. This name appears in the window's title bar unless the title bar is hidden by unselecting the Caption option in the Control group (**F**).

**(B) Width and Height.** Enter the width and height of the window. Width and height are measured in pixels.

**(C) X and Y Position.** Enter the X and Y coordinates where the window appears in the project window. The X and Y coordinates indicate the location, in pixels, of the draw window's upper-left corner; the upper-left corner of the project window has X and Y coordinates of 0.

**(D) Show Scroll Bars.** Select this option to display scroll bars when graphic objects extend beyond the borders of the window. This option overrides the global Configurator Options scroll bars setting (see ["Configurator Options" on page 356](#)).

*NOTE: Changing this setting after initially creating the window **clears undo history** for the project; you will be unable to undo (Edit > Undo) any changes you made to the project.*

**(E) Rescale on Resize.** Check this box to rescale the window graphic objects when the window size is changed in this dialog box. In order for window graphic objects to be correctly scaled, make sure to disable "Show window contents while dragging" in Windows as described below. You can undo a rescaled graphic object using this method. However, undo is not exact, due to rounding when the graphic object is rescaled. Combo Box graphic objects rescale only their width, not height.

To disable "Show window contents while dragging":

1. In the Windows Control Panel, click System.
2. On the left sidebar, click "Advanced system settings."
3. In the Performance section, click Settings.
4. Uncheck "Show window contents while dragging," and click OK.

**(F) Control.** Use the options in the Control group to configure the appearance of the window. Select or unselect the following options:

**Border**—Hides or displays the narrow edge of the window. This option must be selected for the other options in the Control group to be available.

**Caption**—Hides or displays the bar at the top of the window where the window name appears. This option must be selected to move the window within the larger project window.

**Size handles**—If selected, lets you resize the window by clicking and dragging an edge or corner of the window.

**System menu**—Hides or displays the small system menu icon and the Close Window button located at the top of the window. This option is unavailable if the Caption option has not been selected.

**Minimize box**—Hides or displays the standard Windows close box in the upper-right corner of the window. This option is unavailable if the System menu option has not been selected.

**(G) (Draw window only) Runtime Options.** (Use the items in the Runtime Options group to configure how the window opens when the project is run in PAC Display Runtime. Select or unselect the following options:

**Always in memory (fastest access)**—If selected, the window's information is loaded and saved in the computer's memory when the project runs. Use this option for a window that you know will be opened and closed often. This option is selected automatically if you place an alarm graphic in a window.

Normally, only windows that have been opened or iconified are saved in memory. If you use this option with many windows, more computer memory is required, and your PAC Display project will require more time to start up. Using this option with fewer windows uses less memory, and your project will start up more quickly.

**Open when there are new alarms**—If selected, a closed or iconified window that contains an alarm graphic will open when the alarm is triggered. This option is available only if a window contains an alarm graphic that is set to summary or detailed view. For more information on configuring alarms, see ["Adding Alarm Graphics" on page 273](#).

**Disable close if there are active alarms**—If selected, prevents an open window that contains one or more active alarms from being closed. All active alarms in a window must be acknowledged before the window can be closed. For more information on working with alarms, see ["Viewing Alarm Graphics" on page 330](#), ["Modifying Alarm Points" on page 331](#), and ["Disabling Alarm Points in Runtime" on page 333](#).

**Allow control engine switching**—If selected, all graphic objects in the window can use data from the same PAC Control strategy running on a different control engine. The operator switches between control engines in Runtime. For more information on using data from multiple control engines, see ["Switching a Window Between Control Engines" on page 329](#).

**(H) Password Protect.** To assign a password to a window, click here and then enter a password in the dialog box that appears. When a password is assigned to a draw window, a closed window cannot be opened without first entering the password. (Open windows that are iconified or hidden are not affected.)

You cannot assign a password to a window that both contains an alarm and has the Runtime option "Open when there are new alarms" selected.

**(I) Transparency.** (Applicable only when using Windows 8.1 or higher) This feature applies transparency at Runtime to a draw window or (Pro only) URL window. This way, you can make an entire window (and all the objects in it) partially or totally transparent to Runtime users. (To apply transparency to individual graphic objects and not to the window, see [page 118](#).)

To apply transparency to the window and its objects:

1. Click the Transparency button to open the Set Transparency dialog box.
2. Use the slider bar control (or type a number in the Current Transparency field) to define the window's transparency. A value of 0 is completely opaque (no transparency); a value of 100 is completely transparent.  
As you change the transparency value, the transparency of the window and its objects change so that you can see how they will appear in Runtime.
3. Select OK to save the setting and close the dialog box.

When you close the dialog box, the window and its objects are displayed as completely opaque. This lets you see them so you can configure them. However, in Runtime, the window and its objects are displayed with the configured transparency setting.

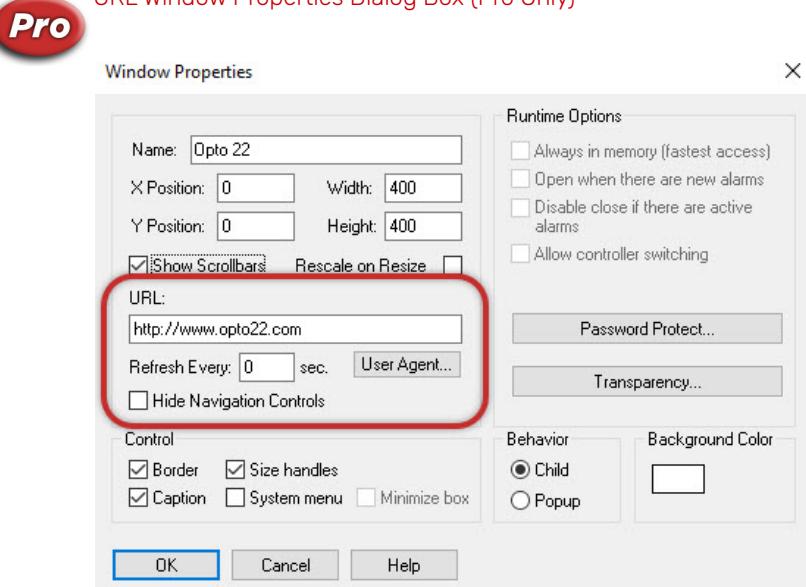
**(J) Behavior.** Use the options in the Behavior group to set how the window appears on-screen when the project is run in PAC Display Runtime. Select one of the following options:

**Child**—prevents the window from being moved or minimized outside the boundaries of the main project window.

**Popup**—lets the window be moved or minimized outside of the main project window.

**(K) Background Color.** (Graphic window only) To set the background color of a window, click the color square and then select a color in the dialog box that appears.

#### URL Window Properties Dialog Box (Pro Only)



A URL window has these additional properties:

#### URL window options.

**URL**—Type the URL of the target webpage.

**Refresh Every \_\_\_\_ sec.**—To refresh the webpage at a specific interval, type the number of seconds in the text box. This is useful for updating static images like a weather radar or images from a security camera.

**User Agent**—To specify the target browser and operating system, click the User Agent button, and then, in the User Agent String dialog box, type a correctly formatted user agent string. This feature lets you override the default User-Agent value in header messages sent to the web server. (User-agent strings are typically advanced settings used when testing web applications with different browsers.) For help creating user agent strings, contact your IT department, or see the Microsoft Developer's Network website at [https://msdn.microsoft.com/en-us/library/ms537503\(v=vs.85\).aspx](https://msdn.microsoft.com/en-us/library/ms537503(v=vs.85).aspx).

To set a global user agent string for all URL controls and URL windows in all of your PAC Display projects (which takes precedence over objects configured with the User Agent button), perform these steps:

- a. In Windows File Explorer, navigate to the folder where PAC Display is installed. (The default folder is C:\Program Files (x86)\Opto22\PAC Project.)
- b. In the folder, create a text file and name it `PAC_DisplayUserAgentString.txt`
- c. In the text file, type a correctly formatted user agent string. Don't type anything else in the text file.

- d. Close and save the text file. When a project is loaded in Runtime, PAC Display uses the user agent string in the PAC DisplayUserAgentString.txt for all URL controls and URL windows

**Hide Navigation Controls**—Check the box to hide the forward and back navigation buttons.

## Opening and Closing Draw and URL Windows

To open or close a draw or URL window in your PAC Display project:

1. From the Windows menu, select Open or Close.  
The Open Windows or Close Windows dialog box appears.
2. Click the name of the window you want to open or close, and then click OK.  
See the next section to learn how to select or deselect multiple window names.

Other ways of opening and closing windows include the following:

- To open a window that has been opened previously, select its name from the bottom of the Windows menu.
- To close a window in which the system menu appears, click the Close button  in the upper-right corner.

## Working with Multiple Windows

There are several ways to select or deselect multiple window names in the Open Windows or Close Windows dialog box.

- To select individual window names, hold down the Shift key and click each window name.
- To highlight all names in the list, click Select All.
- To not select any name in the list, click Deselect All.
- To easily close or open all but one window, click a single name and then click Inverse.

## Importing, Exporting, and Saving Windows

A PAC Display window can be exported from one project, saved as a file, and then imported into another PAC Display project. The exported window file contains all the objects and tags that were in the original window. Exporting and importing draw windows is a convenient way to reuse the same window in different PAC Display projects.

### Exporting Windows

To export a window in a PAC Display project:

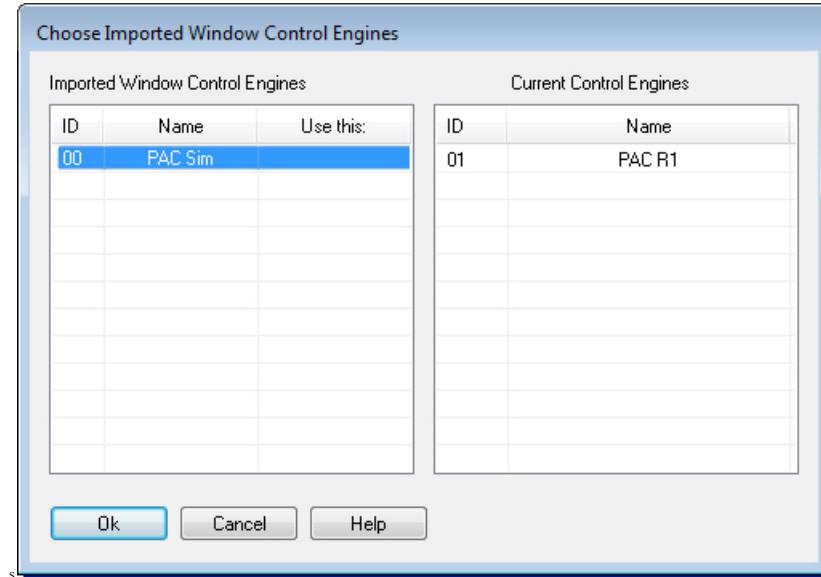
1. Select the window in your PAC Display project that you want to export.  
The window must be open within the Configurator window.
2. Click Window > Export Window.  
The Export Window As dialog box opens.
3. Navigate to the location where you want to save the exported window file, name the file, and then click Save.

### Importing Windows

To import a window in a PAC Display project, do the following:

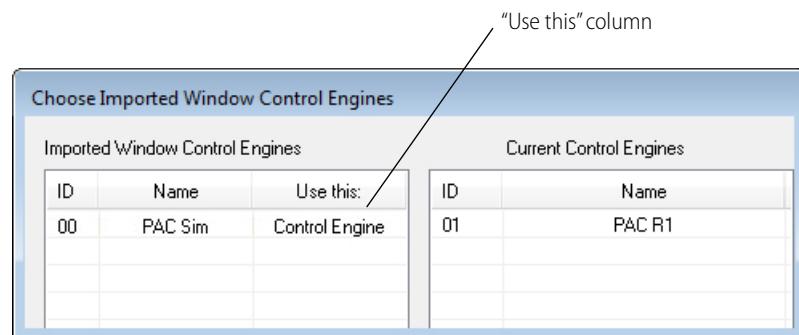
1. Select Window > Import Window.  
The Import Window dialog box opens.
2. Navigate to the location where the exported window file is saved, select the file, and then click Open.

The Choose Imported Window Control Engines dialog box opens.



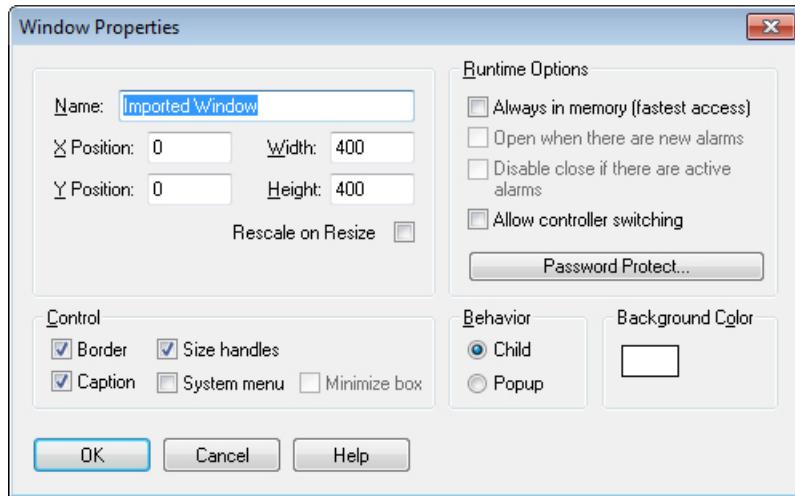
The left pane lists control engines configured in the imported window. The right pane lists control engines configured for the current project.

3. To map a control engine to the imported window:
  - a. Select a control engine in the left pane, and then select a current control engine in the right pane. The name of the mapped control engine appears in the "Use this" column of the Imported Window panel (left panel).



- b. Click OK.

The Window Properties dialog box appears.



4. In the Name field, change the default name "Imported Window" to a suitable name for your project.
  5. Change other properties of the window if needed, and then click OK. See ["Modifying Draw or URL Windows" on page 94](#) for more information on changing window properties.
- The window is added to the PAC Display project.
6. If the new window is not visible in the project window, select Window > Open, choose the window in the list that appears, and then click OK.

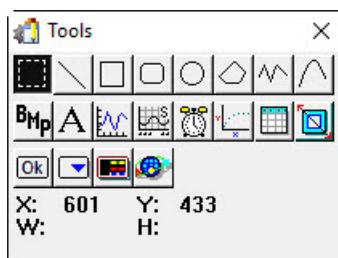
*NOTE: When a window is imported into a PAC Display project, the tags used by objects in that window are not verified for accuracy. Run AutoCorrect tags on the window after importing it. See ["When to Use AutoCorrect Tags" on page 83](#) for instructions.*

## DRAWING GRAPHIC OBJECTS

Once you've opened a project in PAC Display Configurator, you can use the drawing tools in the PAC Display toolbox to create graphic objects in your active window. For descriptions of the tools and shortcut keys, see ["Using the Graphic Tools and Shortcut Keys" on page 101](#).

Follow these general steps to draw a graphic object:

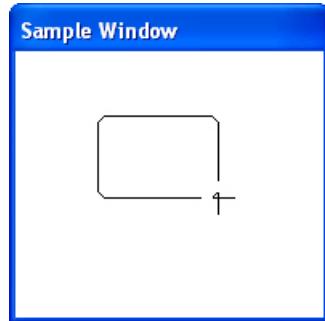
1. If your toolbox is not visible, click View > Toolbox to see the toolbox as it appears below. (You can close the toolbox by selecting View > Hide Toolbox.)



2. Select a drawing tool from the toolbox by clicking it.

The cursor will turn into a crosshair.

3. Click the crosshair in a window, then drag it in any direction to create a graphic object.



In the example above, the Round Rectangle tool  was selected.

### Using the Graphic Tools and Shortcut Keys

Select a tool either by clicking it in the toolbox or by using a shortcut key shown in the table below. For some tools, you can use additional keys to change what the tool does.

To use the additional keys:

1. Select the tool using either a button or shortcut key.
2. If you used a shortcut key, release it.
3. Hold down the additional keys as you draw the graphic object.

Tool	Shortcut Key	Additional Keys	Use
Select 	Enter or Spacebar		Select, move, and resize graphic objects.
Line 	\		Draw straight lines.
		Ctrl	Draw constrained straight lines at angles of 90 degrees.
Rectangle 	[		Draw squares and rectangles.
		Ctrl	Draw squares with the reference point in the top left corner.
		Shift	Draw rectangles with the reference point in the center.
		Shift+Ctrl	Draw squares with the reference point in the center.
Round Rectangle 	R		Draw squares and rectangles with rounded corners.
		Ctrl	Draw squares with rounded corners with the reference point in the top left corner.
		Shift	Draw rectangles with rounded corners with the reference point in the center.
		Shift+Ctrl	Draw squares with rounded corners with the reference point in the center.
Ellipse 	E		Draw circles and ellipses.
		Ctrl	Draw circles with the reference point in the top left corner.
		Shift	Draw ellipses with the reference point in the center.
		Shift+Ctrl	Draws circles with the reference point in the center.

Tool	Shortcut Key	Additional Keys	Use
Polygon 	P		<p>Draw polygons as follows:</p> <ul style="list-style-type: none"> <li>Drag and click to form vertex points.</li> <li>Double-click the last vertex to close the polygon. Sizing handles appear around the object. If you can't select the polygon later with the Select tool, the polygon is not complete.</li> <li>Refresh the window (View &gt; Redraw) to remove incomplete graphic objects.</li> </ul>
Polyline 	L		<p>Draw connected lines as follows:</p> <ul style="list-style-type: none"> <li>Drag and click to draw connected lines.</li> <li>Double-click the last line drawn to finish the polyline. Sizing handles appear around the object. If you can't select the polyline later with the Select tool, the polyline is not complete.</li> <li>Refresh the window (View &gt; Redraw) to remove incomplete graphic objects.</li> </ul>
Bezier Curve 	C		<p>Draw curves as follows:</p> <ul style="list-style-type: none"> <li>Click at least four points in the draw window to draw a curve.</li> <li>Thereafter, click points one at a time in groups of three to continue drawing the curve.</li> <li>Double-click the last point to finish the curve. Sizing handles appear around the object. If you can't select the curve later with the Select tool, the curve is not complete.</li> <li>Refresh the window (View &gt; Redraw) to remove incomplete graphic objects.</li> </ul>
Bitmap 	B		<p>Place bitmap graphic files selected with File &gt; Choose Bitmap. Once the bitmap has been chosen, just click to place the bitmap in the window.</p>
Text 	T		<p>Write text for labels and titles.</p> <ul style="list-style-type: none"> <li>Put your cursor where you want the text to start.</li> <li>Type your text.</li> <li>When finished, click the mouse away from the text you just typed or press Enter.</li> <li>Modify text by selecting it with the Select tool and by using Edit &gt; Edit Text.</li> </ul> <p>The text tool is also used to create text objects which, when configured with the Text-In (from Control Engine) dynamic attribute, are used for viewing strings and other values from the control engine. See “Text In from Control Engine” on page 157 for more information.</p>
Trend 	G		<p>Used to draw graphs that display real-time data against time. See Chapter , “8: Working with Trends,” for more information.</p>
SuperTrend 	Y		<p>Draw graphs that display both real-time and historical data against time. See Chapter , “8: Working with Trends,” for more information.</p>
Alarm 	A		<p>Draw objects that display alarms and other status information. See Chapter , “9: Configuring Trigger-Based Events,” for more information.</p>
XY Plot 	X		<p>Draw graphs that display data plotted on x and y axes. See Chapter , “8: Working with Trends,” for more information.</p>

Tool	Shortcut Key	Additional Keys	Use
Table 	Q		Display data from up to sixteen tables. See “Working with Tables” on page 134 for more information.
Scale Window 	Z		Resize a window and the graphic objects inside at the same time. See “Resizing a Window and the Graphic Objects Inside” on page 111 for more information.
Windows Button 	U		Add a Windows button. See also, “Adding a Windows Button or a PID Button” on page 121.
Combo Box 	M		Add a combo box. See also, “Adding a Windows Combo Box” on page 124.
PID 	I		(Pro only) Add a PID button. See also, “Adding a Windows Button or a PID Button” on page 121
URL 	W		(Pro only) Create a URL control. See also, “Adding a URL Control” on page 131.

## SELECTING GRAPHIC OBJECTS

You can use the Select tool to choose one or more graphic objects in a draw window.

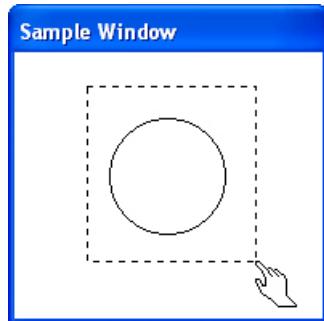
When a graphic object is selected, several solid black sizing handles appear, along with one transparent selection mark. The selection mark shows you whether you've selected a single graphic object or several objects in a group. Each graphic object in a group has a selection mark. Sizing handles can be used to resize the graphic object, which we'll talk about a little later in this chapter.

### Selecting One Graphic Object

The simplest way to select a graphic object in a window is to click it with the Select tool. You can also select a graphic object by clicking and dragging.

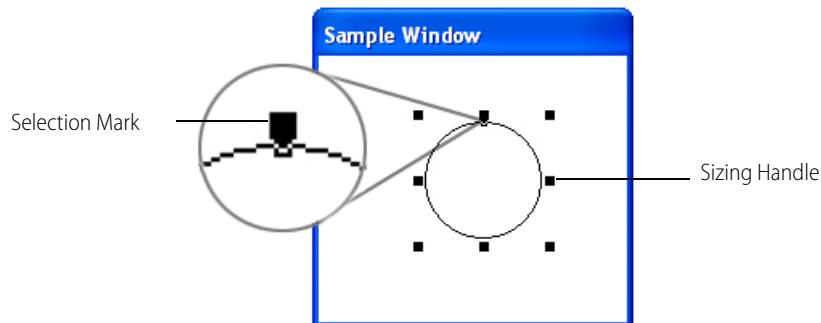
1. Choose the Select tool
2. Click the cursor just outside the graphic object you want to select and drag the cursor completely over the object.

A selection box should appear as shown below:



*NOTE: If you drag the cursor from left to right, you must completely enclose the object in the selection box to select it. However, you can also select an object by dragging the cursor from right to left over only part of the object.*

3. After you release the mouse button, several sizing handles and one selection mark appear around the selected object.



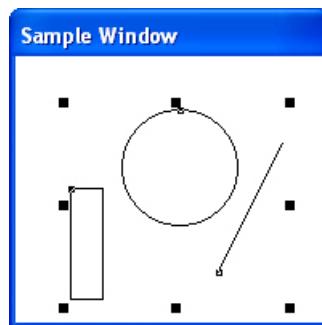
### Selecting More Than One Graphic Object

There are a few ways to select multiple graphic objects. The simplest way is to click and drag.

1. Choose the Select tool  from the toolbox.
2. Click the pointer just outside the objects you want to select and drag the pointer across the group of objects you want to select.

Make sure that you include all the objects within the selection box that appears.

After you release the mouse button, several sizing handles and one selection mark will appear around the selected objects.



Another way to select several objects is to choose the first graphic object using the Select tool, then hold down the Shift key and click each additional object you want included in the selection group. Notice that a selection handle appears on each object you add to your group of objects.

### Selecting All Graphic Objects

To select all the graphic objects that appear in your active window, choose Edit > Select All (Alt+E+S). You can also right-click and choose Select All from the pop-up menu.

### Deselecting One or More Graphic Objects

The easiest way to deselect one or all graphic objects is to click anywhere outside the sizing handles. All of the handles disappear and no graphic objects are selected.

From a selected group of objects, you may need to pick some graphic objects you actually want as part of a final selection group. You can do this by using key combinations.

- To deselect an object within a group of selected objects, hold down the Shift key and click the object you don't want to include.
- To select only one object within a group of selected objects, hold down the Ctrl key and click the object. This deselects all other objects.

## GROUPING AND LOCKING GRAPHIC OBJECTS

You can combine two or more graphic objects into a group so that they are handled as one object. You can then manipulate the graphic object as one unit. As a unit, the grouped graphic objects can be selected, moved, resized, and have dynamic attributes assigned. You can also lock the position of a graphic object in a draw window so it can't be moved.

NOTE: You cannot group:			
Buttons	URL controls	Combo boxes	PID buttons

*CAUTION: If you group objects, PAC Display Runtime processes only the dynamic attributes assigned to the group. Dynamic attributes assigned to individual members of a group are ignored. If a group is later ungrouped, any previously configured dynamic attributes of the individual graphic objects will be recognized and processed in Runtime.*

### To group objects:

1. Select two or more graphic objects.
2. Choose Edit > Group. (You can also right-click and choose Group from the pop-up menu.)  
There will be no visible change, but the objects are collected into one group.

### To ungroup objects:

3. Select a set of graphic objects that were previously grouped.
4. Choose Edit > Ungroup, or right-click and choose Ungroup from the pop-up menu.  
You will see the sizing handles still appear around the former group. Click off the graphic objects and then click an individual object. You will see it's not part of the group anymore.

### To lock objects in position:

After you've arranged several objects in a draw window, sometimes it can be useful to lock the position of one or more items so they aren't accidentally moved. To lock one or more graphic objects, select the item(s) and click Edit > Lock Position. To unlock graphic objects, select the item(s) and click Edit > Unlock Position.

## APPLYING OR CHANGING LINE ATTRIBUTES

*NOTE: If you select more than one graphic object and the objects have different line or fill attributes, no attributes will appear in the menus and dialog boxes for each attribute. However, you can still select new attributes for all selected lines.*

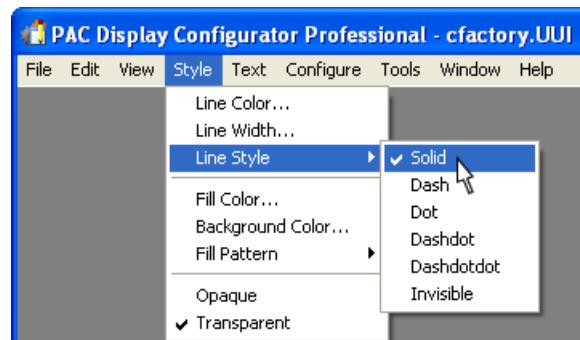
1. Do one of the following:
  - To change attributes for one or more existing objects, select the object(s) using the Select tool.
  - To set attributes for subsequent graphic objects that you create, do not select any object.
2. Choose the line attributes you want to apply to the selected object(s).
  - To change the line color, click Style > Line Color, then choose a color from the Color dialog box and click OK. (You can also right-click the line, and then choose Line > Color from the pop-up menu.)
  - To change the line width of a *solid* line:

- a. Right-click the line, and in the pop-up menu, click Line > Width (or click Style > Line Style from the menu bar).
- b. In the Pen Width dialog box, type the desired pen width. (Pen widths are measured in pixels.)
- c. Click OK to close the dialog box and save the setting.

Non-solid (for example, dotted or dashed) lines have a maximum pen width of 1 pixel, *unless* you apply the transparency feature (described on [page 118](#)) before configuring the line width. For example, if you create a dashed line (without first applying the transparency feature) and then change the width to a value greater than 1 pixel, the dashes disappear and the line becomes a solid line.

To create a *non-solid* line that is greater than 1 pixel wide:

- Right-click the line, and in the pop-up menu, click Line > Style.
- Then, select the desired style. The pop-up menu automatically closes.
- d. Right-click the line again, and in the pop-up menu, click Transparency. In the Set Transparency dialog box, type a value greater than 0. (100—completely transparent—is the maximum value.)
- e. Click OK to close the dialog box and save the setting.
- f. Right-click the line again, and in the pop-up menu, click Line > Width.
- g. In the Pen Width dialog box, type the desired width in pixels, and then click OK to close the dialog box and save the setting.
- To change the line style, click Style > Line Style, then choose a line style from the list that appears (shown below). (You can also right-click the object, choose Line > Style from the pop-up menu, then select a line style from the list that appears.)



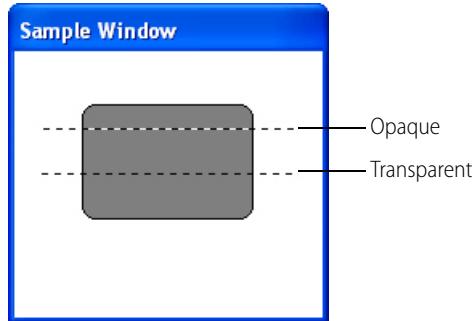
- To change the opaque or transparent attributes of a line, select the appropriate attribute from the Style menu.

The opaque attribute lets the background color of the window show between the dashes in a line.

The transparent attribute lets an object's color show between the dashes in a line.

(The transparent attribute is not the same as the transparency feature. To apply transparency to a line, see [page 118](#).)

Samples of opaque and transparent line attributes are shown in the image below.



## APPLYING OR CHANGING FILL ATTRIBUTES

*NOTE: If you select more than one object and the graphic objects have different line or fill attributes, no attributes will appear in the menus and dialog boxes for each attribute. However, you can still select new attributes for all selected lines.*

1. Do one of the following:
  - To change attributes for one or more existing graphic objects, select the object(s) using the Select tool.
  - To set attributes for subsequent graphic objects that you create, do not select any object.
2. Choose the fill attributes you want to apply to the selected object(s):
  - To change the fill color, click Style > Fill Color, then choose a color from the Color dialog box and click OK. (You can also right-click, choose Fill > Color from the pop-up menu, choose a color from the Color dialog box, and click OK.)
  - To change the fill pattern, click Style > Fill Pattern and choose a fill attribute. A fill color other than white needs to be in effect in order to see the new fill pattern. (You can also right-click, choose Fill > Pattern from the pop-up menu, and choose a pattern.)
  - To change the background color used behind a fill pattern, click Style > Background Color, then choose a color from the Color dialog box and click OK. (You can also right-click, choose Background > Color from the pop-up menu, choose a color from the Color dialog box, and click OK.)

## IMPORTING GRAPHICS

You can easily import bitmap graphics, Windows Metafile graphics, JPEG, PNG, and GIF images into a PAC Display window to enhance or add detail to your operator interface. For your convenience, PAC Display also includes the Symbol Factory, a large library of graphics designed especially for industrial applications.

- ["Importing a Bitmap Graphic" \(below\)](#)
- ["Importing a Metafile, JPEG, or PNG Graphic" on page 108](#)
- ["Importing a GIF Graphic" on page 108](#)
- ["Importing a Graphic from the Symbol Factory" on page 109](#)

### Importing a Bitmap Graphic

A bitmap graphic is a picture, drawing, or other image saved in Microsoft Windows BMP file format. Bitmap graphic files have the file extension .bmp. If you'd like to use bitmap graphics in your project which have been saved in another graphic file format, such as TIFF (file extension .tif), you must first convert the file to BMP.

format. Commercial and shareware applications that can do this are widely available; two popular commercial image editing and conversion applications for Microsoft Windows are Paint Shop Pro® and Photoshop®.

To import a bitmap graphic into your PAC Display project, first choose the bitmap image you want to use, and then use the Bitmap tool to place the bitmap in the window.

1. Click File > Choose Bitmap.
2. In the Choose a Bitmap dialog box that appears, navigate to the folder that contains the bitmap graphic you want to use, and then select the file name and click Open.
3. Select the Bitmap tool  in the toolbox and click the pointer in the desired location in the window.  
The bitmap is centered at the location you have clicked.

### Importing a Metafile, JPEG, or PNG Graphic

The Microsoft Windows Metafile (WMF) format was first introduced by Microsoft in 1988. Like GIF and PNG, the WMF format supports transparency. However, PNG and GIF images usually look better than WMF images in PAC Display.

The Joint Photographic Experts Group (JPEG) file format is a highly compressed format commonly used for photographs. This format is often used for displaying images in a Web browser.

The Portable Network Graphics (PNG) file format provides transparency, and it supports lossless data compression so that the image is perfectly reconstructed from the compressed data. PNG images are a good choice for use in your PAC Display project.

To import a Windows Metafile, JPEG, or PNG graphic into your PAC Display project:

1. Click Edit > Paste from File > Import (Metafile, JPEG, or PNG). (You can also right-click and select Import Metafile, Import JPEG, or Import PNG from the pop-up menu.)
2. In the Import dialog box that appears, navigate to the folder that contains the graphic you want to use, and then select the file name and click Open.  
The selected file is placed in the active draw window.

You can also import a Metafile, JPEG, or PNG graphic used in another program by copying or cutting the graphic to the Windows clipboard, and then pasting it in the project draw window.

### Importing a GIF Graphic

You can import either static or animated GIF images into a PAC Display project. When using GIF images in PAC Display, keep the following things in mind:

- Once imported, GIF images cannot be resized or rotated.
- Animated GIFs appear as static GIFs in Configurator, displaying only the first frame of the animation. Animation occurs in Runtime.
- The GIF image's transparent color may not be set or changed in PAC Display. Use another image editing program to change the transparent color before importing the image into PAC Display.
- Visibility/Blink is the only Control Engine Driven attribute that can be applied to GIF images. The only options are Visible and Invisible. Blink options are not available for GIF images.

To import a GIF graphic:

1. Click Edit > Paste from File > Import GIF. (You can also right-click and select Import GIF from the pop-up menu.)
2. In the Import dialog box that appears, navigate to the folder that contains the graphic you want to use, and then select the file name and click Open.  
The selected file is placed in the active draw window.

## Importing a Graphic from the Symbol Factory

To import a graphic as a Windows Metafile graphic from the Symbol Factory into your PAC Display project:

1. Click Edit > Paste from File > Symbol Factory. (You can also right-click and select Symbol Factory from the pop-up menu.)  
The Symbol Factory window opens.
2. Browse through the categories and thumbnails of graphics until you find the graphic that you want to use.
3. Click the graphic and drag it into the PAC Display draw window.  
You can also click Edit > Paste as Picture (.wmf) Only.

The selected graphic is now available as a Metafile graphic in the active draw window. The Symbol Factory window will remain open until you close it, or until you exit PAC Display Configurator.

### Bitmap Graphics in Symbol Factory

Although Symbol Factory graphics are provided as Metafiles, you can also import these graphics as bitmaps. To import a graphic as a bitmap graphic from the Symbol Factory into your PAC Display project:

1. Click Edit > Paste from File > Symbol Factory. (You can also right-click and select Symbol Factory from the pop-up menu.)  
The Symbol Factory window opens.
2. Browse through the categories and thumbnails of graphics until you find the graphic you want to use.
3. Click the graphic and then click Edit > Copy.
4. Switch to the PAC Display draw window and click Edit > Paste.

The selected graphic is now available as a bitmap graphic object in the active draw window. The Symbol Factory window will remain open until you close it, or until you exit PAC Display Configurator.

## SAVING OBJECTS AS BITMAPS

After creating one or more objects in a draw window, you may want to save the object as a bitmap graphic file. This is useful, for example, if you want to document your operator interface.

*NOTE: Saving a graphic object as a bitmap graphic file is not the same as copying an object, then pasting it into another window. When a graphic object is saved as a bitmap, it loses all dynamic attributes and other properties it has been configured with.*

1. Use the Select tool to select the graphic object you want to save as a bitmap.  
If you don't select a graphic object, the entire active window will be saved as a bitmap file.
2. Click File > Save as Bitmap.
3. In the Save as Bitmap dialog box that appears, navigate to the desired folder and enter a file name. (You can enter a three-letter extension other than .bmp, but the file will still be saved as a bitmap image.)
4. Click Save to save the image.

## COPYING, DUPLICATING, AND PASTING

There are two ways that you can make copies of graphic objects you've created or added to a window. You can copy one or more graphic objects to the Windows clipboard, or duplicate the selected object(s) in the same window without affecting the contents of the clipboard.

You can also copy graphic objects into your PAC Display project from another project, but both projects must be created with the same version of PAC Display. Graphic objects created in an OptoDisplay project cannot be

## MOVING AND RESIZING GRAPHIC OBJECTS

used in a PAC Display project. (OptoDisplay is an HMI application similar to PAC Display that is part of Opto 22's FactoryFloor software suite.)

### Copying and Pasting a Graphic Object

1. Select one or more graphic objects.
2. Choose Edit > Copy. (The keyboard shortcut for this command is Ctrl+C or Ctrl+Ins. You can also right-click and choose Copy from the pop-up menu.)  
The selected objects are copied to the Windows clipboard.
3. Click the window where you want to paste the object(s).
4. Choose Edit > Paste. (The keyboard shortcut for this command is Ctrl+V. You can also right-click and choose Paste from the pop-up menu.)  
The clipboard contents are pasted in the center of the active window.

### Duplicating a Graphic Object

1. Select one or more graphic objects.
2. Choose Edit > Duplicate. (The keyboard shortcut for this command is Ctrl+D. You can also right-click and choose Duplicate from the pop-up menu.)  
A copy of the graphic object is placed immediately below the selected object. Note that the contents of the Windows clipboard are not affected by duplicating a graphic object.

## MOVING AND RESIZING GRAPHIC OBJECTS

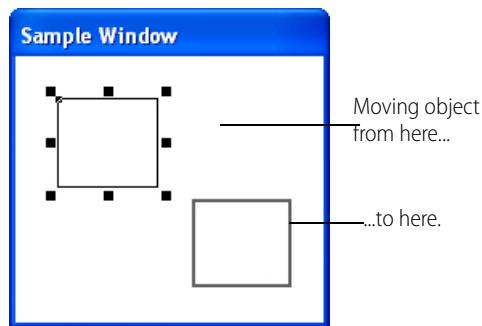
To build your operator interface, you will need to be able to position, resize, and reshape graphic objects. This is done using the Select tool with different options. (Objects can also be positioned and resized by entering values in the Graphic Dynamic Attributes dialog box; see ["Chapter 7: Using Animated Graphic Objects" on page 139](#) for more information.)

["Moving Graphic Objects"](#) (below)

["Reshaping Graphic Objects"](#) on page 113

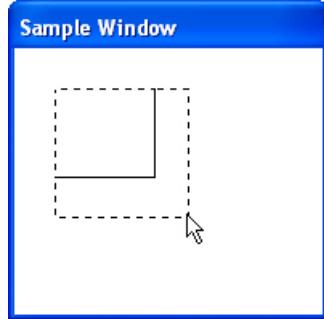
### Moving Graphic Objects

1. Choose one or more graphic objects to move using the Select tool .
2. To move a graphic object, click the object (but not on a sizing handle) and drag it to the new position.  
You can't drag graphic objects from one window to another. You must copy or cut graphic objects to move them between windows.



## Resizing a Graphic Object Using Its Sizing Handles

1. Select one or more graphic objects to resize using the Select tool .
  2. To resize a graphic object, position the pointer over a square handle, click, and drag.
- As illustrated below, the pointer turns into an arrow, and the size of the graphic object changes relative to the sizing handle you're dragging.



3. When the graphic object(s) are the size you want, release the mouse button.

## Resizing Multiple Graphic Objects to Equal Dimensions

When multiple graphic objects are selected, they can be resized equally so that all the objects have the same height and width. This works on all graphic objects except for the following: alarm graphics, SuperTrend, Trend, XY plot, Table controls, buttons, URL controls (Pro only), and PID buttons (Pro only).

1. Click on the Select tool .
2. Choose two or more graphic objects to resize.

*NOTE: If you include any of the unsupported graphic objects, you won't be able to select Size as described in the next step.*

3. Click Edit > Size, then one of the following options:
  - **Grow to Largest Height**—All selected objects are resized to the height of the tallest object selected.
  - **Grow to Largest Width**—All selected objects are resized to the width of the widest object selected.
  - **Shrink to Smallest Height**—All selected objects are resized to the height of the smallest object selected.
  - **Shrink to Smallest Width**—All selected objects are resized to the width of the least wide object selected.

You can also select these options by right-clicking the selected objects, selecting Size from the pop-up menu, and then choosing a Grow or Shrink option.

## Resizing a Window and the Graphic Objects Inside

The Scale Window tool allows you to resize a window and the graphic objects inside at the same time.

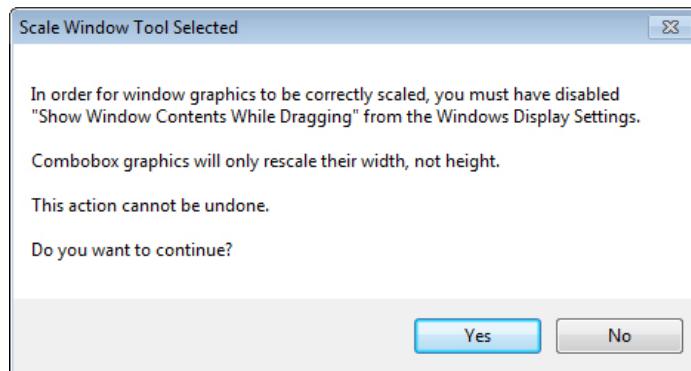
*NOTE: Resizing graphic objects in this manner is not exact. Graphic objects are resized in units of whole-number percentages, not fractional percentages, and the vertical and horizontal dimensions are resized independently. So if a window is returned to its original size after it has been modified, it may not look exactly the same as it did before it was resized. Also, resizing a window using this method cannot be undone.*

1. In the Windows Control Panel, click System.

## MOVING AND RESIZING GRAPHIC OBJECTS

2. On the left sidebar, click "Advanced system settings."
3. In the Performance section, click Settings.
4. Make sure that "Show window contents while dragging" is unchecked, and then click OK.
5. (Recommended) Make a copy of the window to test the results.
6. Click in the window you want to resize to activate that window.
7. Choose the Scale Window tool  from the toolbox.

The Scale Window Tool Selected dialog box appears.

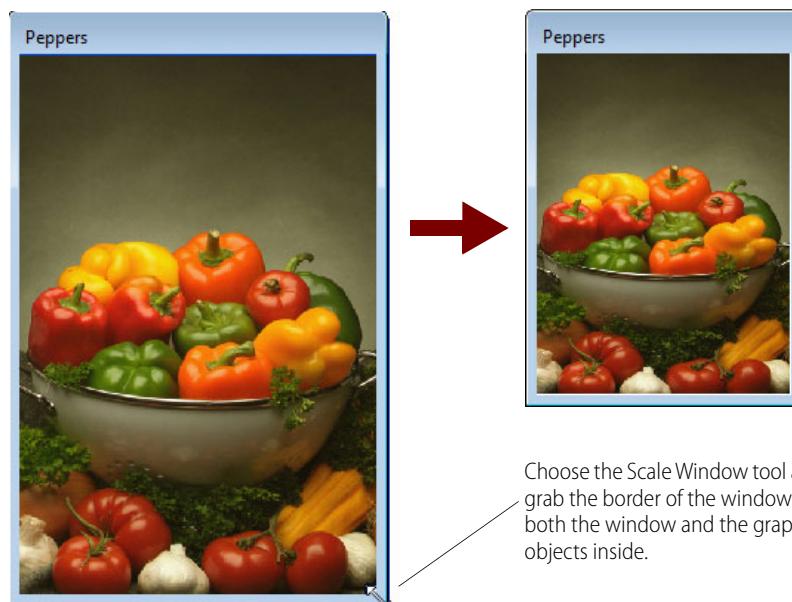


8. Click Yes to continue.

*NOTE: If you click in a window other than the active one, the dialog box will close and the Scale Window tool will revert to the Select tool, just as though you had clicked the No button.*

9. Grab the border of the active window to resize both the window and the graphic objects inside. The new size is shown in the Toolbox.

*NOTE: If you click in or try resize a different window, or if you move the cursor back inside the drawing area of the active window, the Scale Window reverts to the Select tool.*



## Reshaping Graphic Objects

You can adjust the individual points that make up a polyline, polygon, or Bezier curve object.

1. Using the Select tool , select a polyline, polygon, or Bezier curve object.
2. Click Edit > Edit Points, or right-click and choose "Edit Points" from the pop-up menu.
3. Move the cursor over a point on the selected object.  
When the cursor is over a point on the object, the point is highlighted with a small black square.
4. Click the highlighted point, drag it to the desired location, and then release the mouse button.  
The highlighted point will appear in the new location.
5. When you are done adjusting points on the object, click outside of the object to deselect it.

## CHANGING STACKING ORDER

When graphic objects in a window overlap, they're assigned a stacking order (or "Z-order") to define which object appears in front of or in back of another object. With the Z-Order function, you can change the order in which objects are stacked. (When graphic objects are grouped, the group is treated as a single object in the stack. For details about grouping objects, see [page 105](#).)

**NOTE:** You can't change the Z-order of:

Buttons	URL controls	Combo boxes	PID buttons
Alarm graphics	Table controls	SuperTrends	

To change the Z-order of overlapping graphic objects, right-click an object in the stack, and from the pop-up menu, click Z-Order. (Alternatively, you can select an object and click Edit > Z-Order from the menu bar.) Then, choose from these options:

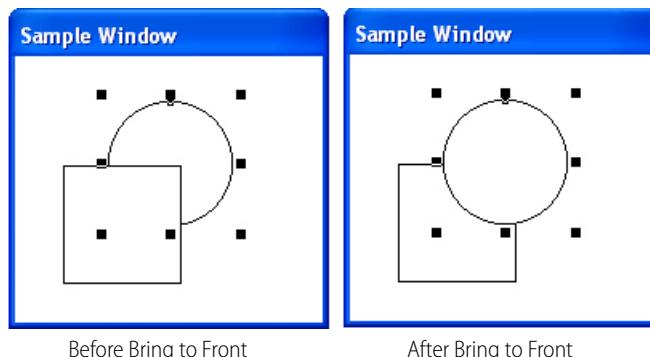
- Arrange (described on [page 113](#))
- Bring to Front
- Move Forward
- Send to Back
- Move Backward

### Bring to Front, Send to Back, Move Forward, Move Backward

If you select Bring to Front, the graphic object is moved to the front of other objects.

Likewise, if you select Send to Back, the graphic object is moved behind all other objects.

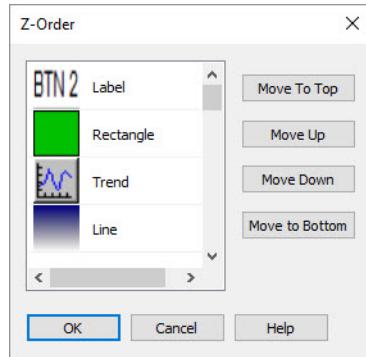
The commands Move Forward and Move Backward work similarly, except that the graphic object you select is moved ahead or behind one object, not ahead or behind all other objects.



## Arrange

The Arrange feature is the easiest way to rearrange the order of overlapping objects. You can also use the Arrange feature to quickly open an object's Graphic Dynamic Attributes dialog box (or the Trend Configuration dialog box, if the object you select is a trend.)

When you choose the Arrange option, the Z-Order dialog box displays thumbnails and descriptions of the object you selected and the ones *beneath* it in the stack, in order from top to bottom.

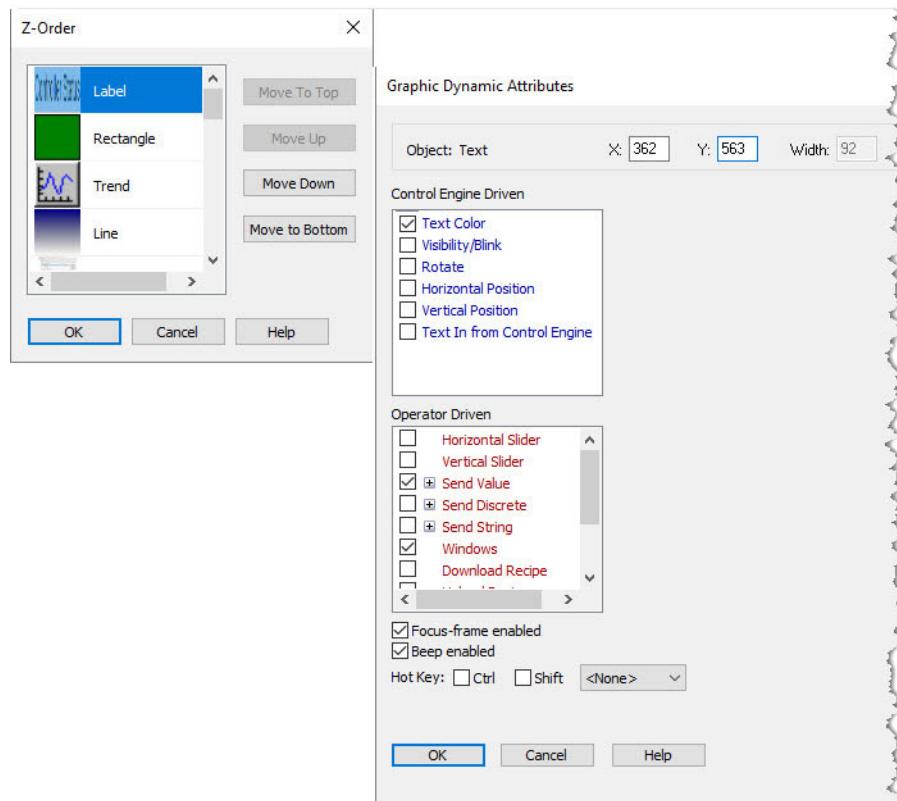


**To re-arrange the Z-order,** click an item in the list, and then drag and drop it to a different position in the stack. As you drag the item, a guideline shows its new position.

Alternatively, you can click the item, and then click a button to move the object up, down, to the top, or to the bottom of the stack. Buttons that aren't applicable to the item you've selected are grayed out. (For example, if you've selected the top item in the list, the Move to Top and Move Up buttons are grayed out.)

The Note on page 113 lists graphic objects whose Z-order cannot be changed. If any of these objects are contained in your selection, they will not appear in the Z-Order dialog box.

To display an object's **Graphic Dynamic Attributes dialog box**, double-click an item in the list. This feature lets you configure an object's dynamic attributes without having to separate it from the stack. (If the item you selected is a trend, the Trend Configuration dialog box is displayed.)



## DELETING GRAPHIC OBJECTS

There are several ways to delete a graphic object in a window. Depending on the commands you use, the method you choose may affect the contents of the Windows clipboard.

1. Select one or more graphic objects. (Use Edit > Select All to select all objects.)
2. Delete the graphic objects using one of the following methods:
  - To cut a graphic object and save it in the Windows clipboard so you can use it elsewhere, choose Edit > Cut, or press Shift+Del, or press Ctrl+X, or right-click and choose Cut from the pop-up menu. You can paste the graphic object into another window or elsewhere in the same window.
  - To permanently delete a graphic object, choose Edit > Delete, or press the Del key, or right-click and choose Delete from the pop-up menu.

The graphic objects are *not* copied to the clipboard and cannot be retrieved.

## ALIGNING GRAPHIC OBJECTS

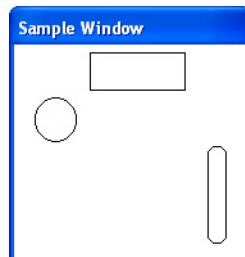
You can align selected graphic objects based on common edges, or based on common centers through objects. You can also adjust the space between graphic objects.

1. Select the graphic objects you want to align.  
You have to select at least two objects to enable this command.

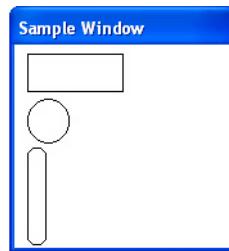
## ROTATING OBJECTS

2. Select the Edit > Align command and choose an option to base the alignment on. (You can also right-click and choose Align from the pop-up menu.)

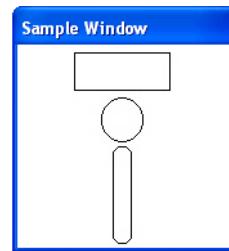
The following illustration shows the results of applying the different alignment options:



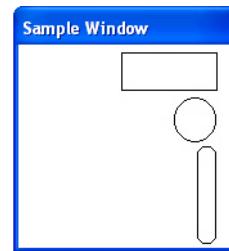
Before Alignment



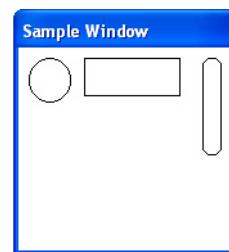
After Left Align



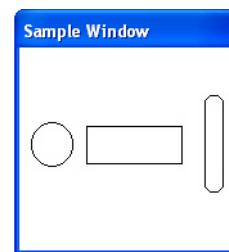
After Center Align



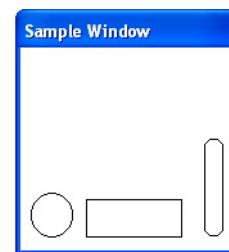
After Right Align



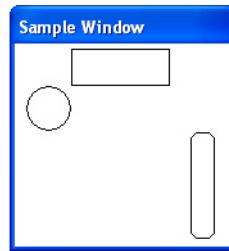
After Top Align



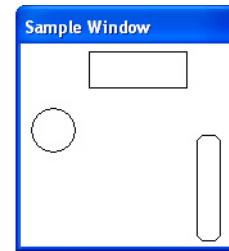
After Middle Align



After Bottom Align



After Space Evenly Vertically



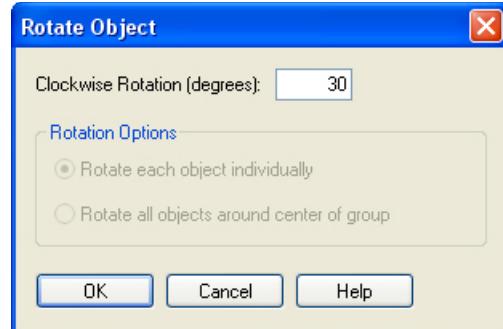
After Space Evenly Horizontally

## ROTATING OBJECTS

You can rotate the following objects: Bitmaps, Metafiles, Curves, Polygons, Ellipses, Polylines, JPEGs, PNGs, Rectangles, Lines, and Text.

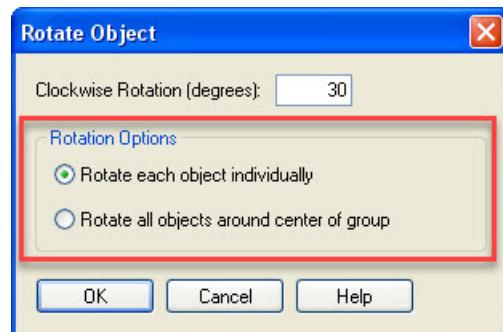
**To rotate an object or a group of objects:**

1. Select one or more objects.
2. Choose Edit > Flip/Rotate > Rotate to open the Rotate Object dialog box.
3. For one object:  
Enter the degrees of rotation, then click OK.



For *more than one* object:

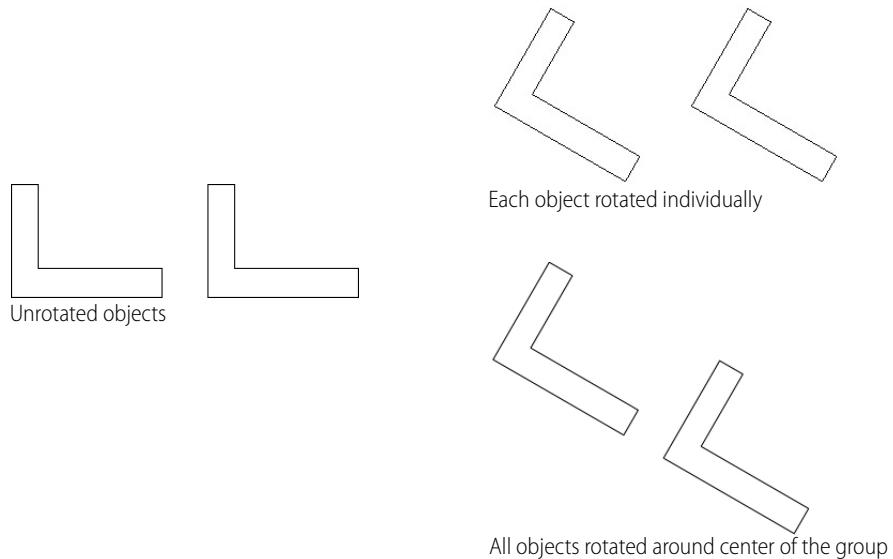
Enter the degrees of rotation, select one of the Rotation Options, and then click OK.



**Rotate each object individually** rotates each object the specified number of degrees around its own center.

## FLIPPING OBJECTS

**Rotate all objects around center of group** rotates each object around the center point of all the selected objects



## FLIPPING OBJECTS

You can flip the following objects: Curves, Polygons, Ellipses, Polylines, Rectangles, and Lines.

### To flip an object around a central horizontal or vertical axis:

1. Select one or more objects.
2. Choose Edit > Flip/Rotate and select an option, or right-click and choose Flip/Rotate from the pop-up menu.
  - To flip a graphic object from right to left (or vice versa), choose Flip Horizontal.
  - To flip a graphic object from top to bottom (or vice versa), choose Flip Vertical.

## APPLYING TRANSPARENCY TO GRAPHIC OBJECTS

*NOTE: To apply transparency to a draw window or (Pro only) URL window, see "Window Properties Dialog Box" on page 95.*

You can apply transparency to graphic objects (with a few exceptions<sup>1</sup>) so that in Runtime, operators can see through them.

By using a slider control or by entering a value between 0 and 100, you can set the transparency of an object (or group of objects) from completely invisible to entirely opaque.

Note that some PAC Display controls<sup>2</sup> support transparency only in Windows 8.1 or higher.

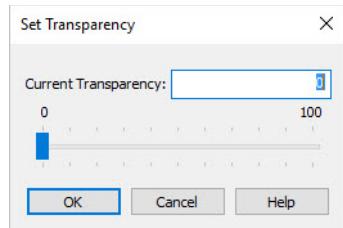
### To apply transparency to an object or group of objects:

---

<sup>1</sup>All graphic image formats support transparency except Microsoft Windows-format metafiles (.WMF and .EMF).

<sup>2</sup>Controls that support transparency only in Windows 8.1 and higher: SuperTrends, alarms, tables, buttons, PID buttons, combo boxes, URL controls, and URL windows.

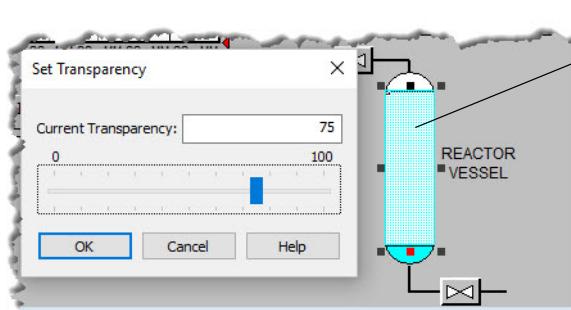
1. Select one or more objects, and then right-click to display the pop-up menu. (For graphic objects, the Transparency feature is available only from the pop-up menu. It is not an option in the PAC Display menu bar.)
  2. From the pop-up menu, click Transparency.
- The Set Transparency dialog box is displayed.



3. Use the slider bar control (or type a number in the Current Transparency field) to define the object's transparency. A value of 0 is completely opaque (no transparency); a value of 100 is completely transparent. When applying the transparency feature to a line

*NOTE: When applying the transparency feature to a non-solid (for example, dotted or dashed) line, you must first set the transparency value, and then you can configure the line style. For details about line styles, see "Applying or Changing Line Attributes" on page 105.*

When you stop moving the slider (or after typing a number in the Current Transparency field), the selected graphic objects appear with the configured transparency.



Graphic objects are displayed in their transparency setting

4. Select OK to save the setting and close the dialog box. Otherwise, click Cancel to reset the graphic objects to their original transparency.

## WORKING WITH TEXT

The Text tool is a convenient way to label, title, and add impact to your graphic objects. Text that you add to a graphic object can be changed at any time, and formatted using different fonts, font sizes, and colors.

*IMPORTANT: The text tool is also used to create objects that display values and string data from a control engine. Configure the text object you create using the Text In (from control engine) dynamic attribute; see "Text In from Control Engine" on page 157 for specific instructions.*

- ["Adding Text" \(below\)](#)
- ["Editing Text" on page 120](#)
- ["Formatting Text" on page 120](#)

## Adding Text

1. Choose the Text tool from the toolbox, or right-click and select Text from the pop-up menu.
2. Click the cursor where you want to place your text.  
You can also choose to place the text somewhere other than its final location, work on the text until it's ready to use, and then move it to the desired location.
3. Type the text.
4. When you're done with the text you want to type, either press Enter on the keyboard or click outside the text area.  
The text you've typed is now an object that you can select and manipulate like other objects.

## Editing Text

1. With the Select tool, choose the text object you want to modify.
2. Choose Edit > Edit Text, or right-click and choose Edit Text from the pop-up menu.
3. Enter the new text in the Edit Text dialog box that appears, then click OK.  
The text object is now modified with the new text.

## Formatting Text

1. With the Select tool, choose the text object you want to modify.
2. Choose a formatting option from the Text menu, or right-click the text object and select an option from the pop-up menu. The following formatting options are available:
  - **Font**—Changes the font family used for the text in a text object. You can use any fixed or TrueType font family installed on the computer.
  - **Size**—Changes the size of the characters in a text object.
  - **Color**—Defines the color in which the text appears.
  - **Background**—Defines the color of the area directly behind a text object. This formatting option is visible only when the Opaque attribute is selected.
  - **Style**—Changes the weight, italicization, and other characteristics of the characters in a text object. Styles available are Normal, **Bold**, *Italic*, Underline, and Strikeout.
  - **Opaque**—Determines how text appears when overlapping other objects. Opaque style is applied to text just like any other style. If the text is set to Opaque, objects under the text will be overwritten by the text background color.



Example of Opaque Text

- **Transparent**—Determines how text appears when overlapping other objects. The opposite of opaque, if the text is set to transparent, objects under the text will remain visible and unaffected by the text background color.



Example of Transparent Text

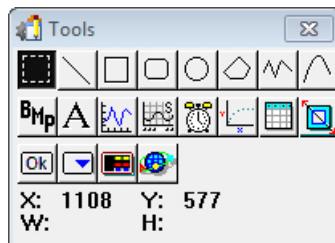
The text object is now modified with the format changes.

See “[Text Menu](#)” on page 366 for additional information on creating and formatting a text object.

## ADDING A WINDOWS BUTTON OR A PID BUTTON

The Button tool  adds an unlabeled Windows button to the active display window. The PID Button  tool (**Pro only**) adds PID button.

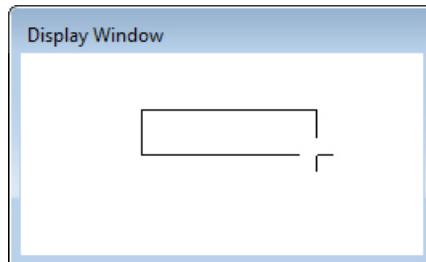
1. If your toolbox is not visible, click View > Toolbox to open the toolbox.



2. Select either the Button tool or the PID Button tool.

The cursor turns into a crosshair.

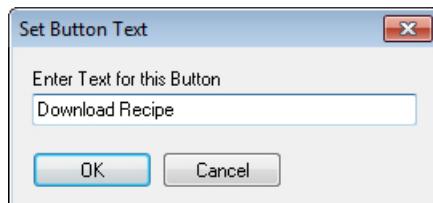
3. Click the crosshair in a window, then drag it in any direction to create a frame for the button.



4. To add a label to the button, right-click and select Edit Text from the pop-up menu.

The Set Button Text dialog box opens.

5. Enter the text, and then click OK.



If you want to add control engine-driven dynamic text, see “[Assigning a Control Engine-Driven Dynamic Attribute to Windows Button Text](#)” on page 122.

The new label appears on the button.



- To change the font on the label, right-click the button and select Change Font from the pop-up menu.

*NOTE: Buttons cannot be grouped or have their Z-order changed.*

### Assigning Operator-Driven Dynamic Attributes to a Windows Button

You can assign any of the operator-driven dynamic attributes to a Windows button except for Read and Clear. For more information on assigning dynamic attributes, see ["Assigning a Dynamic Attribute to a Graphic Object" on page 165](#). As described in step 5 of ["Adding a Windows Button or a PID Button,"](#) you can also assign a dynamic attribute to the button's text.

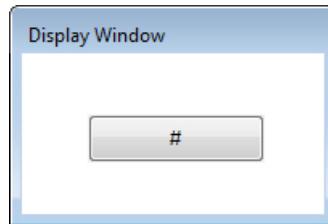
*NOTE: The focus-frame enabled option is disabled for Windows buttons, since Windows automatically highlights the button when the mouse is moved over it. For more information on the "Focus-frame enabled" option, see ["Assigning a Dynamic Attribute to a Graphic Object" on page 165](#).*

### Assigning a Control Engine-Driven Dynamic Attribute to Windows Button Text

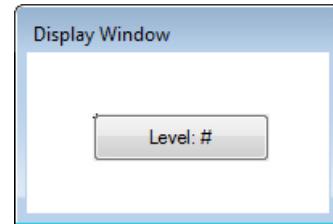
Using this feature, a Windows button can display varying dynamic text depending on the button's current function. For example, a Windows button could be configured with the text, "Begin # batch," where the # is tied to a string variable in the strategy that indicates what kind of cookie is supposed to be made. The # would be replaced by either "Peanut Butter" or "Chocolate Chip," and the button would display "Begin Peanut Butter batch" or "Begin Chocolate Chip batch."

To add a control engine-driven dynamic attribute to text on a Windows button:

- Create a Windows button as described in ["Adding a Windows Button or a PID Button" on page 121](#).
- Insert a pound sign (#) sign in the button's text to indicate where to place a string that reads a tag from a control engine and displays a string based on a received numeric value, string, or discrete value. You can use more than one pound sign, or you can combine text and pound signs:



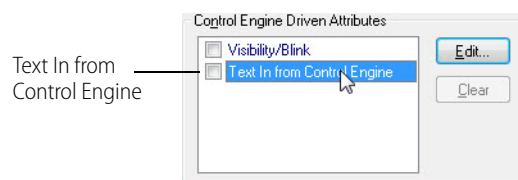
Pound sign only



Text and pound sign

- Double-click the button to open the Configure Dynamic Attributes dialog box.

Below the Visibility/Blink option, you'll see the Text in From Controller option.



*NOTE: You must have entered a pound sign on the Windows button in the previous step. Otherwise, the Text In from Control Engine option is not displayed.*

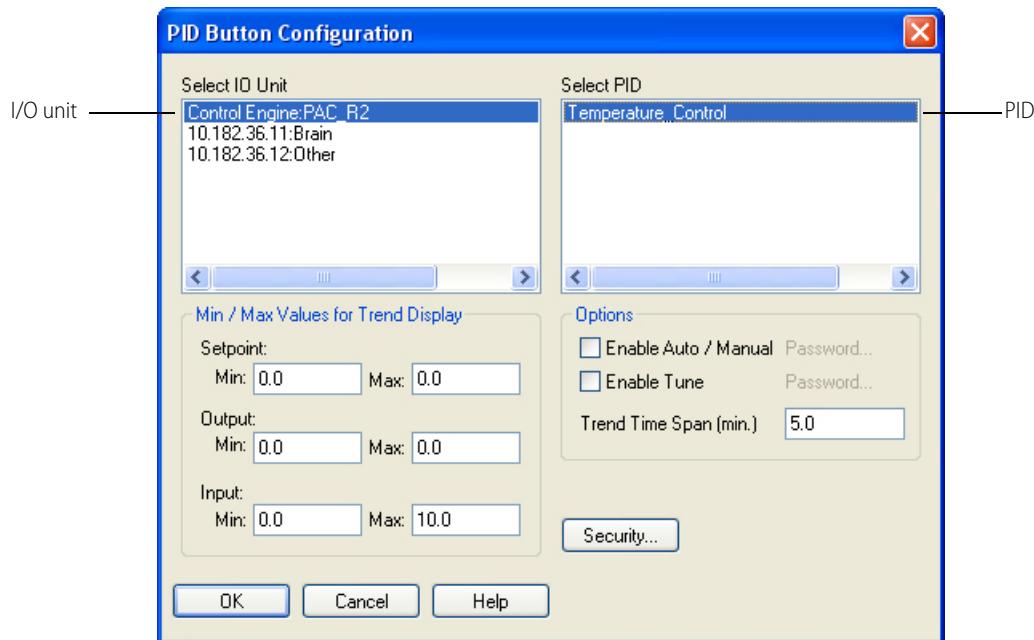
- Double-click Text In from Control Engine to configure this control engine-driven dynamic attribute. See ["Text In from Control Engine" on page 157](#) for specific instructions.

## Configuring a PID Button

Double-clicking a PID button opens the PID Configuration dialog box.

To configure a PID button:

1. Select an IO Unit from the “Select IO Units” pane, and then select a configured PID that appears in the right pane.



Part of the PAC Display Runtime PID Window is a SuperTrend that plots the Input, Output and Setpoint values.

2. Enter the minimum and maximum values to display on the SuperTrend that appears the PAC Display Runtime PID Window.

The PID SuperTrend plots the Input, Output, and Setpoint values. In general, you should obtain the initial values from the control strategy, but you can modify them to suit your needs.

*NOTE: These values are for the SuperTrend display only. The values configured in the PAC Control strategy are not changed.*

3. You can configure the Options as follows:

- *Enable Auto / Manual:* Select this check box to allow a user to switch between Auto and Manual mode from within the PID window in Runtime. Also, you can configure a password to allow changing the mode in Runtime.
- *Enable Tune:* Select this check box to allow a user to adjust PID tuning parameters in Runtime. The available parameters include Gain, Integral, Derivative, and Scan Rate. You can configure a password to allow tuning in Runtime.
- *Trend Time Span (min):* This is the time span (in minutes) of the SuperTrend in the Runtime PID Window. The default is 5 minutes. Enter a new time span if desired.

4. If desired, click Security to configure security attributes for the PID Button itself. This is configured the same way as for any other graphic dynamic attribute (see [“Security Settings for Graphic Objects and Dynamic Attributes” on page 176](#)). PID button security allows only specified users to launch the Runtime PID Window.

*NOTE: PID Buttons may not be grouped with other PAC Display graphic objects or have their Z-order changed.*

## ADDING A WINDOWS COMBO BOX

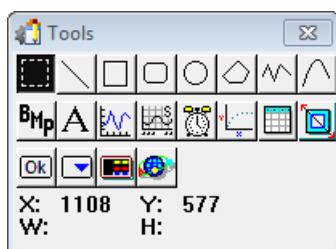
For information on using a PID button in Runtime, see “[Using a PID Button](#)” on page 337.

## ADDING A WINDOWS COMBO BOX

See also, “[How a Combo Box Behaves in Runtime](#)” on page 337

The Combo Box tool  adds a Windows combo box to the active display window.

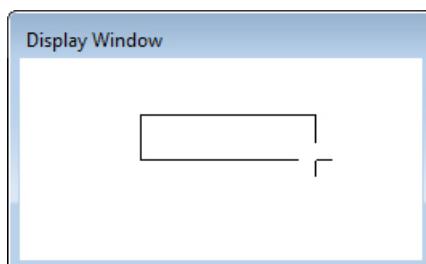
1. If your toolbox is not visible, click View > Toolbox to open the toolbox.



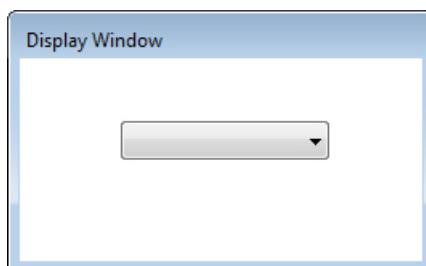
2. Select the Combo Box tool.

The cursor turns into a crosshair.

3. Click the crosshair in a window, then drag it in any direction to create a frame for the button.



A combo box appears in the display window.



*NOTE: The height of the combo is fixed and cannot be changed. Using the Select tool, you can change only the width.*

### Creating a Combo Box List

Each list item that you add to the new combo box can be assigned one or more of the following dynamic attributes.

**Control Engine Driven:** Text-in from Control Engine

**Operator Driven:**

- Send Value
- Send Discrete
- Send String
- Window
- Download Recipe
- Upload Recipe
- Launch Application
- Execute Menu Item

*NOTE: The operator-driven dynamic attribute Read and Clear cannot be used with a combo box.*

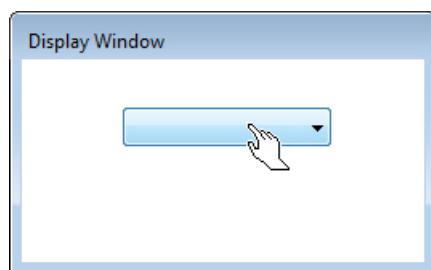
See the following two sections to add a list item to a combo box, and then assign one or more dynamic attributes to the item.

["Adding a List Item to a Combo Box" \(below\)](#)

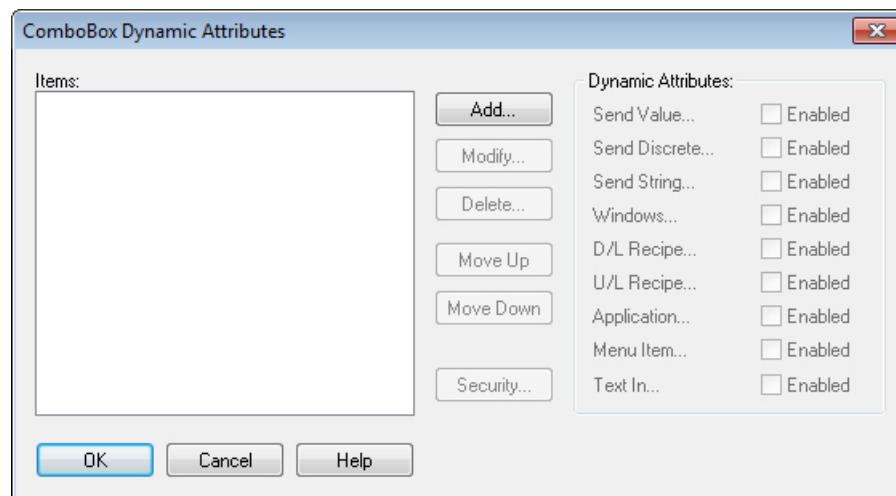
["Assigning One or More Dynamic Attributes to a Combo Box List Item" on page 127](#)

**Adding a List Item to a Combo Box**

1. Using the Select tool, double click on the combo box.



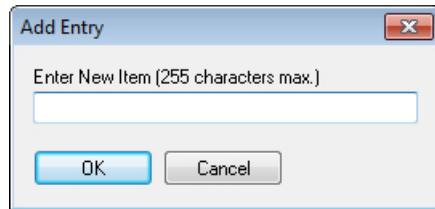
This opens the ComboBox Dynamic Attributes dialog box:



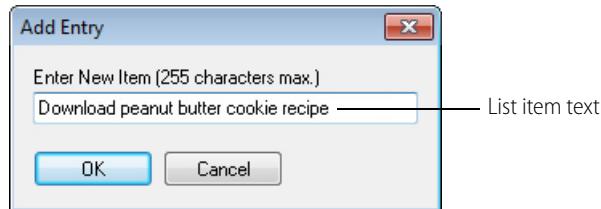
You'll add individual list items for the combo box to the Items text box.

## ADDING A WINDOWS COMBO BOX

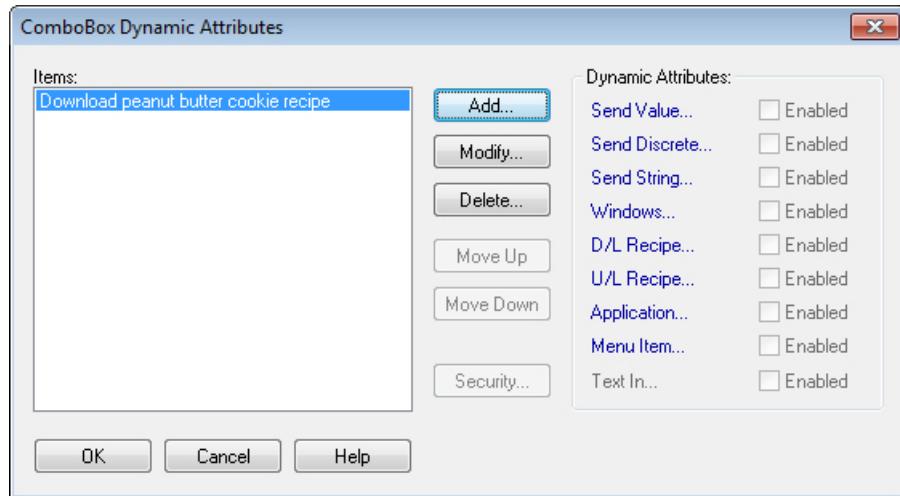
2. Click the Add button to open the Add Entry dialog box.



3. Enter text for the list item, then click OK.



The new list item appears in the Items list:

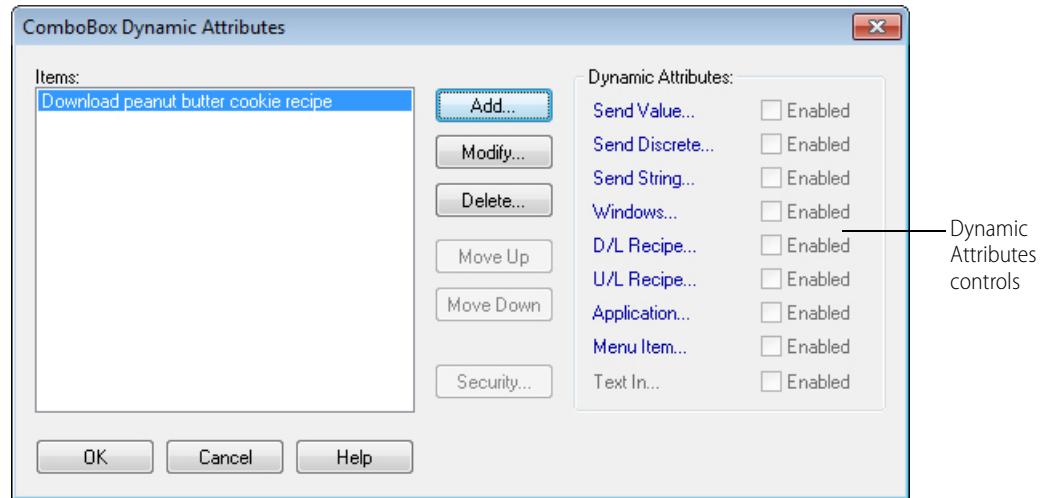


To modify the text of an item, click the Modify button, make changes to the text, and then click OK. If there is more than one item in the list and you want to re-arrange the order of the items, select the item you want to move and click the Move Up or Move Down button.

Follow the instructions in the next section to assign one or more dynamic attributes to an item.

### Assigning One or More Dynamic Attributes to a Combo Box List Item

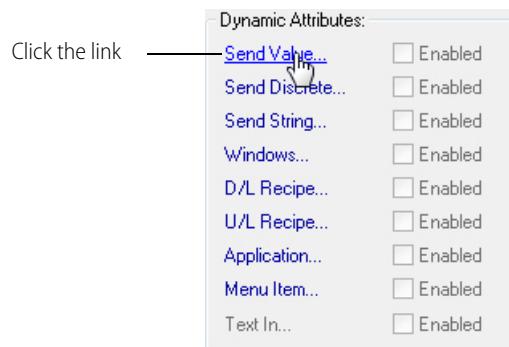
- In the Combo Box Dynamic Attributes dialog box, highlight an item to activate the Dynamic Attributes controls:



*NOTE: If no "Text-in from control engine" placeholder character (#) is embedded in the text, the Text In fields are disabled. See "Text In from Control Engine" on page 157 for more information.*

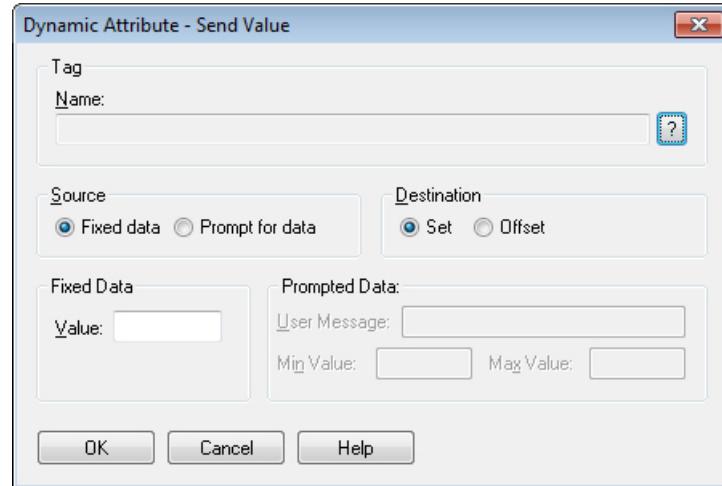
As mentioned previously, you can assign one or more dynamic attributes to each entry in the list. For example, "Download peanut butter cookie recipe" item may have a Send Value, a Send Discrete, and a Download Recipe assigned to it.

- To configure a dynamic attribute, click the link for the desired attribute.



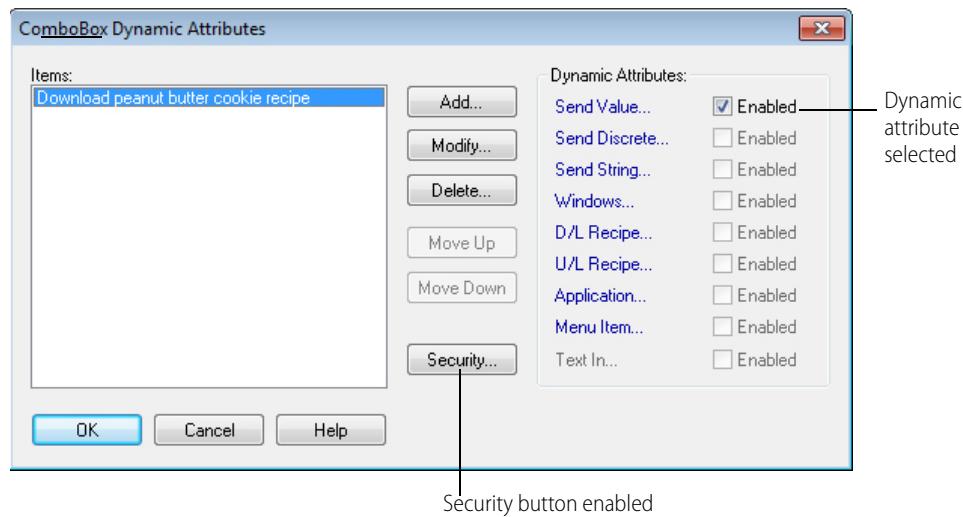
## ADDING A WINDOWS COMBO BOX

This opens a Dynamic Attribute dialog box for that specific attribute.



3. Configure the dynamic attribute, and then click OK.

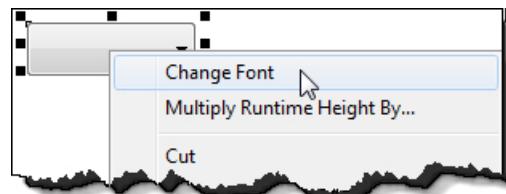
Once an attribute has been configured, the Enabled check box is selected. To disable the attribute, uncheck this check box. Also, the Security button becomes enabled.



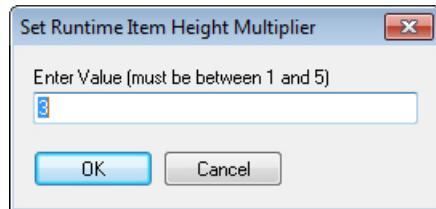
### Changing the Font or Spacing of Combo Box Items

Using the Change Font and Multiply Runtime Height By commands you can change the font or spacing of text items listed in a combo box.

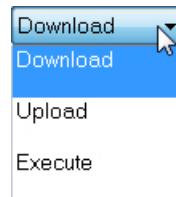
To access these commands in Configurator, right-click on a combo box with the Select tool.



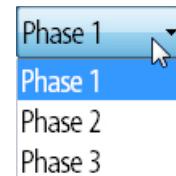
- **Change Font** opens the standard font dialog box. If you change the size of the text, the height of the combo box is changed to accommodate the new size.
- **Multiply Runtime Height By... increases the space beneath each item in the list by a factor of 1, 2, 3, 4, or 5.** This does not change the text height, nor does it change the size of the closed comb box. Note that there is no visible change in Configurator because there are no items in the list in Configurator. (They are added only in Runtime.)



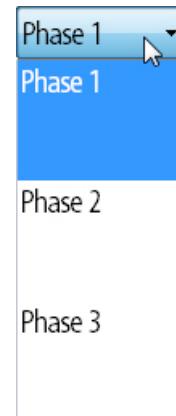
**Example 1:** The combo box has the default font, but has a Runtime Height Multiplier of 2. This results in additional space between each item, but the combo box size stays the same.



**Example 2:** The font has changed to Myriad Pro 16, but the Height Multiplier has the default value of 1. The result is that the text is larger and so is the size of the combo box. The spacing between items remains unchanged.



**Example 3:** As in example 2, the font has changed to Myriad Pro 16. However, the Height Multiplier is now 3. The combo box will be the same size as in example 2, but the spacing between each item increases by a factor of 3.



### Adding Security to a Combo Box

To add security to a combo box, click the Security button. This is configured in the manner as for other graphic objects in PAC Display. For more information, see “[Security Settings for Graphic Objects and Dynamic Attributes](#)” on page 176.

The following characteristics apply to combo box security:

- Security is applied to all configured dynamic attributes of the item. However, in Runtime, the Security dialog box appears only once per selected list item. For example, if a single entry has Send Value, Send

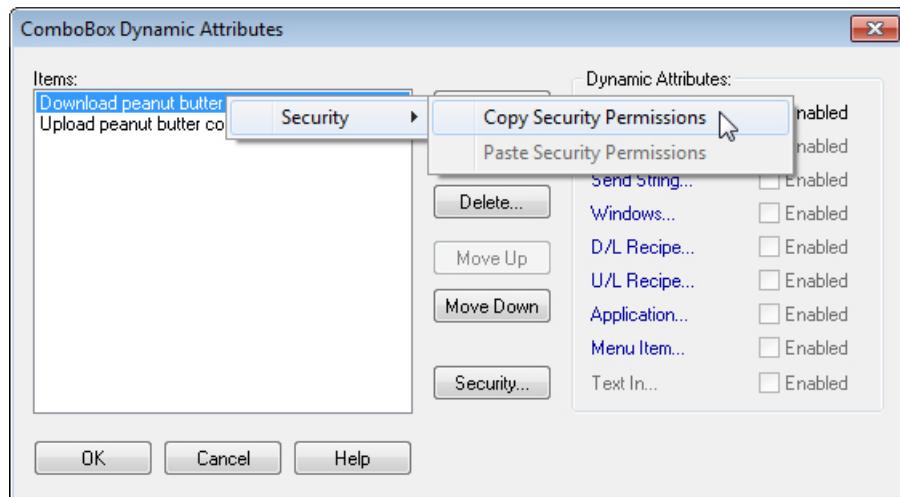
String and Menu Item, rather than the security dialog box appearing three times (once per dynamic attribute) it appears only once for the list item.

- Each list item may have its own security configured
- Security attributes may be copied and pasted from one item to another
- It is not possible to configure security for the combo box as a whole

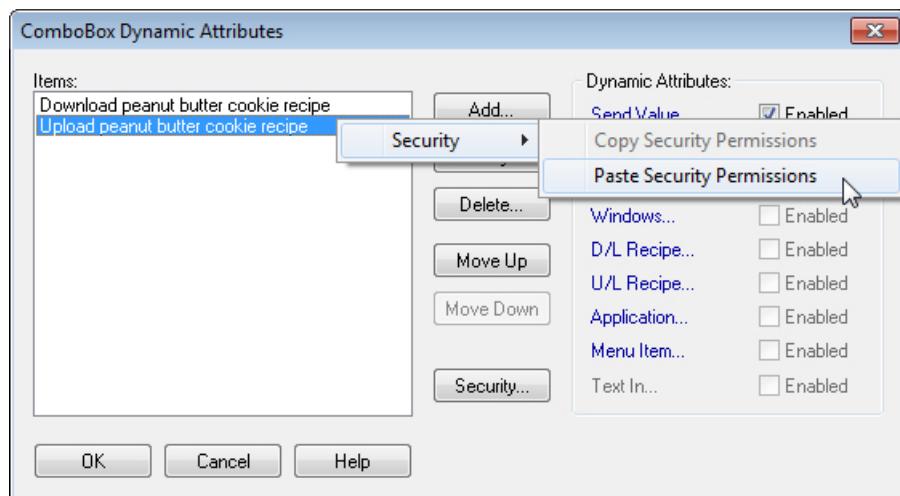
Once security has been configured for a dynamic attribute, the security may be copied and pasted to other entries in the Items list as described below.

**To copy and paste security attributes from one item to another:**

1. Open the Dynamic Attributes dialog box for the Combo Box.
2. Select an item that has one or more dynamic attributes assigned to it.
3. Right-click on the item and choose Security > Copy Security Attributes from the pop-up menu.



4. Right-click on a different item and choose Security > Paste Security Attributes from the pop-up menu.



*NOTE: The "Focus-frame enabled" option is disabled for combo boxes, since Windows automatically highlights the combo box when the mouse is moved over it. For more information on the "Focus-frame enabled" option, see "Assigning a Dynamic Attribute to a Graphic Object" on page 165.*

*NOTE: Combo boxes may not be grouped with other PAC Display graphic objects or have their Z-order changed.*

## ADDING A URL CONTROL

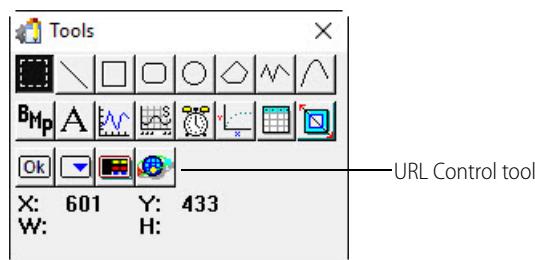


**(Pro only)** The URL Control tool adds a simplified browser to the active display window. Like a URL window (see “[Using Draw Windows and URL Windows](#)” on page 91), this allows you to display a specific website within your project, or a web application such as Opto 22’s groov (see “[Adding a groov URL Control](#)” on page 133). However, unlike a URL window, a URL control browser is placed within a draw window. While this allows you to add other graphic objects within the same draw window, in Runtime the user cannot resize a URL control browser. But the browser does provide scrollbars to allow you to see the entire page, and forward and back buttons are provided for navigation. There is no keyboard support for static web pages in a URL control.

*NOTE: A window cannot contain both an alarm control and a URL control.*

*NOTE: If a window in Configurator contains a URL control, the Always in Memory option in the Window > Properties dialog box is disabled and cannot be used for that window.*

1. If your toolbox is not visible, click View > Toolbox to open the toolbox.

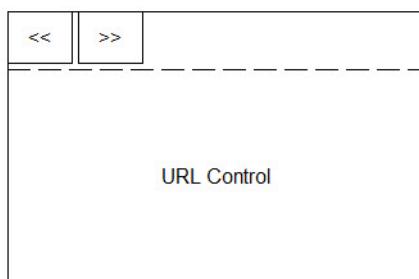


2. Select the URL Control tool.

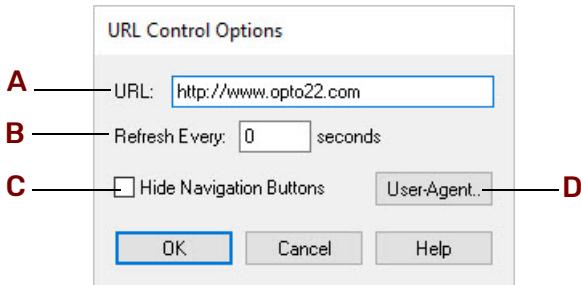
The cursor turns into a crosshair.

3. Click the crosshair in a window, and then drag it in any direction to create a frame for the browser.

*NOTE: Remember that the browser cannot be resized in Runtime, so make sure that the frame is big enough to display the information in the target website.*



4. Using the Select tool, double-click the control to open the URL Control Options dialog box.



**URL**—Type the URL of the target webpage.

**Refresh Every \_\_\_\_ sec.**—To refresh the control at a specific interval, type the number of seconds in the text box. This is useful for updating static images like a weather radar or images from a security camera.

**User Agent**—To specify the target browser and operating system, click the User Agent button, and then, in the User Agent String dialog box, type a correctly formatted user agent string. This feature lets you override the default User-Agent value in header messages sent to the web server. (User-agent strings are typically advanced settings used when testing web applications with different browsers.) For help creating user agent strings, contact your IT department, or see the Microsoft Developer's Network website at [https://msdn.microsoft.com/en-us/library/ms537503\(v=vs.85\).aspx](https://msdn.microsoft.com/en-us/library/ms537503(v=vs.85).aspx).

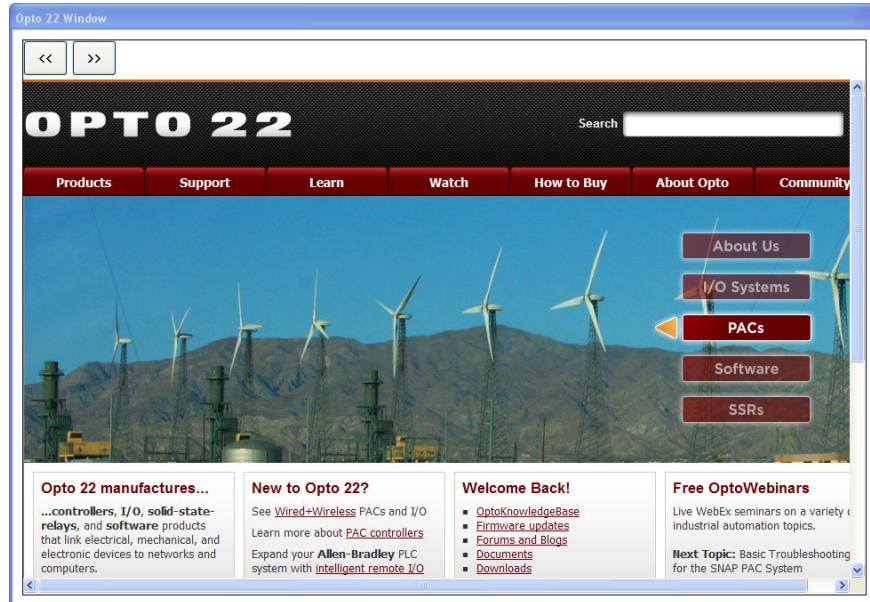
To set a global user agent string for all URL controls and URL windows in all of your PAC Display projects (which takes precedence over objects configured with the User Agent button), perform these steps:

- a. In Windows File Explorer, navigate to the folder where PAC Display is installed. (The default folder is C:\Program Files (x86)\Opto22\PAC Project.)
- b. In the folder, create a text file and name it `PAC_DisplayUserAgentString.txt`
- c. In the text file, type a correctly formatted user agent string. Don't type anything else in the text file.
- d. Close and save the text file. When a project is loaded in Runtime, PAC Display uses the user agent string in the `PAC_DisplayUserAgentString.txt` for all URL controls and URL windows

**Hide Navigation Controls**—Check the box to hide the forward and back navigation buttons.

5. When finished, click OK to save your changes and close the dialog box.

The URL you entered appears in the center of the control to show which webpage will be loaded in Runtime. In Runtime, the browser looks like this:



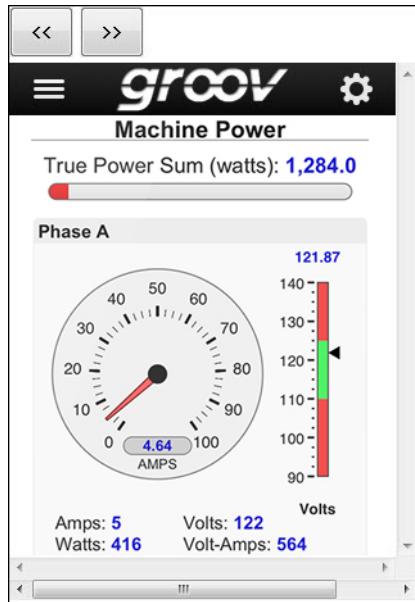
### Adding a *groov* URL Control

If you have Opto 22's *groov* on your network, you can access your *groov* project in Runtime by creating a URL control in Build that points to *groov*. When you create the control, make sure to enter the exact same URL for *groov* as you would in a regular browser including "https://".

Because *groov* is a web application rather than a static web page, you can use all of *groov* features from within a PAC Display URL control. Keep in mind that a user cannot change the size of a URL control, but they can change the size of a URL window (see "[Adding a \*groov\* URL Window](#)" on page 93).

If the *groov* project has a URL link to an external webpage, when you click the URL in Runtime, the webpage will open in a new popup window. When the popup containing the external webpage is closed, any popup windows that originated from that window will also be closed.

For more information about *groov*, see the (form 2027).



## WORKING WITH TABLES

Using PAC Display's Table tool , you can add an object to display the contents of tables used in a PAC Control project. In a single on-screen object, you can display the contents of up to sixteen separate tables. The tables can contain 32-bit and 64-bit integers, floating point values, or text strings.

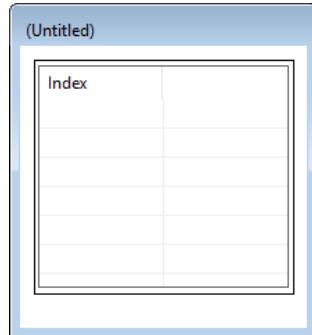
For information on changing individual table elements in PAC Display Runtime, see “[Writing Directly to Individual Elements](#)” on page 336. For information on changing multiple table elements at the same time, see “[Configuring Recipes](#)” on page 239.

[“Creating a Table” on page 134](#)

[“Configuring a Table” on page 135](#)

### Creating a Table

1. Select the Table tool in the toolbox.
2. Click the mouse button, drag the mouse to the desired size, and then release the mouse button.  
The table object appears.

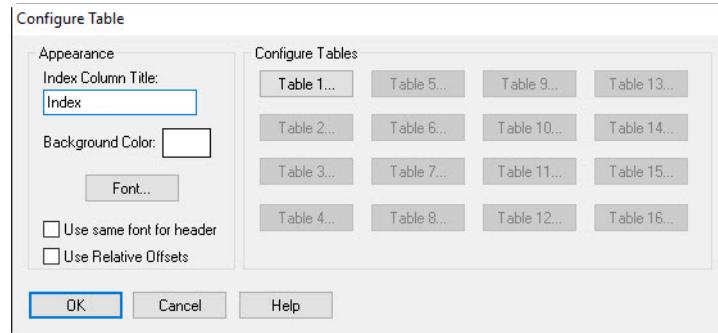


## Configuring a Table

After creating a table object in a draw window, you must specify which table(s) will be displayed. For each table, you can optionally specify which table elements will be displayed.

1. Double-click the table object with the Select tool.

The Configure Table dialog box appears.



2. In the Appearance area:

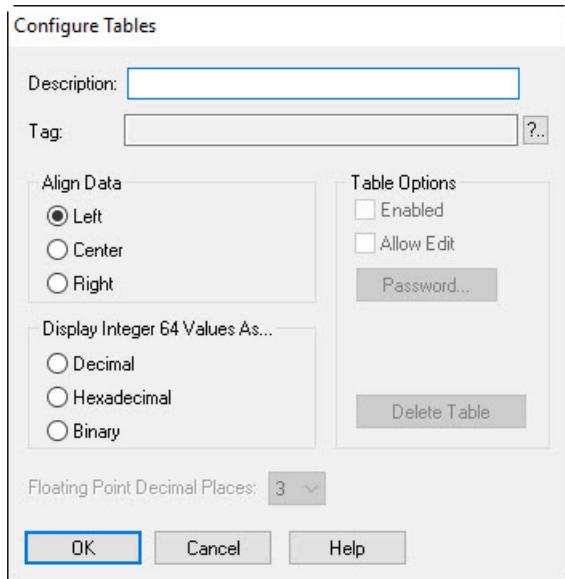
- If desired, type a new title for the Index Column. (By default, the title is "Index.")

*NOTE: To hide the Index column, delete any text in the Index Column Title field. (This hides the Index column in both Runtime and Configurator.)*

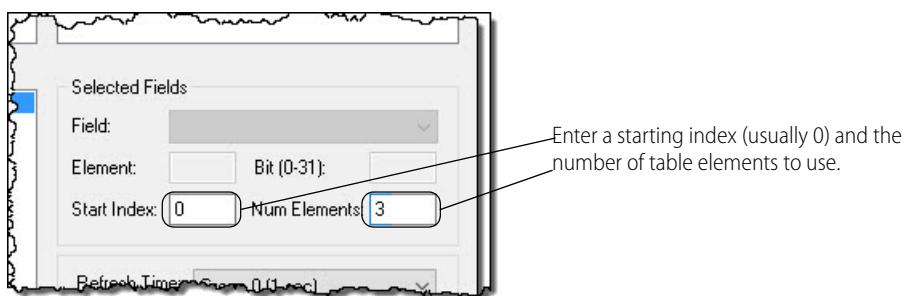
- If desired, choose the background color and font used in the table object.
  - To select a background color, click the white square next to Background Color, select a color in the Windows color selector that appears, and then click OK.
  - To select the font, click Font, select a font in the Windows font selector that appears, and then click OK.
  - To use the selected font in the header of each table column, select "Use same font for header."
  - When Use Relative Offsets is selected, all table data will begin at the top row of the table control, regardless of which actual data table index is being displayed.

For example, if Table 1 is configured to show elements 0 – 50 of a table, and Table 2 shows elements 200-250 of a different table, then the top row of the table control for Table 1 corresponds to the data at element 0, and the top row of the table control for Table 2 corresponds to the data at element 200.

3. In the Configure Tables area, click Table 1. The Configure Tables dialog box appears.



4. If desired, type a description. Up to 12 characters of the description will appear on the Table button when you close the dialog box. (If you don't type a description, after you configure a tag, the tag's item name is displayed in the Description field.)
5. Click the Tag Selection button [?], and in the Tag Selection dialog box that appears, select a table.
- To display a range of table elements, type a start index (usually 0) and the number of elements (10240 maximum) to be displayed.



- You can also configure a refresh time for the table object. For details, see "Refresh Time Groups" on page 183.
6. Click OK to exit the Tag Selection dialog box. The Configure Tables dialog box appears, where you can configure additional options:
- **Align Data.** To align the data in the table, select the appropriate option for left, center, or right-justified data.
  - **Display Integer 64 Values As.** By default, discrete bits and digital point states stored in an Integer 64 value are displayed in decimal format. To see four bits at a time, select Hexadecimal. To see each bit or point state, select Binary. (This option is disabled if you did not select an integer-64 table.)
  - **Floating Point Decimal Places.** To configure the number of floating point decimal places to be displayed in the table, select a value from 0 to 6. (This option is disabled if you did not select a float table.)
  - **Table Options.** By default, Enabled is selected to allow the operator to use the table in Runtime.

Allow Edit is also enabled, and allows the Runtime operator to click on a cell in the table, and then enter a new value. To prevent an operator from editing the data, deselect Allow Edit.

To require a password to edit data in a table, select the table's Allow Edit option, and then click Password. In the dialog that appears, type the password, confirm it, and then click OK.

7. Click OK to exit the Configure Tables dialog box and return to the Configure Table dialog box.
8. To configure additional tables, click its Table button, and then repeat steps 4 through 7. When you have finished configuring tables, click OK to close the Configure Table dialog box.

To delete a table, click its Table button, and then click Delete Table. The remaining tables are reordered.

## PRINTING

To print the displayed windows, click File > Print to display the Print dialog box. If the settings are correct for your printer, click OK.

If you need to change printer settings, click the Properties button in the Print dialog box. You can also change the printer settings without printing the Configurator screens by selecting the File > Printer Setup command.



# 7: Using Animated Graphic Objects

## INTRODUCTION

This chapter describes how to animate graphic objects to show how I/O data and other values change in real time. It also describes how PAC Display scans data from control engines to update its graphic objects, and how you can adjust this scanning to optimize your PAC Display project for best performance.

### In This Chapter

About Animated Graphic Objects .....	page 139
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Assigning a Dynamic Attribute to a Graphic Object .....	page 165
Copying Configured Attributes to other Graphic Objects .....	page 169
Assigning Send Value, Send Discrete, and Send String .....	page 169
Assigning a Chart State Value to a Graphic Object .....	page 172
Adding Hint Text to a Graphic Object .....	page 175
Security Settings for Graphic Objects and Dynamic Attributes	page 176
Viewing Tags and Dynamic Attributes .....	page 180
Scanning to Update Graphic Objects .....	page 182

## ABOUT ANIMATED GRAPHIC OBJECTS

As your PAC Control strategy runs on the control engine, values and states of tags in the PAC Control strategy database are continuously updated. PAC Display uses this changing data to modify attributes (such as size, position, and color) of the graphic objects that you have connected to the tags. The end result is an animated, continually updated display that shows status information about a control process.

To animate graphic objects, you must assign *dynamic attributes* to objects you've drawn. These are attributes that make the graphic object change based on the values read from or sent to control engines, based on events that happened, or based on how the operator interacts with the interface.

Two types of dynamic attributes can be assigned to a graphic object: control engine-driven attributes and operator-driven attributes.

**Control engine-driven attributes** are always linked to a tag (I/O point, value, and so forth) in a PAC Control strategy. This type of attribute can change the object's appearance depending on the tag's value when the control engine reads it. For example, if the tag reflects an alarm condition for a process, you could configure the attribute to change the object's color to red for the Runtime operator to see.

**Operator-driven attributes** are assigned to a graphic object. These attributes change the object as an operator interacts with the interface. As a result, events may be triggered, or new tag values may be sent to an

attached control engine. For example, you could configure an attribute to close a valve when the operator clicks a button in the HMI.

## DYNAMIC ATTRIBUTES AND THEIR FEATURES

This section describes each dynamic attribute and explains its configurable features.

Some dynamic attributes cannot be assigned to certain graphic objects. When that's the case, the Not Available indicator  appears next to the attribute's name in the Graphic Dynamic Attribute dialog box. (For more information, see ["Assigning a Dynamic Attribute to a Graphic Object" on page 165](#).)

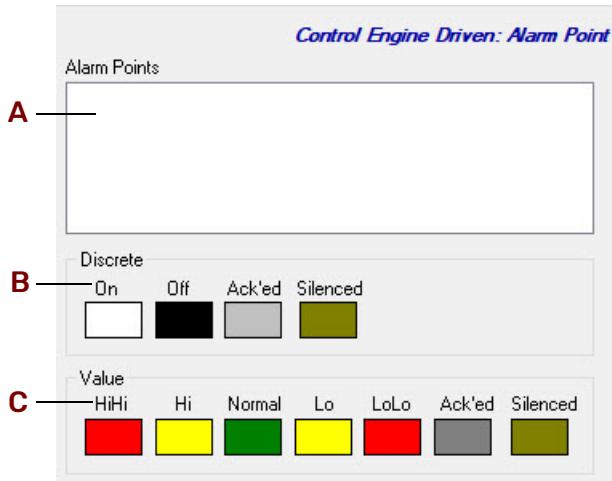
Type	Dynamic Attribute	Function
operator-driven	<a href="#">Download Recipe, page 142</a>	Downloads a recipe file to the control engine
operator-driven	<a href="#">Execute Menu Item, page 144</a>	Executes a single menu item
operator-driven	<a href="#">Horizontal Slider, page 147</a>	Creates a horizontal slider that an operator can use to change values in a tag.
operator-driven	<a href="#">Launch Application, page 148</a>	Starts an application
operator-driven	<a href="#">Read and Clear, page 151</a>	Reads a tag's value and simultaneously clears (resets) it
operator-driven	<a href="#">Send Discrete, page 153</a>	Sends a discrete value to a tag in the control engine
operator-driven	<a href="#">Send String, page 154</a>	Sends a string to a tag in the control engine
operator-driven	<a href="#">Send Value, page 154</a>	Sends a value to a tag in the control engine
operator-driven	<a href="#">Upload Recipe, page 158</a>	Uploads a recipe file from a control engine
operator-driven	<a href="#">Vertical Slider, page 161</a>	Configures a vertical slider
operator-driven	<a href="#">Windows, page 163</a>	Changes the state of a window in the HMI
control engine-driven	<a href="#">Alarm Point, page 140</a>	Changes the graphic object's color based on the state of an alarm point
control engine-driven	<a href="#">Control Engine Status, page 141</a>	Changes the graphic object's color based on the status of one or more control engines
control engine-driven	<a href="#">Fill Color, page 144</a>	Changes the graphic object's color
control engine-driven	<a href="#">Horizontal Position, page 146</a>	Adjusts the graphic object's horizontal position
control engine-driven	<a href="#">Horizontal Size (Width), page 146</a>	Adjusts the graphic object's width
control engine-driven	<a href="#">Line Color, page 150</a>	Changes a line's color or the color of the line around the graphic object
control engine-driven	<a href="#">Rotate, page 152</a>	Rotate the graphic object
control engine-driven	<a href="#">Text Color, page 155</a>	Changes the color of text in the HMI
control engine-driven	<a href="#">Text In from Control Engine, page 157</a>	Displays a tag value in a text object
control engine-driven	<a href="#">Vertical Position, page 160</a>	Adjusts the graphic object's vertical position
control engine-driven	<a href="#">Vertical Size (Height), page 160</a>	Adjusts the graphic object's height
control engine-driven	<a href="#">Visibility/Blink, page 162</a>	Makes a graphic object visible or invisible, or causes it to blink

### Alarm Point

Use this attribute to change the color of a graphic object based on the state of an alarm point. You can use this attribute with circles, rectangles, and polygons. By default, the color of the graphic object corresponds to the

Normal, or unalarmed, state. See also, “Configuring Alarm Points” on page 258 and “Configuring Project Alarms” on page 277

In the Graphic Dynamic Attributes dialog box, click Alarm Point (in the Control Engine Driven list) to display its features.



**(A) Alarm Points.** The names of the alarm points configured for the project appear here. Click an alarm point in the list, and then set the colors that will be used for the graphic object in the Discrete group or the Value group.

Alarm points that monitor digital points are configured as discrete alarm points, and have four states: On, Off, Ack'ed, and Silenced. Alarm points that monitor analog points are configured as value alarm points, and have six states: HiHi, Hi, Normal, Lo LoLo, Ack'ed, and Silenced. See “Configuring Alarm Points” on page 258 for more information about setting up alarm points.

**(B) Discrete.** To select colors for a discrete alarm point's On and Off states, click the color box for each state and then choose a color in the dialog box that appears. If you have selected an alarm point for a digital I/O point, only the Discrete group will appear in the Dynamic Attribute - Alarm Point dialog box.

**(C) Value.** To select colors for a value alarm point's HiHi, Hi, Normal, Lo LoLo, Ack'ed, and Silenced states, click the color box for each state and then choose a color in the dialog box that appears. If you have selected an alarm point for an analog I/O point, only the Value group will appear in the Dynamic Attribute - Alarm Point dialog box.

## Control Engine Status

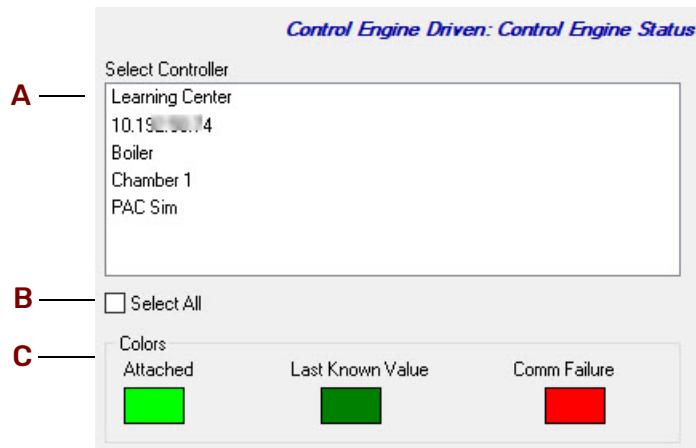
Use this attribute to change the color of a graphic object based on the status of one or more control engines. You can use this attribute with circles, rectangles, and polygons.

*NOTE: When the Control Engine Status dynamic attribute is selected, the Not Available indicator  appears next to all other Control Engine-driven attributes to indicate they are disabled. (They can't be used together with Control Engine Status.)*

If the Control Engine Status attribute is used to monitor multiple control engines, the graphic object will display the status color for the control engine that is in the most critical condition. Least critical to most critical status is shown below:



In the Graphic Dynamic Attributes dialog box, click Control Engine Status (in the Control Engine Driven list) to display its features.



**(A) Select Controller.** The names of the control engines configured for the project appear here.

Select a control engine. To select multiple control engines, hold down the Ctrl key and click each one you want to select.

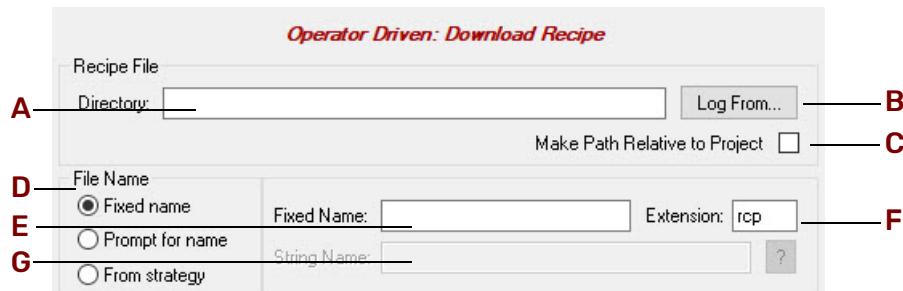
**(B) Select All.** To select all control engines in the list, click Select All.

**(C) Colors.** To select colors for a control engine's state, click the color box for the state and then choose a color in the dialog box that appears.

## Download Recipe

Use this attribute to download a recipe file to a control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. For more information about recipes, see ["Configuring Recipes" on page 239](#).

In the Graphic Dynamic Attributes dialog box, click Download Recipe (in the Operator Driven list) to display its features.



**Name (Trigger-based recipe download).** Enter a name for this recipe. This name is used to refer to this trigger-based recipe in the Recipe Managers list dialog box. The name can be up to 40 characters long.

**(A) Directory.** Enter the directory location of the recipe file. Use the button **B** to quickly enter a directory name.

**(B) (Basic only) Browse.** Click to quickly find the recipe file directory for **A**. Use the Select Download File Directory dialog box that appears to navigate to the desired directory, and then click OK.

**(B) (Pro only) Log From.** Click to select whether to log from an ASCII recipe file or from a database table.

- If you click Log File in the pop-up menu, use the Browse for Folder dialog box to navigate to the desired directory, and then click OK.
- If you click Log File in the pop-up menu, use the Select Database Table dialog box to select the desired table, and then click OK. For more information about logging to a database table, see "[Configuring an ODBC Data Source](#)" on page 55.

**(C) Make Path Relative to Project.** When selected, if you copy the project and recipe files to a different computer, PAC Display will look in the same relative location to find the recipe files in Configurator and Runtime.

For example, if the project is saved in C:\proj\ and you configure recipes files to be in C:\proj\recipes\, then the relative path would be this: .\recipes\

If you then saved the project to C:\temp\newproj\, PAC Display would look for recipe files in the new location's relative path: C:\temp\newproj\recipes\

**(D) File Name.** Choose the source of the recipe file name:

#### Fixed Name

Check this if the recipe file is a file name you want to configure at this time. If this option is selected, the File Name edit box appears, prompting you for a file name. Make sure the file exists in the Directory entry, otherwise an error is posted. The file name may not be changed at Runtime.

The Extension parameter also appears and prompts for a one to three character long extension that's appended to the Fixed Name. The extension must not contain a period or a DOS wild card character. The default extension is "rcp".

#### Prompt For Name

Check this if the recipe file name is to be prompted at Runtime when the trigger occurs. If this option is selected, the Extension parameter also appears. Enter a one to three character long extension which does not contain a period or a DOS wild card. This extension is used as a filter to select which files are displayed when prompting a user for the recipe name at Runtime, however files with different extensions may be selected.

#### From Strategy

Check this option if you want to use a string tag name from the control engine strategy to specify the recipe file name. If this option is selected, the String Name edit box appears, prompting for the name of the PAC Control tagname you want to use. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a tagname.

**(E) Fixed Name.** If Fixed Name was selected in File Name (**D**), enter the name of the recipe file located in Directory (**A**). Notice the file extension is .rcp.

**(F) Extension.** Specify the file extension for the recipe files available to this dynamic attribute by entering the extension in the File Extension field. The extension must be one to three characters long and must not contain a period or DOS wild card characters.

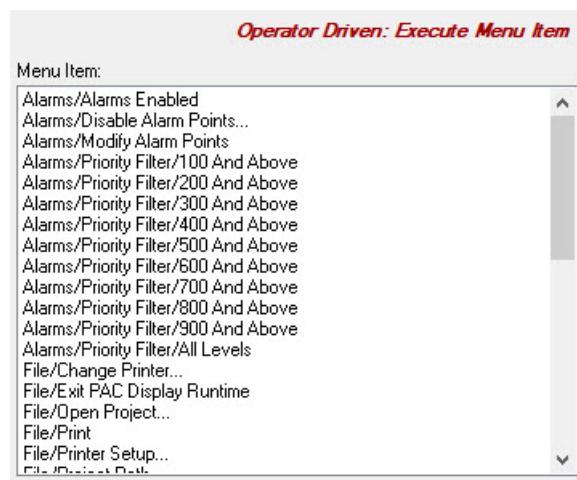
If Fixed Name is checked, this extension will be appended to the File Name entry to create the name for the recipe file. If Prompt For Name is checked, this extension will be used as a filter to select the files for display in a file selection dialog box when PAC Display Runtime executes this dynamic attribute; however, you may override this filtering if you wish to select a file with a different extension.

**(G) String Name.** If From strategy was selected in Fixed Name (**D**), use either Quick Tag Entry (see page 74) or the Tag Selection dialog box (see page 75) to select a tagname.

### Execute Menu Item

Use this attribute to run a single Runtime command when an object is clicked. This is useful if you want to hide the menu bar and allow only limited access to certain items. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Execute Menu Item (in the Operator Driven list) to display its features.

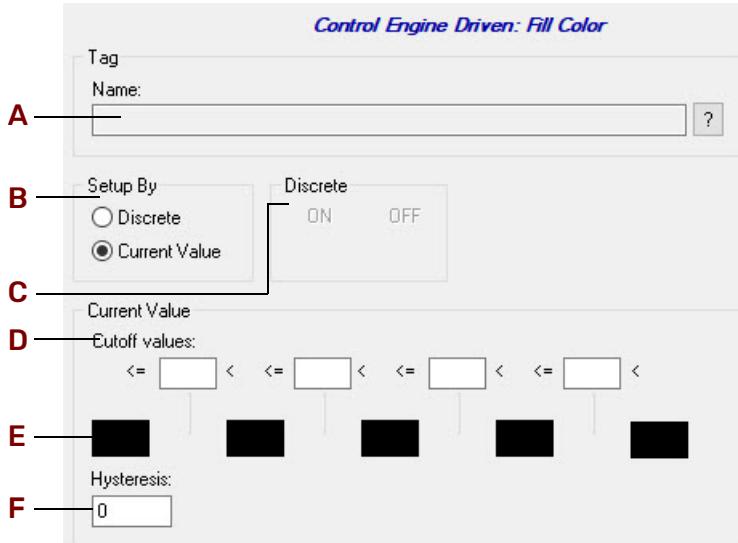


Select a command from the Menu Item list. For more information on the Runtime commands, see "Runtime Menus" on page 370.

### Fill Color

Use this attribute to change a graphic object's fill color based on a tag value from the control engine. This is a control engine-driven attribute and is available for rectangles, round rectangles, ellipses, and polygons.

In the Graphic Dynamic Attributes dialog box, click Fill Color (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the Cutoff Values group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in Cutoff Values (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

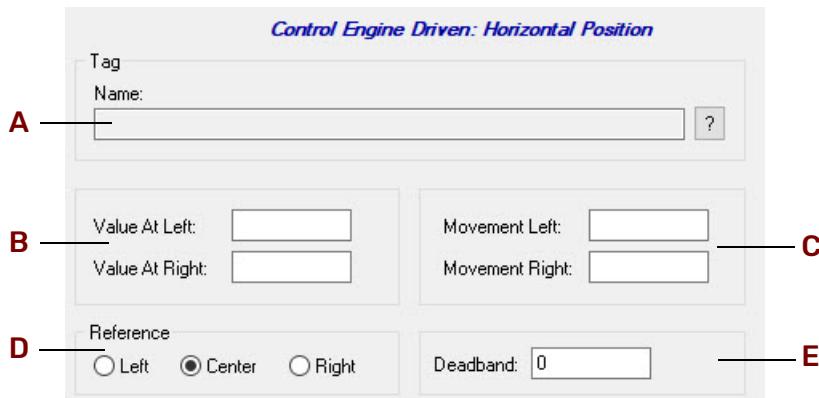
**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

## Horizontal Position

Use this attribute to adjust the horizontal position of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons, polylines, curves, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Horizontal Position (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes, the graphic object's horizontal position is changed.

**(B) Value at Left/Right.** Enter the leftmost and rightmost value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Left/Right.** Enter the leftmost and rightmost movement the object can change. The movement units are in pixels. Suppose your left and right values are 0 and 100, and your left and right movements are 0 and 200. When the tag value is 50, the object will be moved 100 pixels to the right.

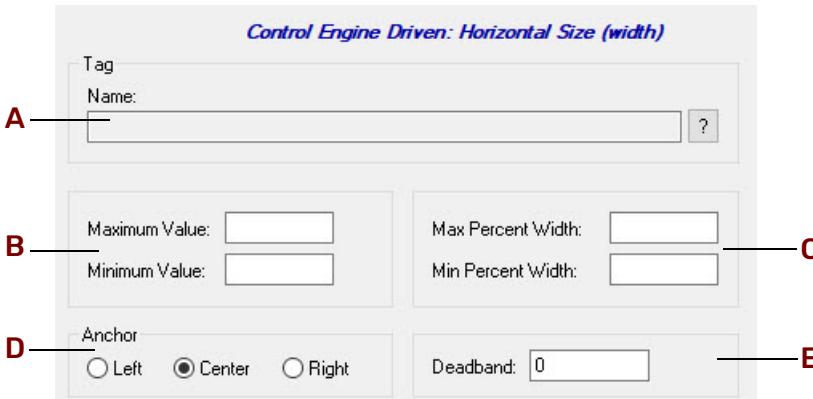
**(D) Reference.** Select the reference point for the object. The choices are left, center, and right. The Horizontal Size (Width) dynamic attribute must also be configured in order for this option to affect the graphic object.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the graphic object's movement will actually change. Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next tag reading must be greater than 55 in order for the graphic object to move.

## Horizontal Size (Width)

Use this attribute to adjust the width of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, and curves.

In the Graphic Dynamic Attributes dialog box, click Horizontal Size (width) (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes in the PAC Control strategy, the graphic object's width is changed.

**(B) Maximum/Minimum Value.** Enter the maximum and minimum value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Max/Min Percent Width.** Enter the maximum and minimum percentage the object can change. The percentage range is from 0 to 1,000 percent. Suppose your minimum value is 0 and your maximum value is 10, and the minimum and maximum percentages range is 0 to 200. When the tag value is 10, the object will be twice as big as you've originally drawn it. When the tag value is 5, the object will be the same size you've drawn it, which is 100 percent.

**(D) Anchor.** Enter the anchor point for the object. This is the reference point on the object from which the graphic object changes. The choices are left, center, and right.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the graphic object's width will actually change.

### Horizontal Slider

Use this attribute to configure a horizontal slider when a graphic object is clicked. This is an operator-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, and bitmaps.

## DYNAMIC ATTRIBUTES AND THEIR FEATURES

In the Graphic Dynamic Attributes dialog box, click Horizontal Slider (in the Operator Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. The distance the horizontal slider is moved affects the value sent to the tag in the control engine.

**(B) Value at Left/Right.** Enter the leftmost and rightmost value for the tagname in **A**. For example, if you know your tag values can be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Left/Right.** Enter the leftmost and rightmost movement the object can change. The movement units are in pixels. Suppose your left and right values are 0 and 100, and your left and right movements are 0 and 200. If you move the tag 100 pixels to the right, the tag value sent will be 50.

**(D) Reference.** Select the reference point for the object. The choices are left, center, and right. Note that you must also separately configure the Horizontal Size (Width) dynamic attribute to use this option.

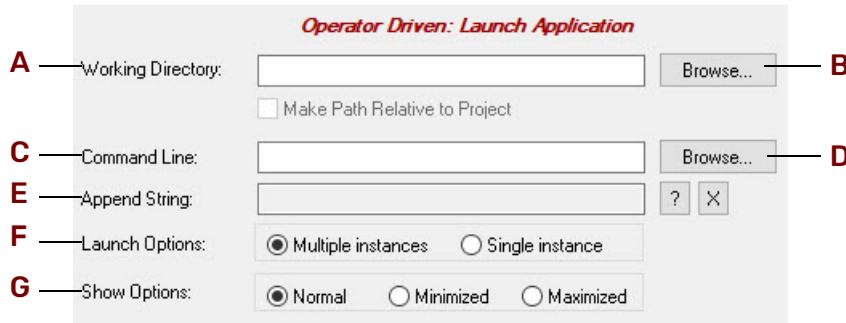
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the tag value should be changed.

Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next graphic object movement must be greater than 55 in order for the tag value to change.

### Launch Application

Use this attribute to start an application when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Launch Application (in the Operator Driven list) to display its features.



**(A) Working Directory.** (Optional) Enter the working directory you want to be in when you start the application. Use the Browse button **B** to quickly enter a directory name. If a working directory is not specified, the current PAC Display Runtime directory is used when launching the application. You can change the working directory at any time.

**(B) Browse.** Click to find the directory for **A**. The Working Directory Selection dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(C) Command Line.** Enter the complete path and file name of the application you want to launch. Use the Browse button (**D**) to quickly enter the path.

**(D) Browse.** Click to find the path and application name for **C**. The Application Manager Executable File Selection dialog box appears. Use it to select an application and click Open when you're done.

**(E) Append String.** (Optional) Enter the name of a string tag to use to append to the path entered in Command Line (**C**). The string appended may be a file name the launched application should open.

Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.

Use the Delete button to clear an entry you may have made in this field. Only tag names may be entered. Literal strings are not accepted. If the appended string is a parameter, a space must be included in the Command Line string to separate it from the main command line.

**(F) Launch Options.** Select Single instance to have PAC Display Runtime check whether the graphic object has previously launched an application that is currently running. If the object has not previously started a currently running application, the application will be launched.

Select Multiple instances to allow the graphic object to start more than one instance of an application. Some applications allow only one session of an application to run, while others allow multiple sessions.

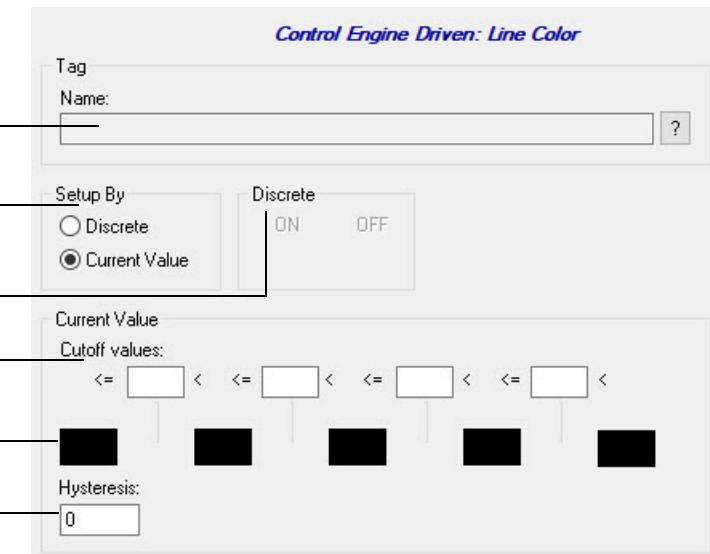
Note that the Single Instance option doesn't limit the number of active sessions of an application that is launched by other graphic objects and triggers. For example, if the graphic object launches a Microsoft Word session, that object can't launch any other application until the Word session ends. However, a trigger-based event can launch a second, separate session of Word, so two Microsoft Word sessions will be running concurrently.

**(G) Show Options.** Click here to configure how the application window will appear. Your choices are Normal, Minimized, and Maximized.

## Line Color

Use this attribute to change a line color or the line color around a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, and Bezier curves.

In the Graphic Dynamic Attributes dialog box, click Line Color (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the CutoffValues group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in Cutoff Values (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

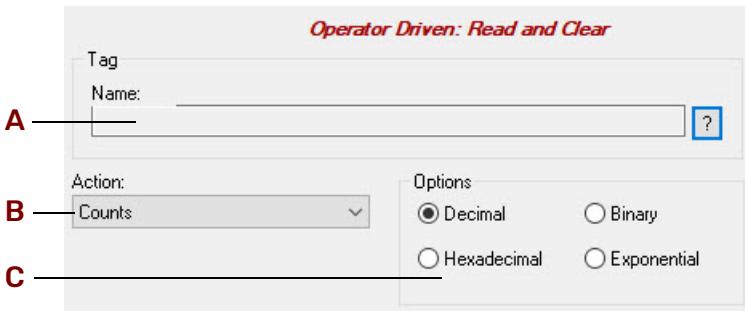
**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

## Read and Clear

Use this attribute to read a tag value and then clear (reset) it. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Read and Clear (in the Operator Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.

**(B) Action.** Choose the item to be read and cleared when the operator clicks the graphic object:

- Counts (returns an integer value and then clears counts)
- On time total
- Off time total
- Latch (ON)
- Latch (OFF)
- On pulse measure
- Off pulse measure
- Period
- Minimum
- Maximum

**(C) Options.** Formatting options for how values appear when read appear here. Depending on the item you selected in Action **(B)**, one of the following option groups will be available:

- Numerical formats—Decimal, binary, hexadecimal, and exponential formats are available for values returned as numbers (for example, the state of all 32 points on a high-density module).
- Text formats—Custom text that corresponds to a discrete value's on and off states can be entered here.

### Notes:

- If the Read and Clear dynamic attribute has been assigned to an object, a "Text In from Control Engine" dynamic attribute cannot also be assigned to that same object.
- If a text placeholder (##) is used to view return values, these placeholder characters will appear that way in Runtime until the operator triggers the read and clear. Once this has happened, the graphic object will not change until the read and clear is triggered again.

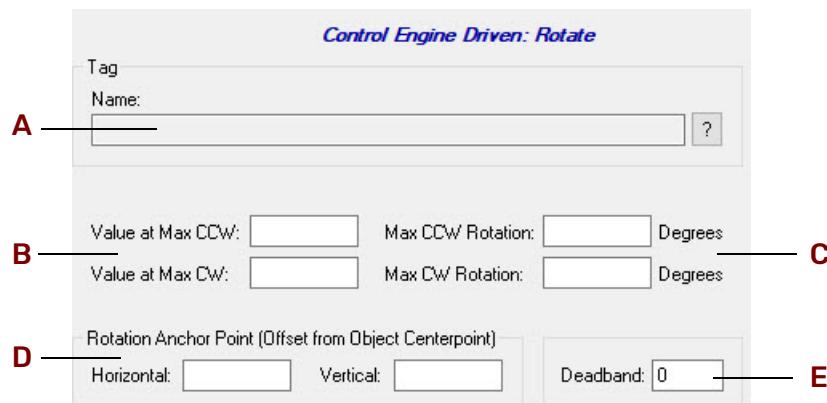
- If more than one graphic object in a PAC Display window is configured with the same Read and Clear dynamic attribute, each object is treated independently. The graphic objects are not linked to each other, so when one object is read and cleared, the other object will not reflect this.

## Rotate

Use this control engine-driven to rotate any of the following graphic objects based on a tag value from the control engine: Bitmap, Metafile, Curve, Polygon, Ellipse, Polyline, JPEG, PNG, Rectangle, Line, or Text.

*NOTE: Dynamic rotation can be a CPU intensive. Use dynamic rotation judiciously.*

In the Graphic Dynamic Attributes dialog box, click Rotate (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, the graphic object's line rotates.

**(B) Value at Max.** These fields are used to specify the return data from the tag that will produce the maximum counterclockwise (CCW) and maximum clockwise (CW) rotation. The Value at Max CCW may be either less than or greater than the Value at Max CW, so that rotation may proceed in either direction as the data from the tag increases or decreases. Therefore, the term "exceeds" is used below to indicate a value that may be either greater than or less than the CCW or CW Max value.

When the tag returns data that is equal to or exceeds the Value at Max CCW to PAC Display, the graphic object will rotate counterclockwise as far as possible, as specified by the Max CCW Rotation value explained below. When the tag returns data that is equal to or exceeds the Value at Max CW Rotation to PAC Display, the graphic object will rotate clockwise as far as possible, as specified by the Max CW Rotation value explained below.

**(C) Max Rotation.** These fields are used to specify the maximum counterclockwise and clockwise rotation angle that the graphic object may undergo (in degrees from its configured location). The entered values must be non-negative numbers. The Max CCW Rotation angle is achieved when the tag returns data that is equal to or exceeds the Value at Max CCW, as explained above. The Max CW Rotation angle is achieved when the tag returns data that is equal to or exceeds the Value at Max CW, as explained earlier in this section.

**(D) Rotation Anchor Point.** The rotation anchor point is used to specify the fixed location that the graphic object rotates around. This location is specified in terms of an offset (in units of pixels) from the center point of the graphic object at its configured location.

In the Horizontal field, enter a negative value to specify a position that is to the left of the configured location or enter a positive value to specify a position that is to the right of the configured location. In the Vertical field,

enter a negative value to specify a position that is above the configured location or enter a positive value to specify a position that is below the configured location. If a value of zero is specified for both fields, then the graphic object will rotate about its center point.

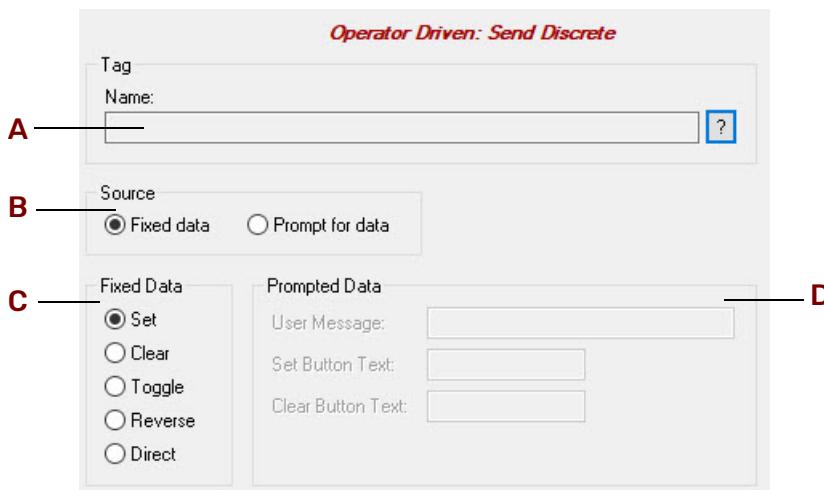
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the line's rotation angle should change.

For example, let's say the deadband is 2. A tag with a value of 50 is read. The next tag value read is 51. The line does not rotate because the value read is within the deadband range.

### Send Discrete

Use this attribute to send a discrete value to a tag in the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Send Discrete (in the Operator Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the tag value entered by the operator or configured in this dialog box.

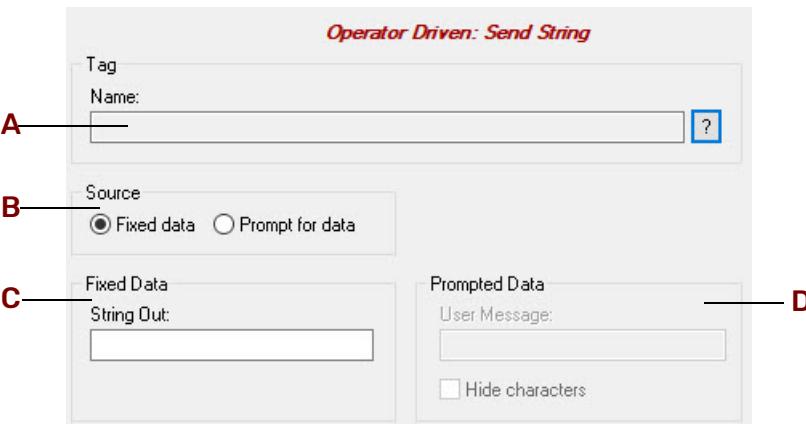
**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the setting selected in the Fixed Data field (**C**) is sent to the tag. If you select Prompt for data, the Prompted Data field (**D**) is activated and you can enter a message that will prompt the operator to select a discrete state for the tag.

**(C) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the setting to be sent to the tag. The **Set** option turns the tag on; **Clear** turns the tag off; **Toggle** changes the tag to the opposite of its current state (from on to off, or from off to on); **Reverse** changes the tag's state to off when the mouse is clicked on the graphic object, and on when the mouse button is released; **Direct** changes the tag state to on when the mouse is clicked on the graphic object, and off when the mouse is released.

**(D) Prompted Data.** If Prompt for Data was selected Source (**B**), enter a message here that will prompt the operator to select a tag state. Two buttons will be displayed to the operator. Enter the labels for the Set Button and the Clear Button. The Set Button sends a discrete value to set the tag to the on state, and the Clear Button sends a discrete value to set the tag to the off state.

## Send String

Use this attribute to send a string to the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. **In the Graphic Dynamic Attributes dialog box, click Send String (in the Operator Driven list) to display its features.**



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the string tag entered by the operator or configured in this dialog box.

**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the setting selected in Fixed Data (**C**) is sent to the tag. If you select Prompt for data, the field in Prompted Data (**D**) is activated and you can enter a message that will prompt the operator to enter a string to send to the tag.

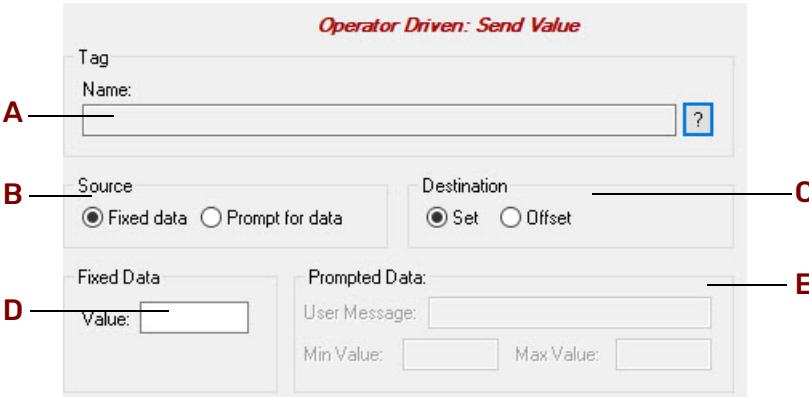
**(C) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the string to send to the tag.

**(D) Prompted Data.** If Prompt for Data was selected in Source (**B**), enter a message to prompt the operator to enter a string. Choose the Hide characters option if you don't want the text entered by the operator to be displayed.

## Send Value

Use this attribute to send a value to a tag name in the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Send Value (in the Operator Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the tag value entered by the operator or configured in this dialog box.

**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the value entered in the Fixed Data field (**D**) is sent to the tag. If you select Prompt for data, the Prompted Data field (**E**) is activated and you can enter a message that will prompt the operator to input a value to send to the tag.

**(C) Destination.** Choose Set to assign the sent value to the tag, or choose Offset to add the value to the tag.

**(D) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the value to send to the tag.

This value can be either a decimal or hexadecimal number. If entering a hexadecimal number, the number must be preceded by "0x" and contain no spaces (for example, "0x7FFFFFFF" and not "0x 7FFF FFFF").

**(E) Prompted Data.** If Prompt for Data was selected in Source (**B**), enter a message to prompt the operator for a value. Enter a minimum and maximum value the entered data should be within.

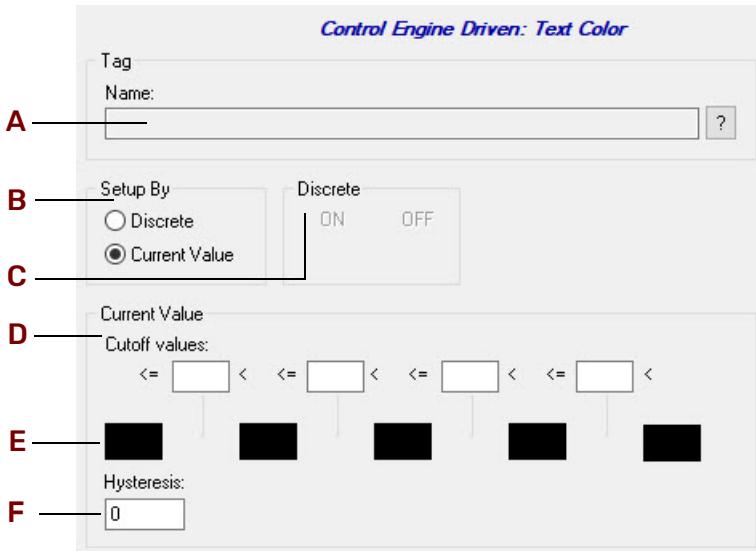
*IMPORTANT: If using hexadecimal numbers, enter a minimum number of 0x80000000 and a maximum number of 0x7FFFFFFF.*

### Text Color

Use this attribute to change the color of text in the interface based on a tag value from a control engine. This is a control engine-driven attribute and is available for grouped objects and text.

## DYNAMIC ATTRIBUTES AND THEIR FEATURES

In the Graphic Dynamic Attributes dialog box, click Text Color (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the CutoffValues group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in Cutoff Values (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

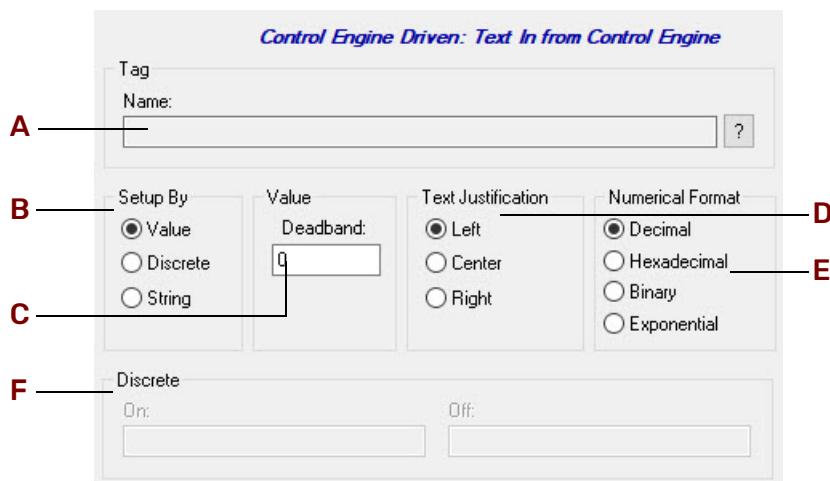
## Text In from Control Engine

Use this attribute to read a tag from a control engine and display various strings to the operator. You can read in a numeric value, a string, or a discrete value, and set up a string that will be displayed based on what was received. This is a control engine-driven attribute and is available for a text object.

A # sign in the text object indicates where the text string should be displayed. Only one # is needed to display an entire string. If there's no # sign within the text object, then the string will be appended to the end of the text object. You can configure how a floating point number is displayed by using a decimal point along with the # signs. For every decimal place you want displayed after a decimal point, use a # sign. For example, your text object could say: "Low level reading: ###.#." Your tag value is 200.55, so your displayed string is: "Low level reading: 200.6."

*NOTE: The extra # signs to the left of the decimal point aren't required, but are useful for determining how much space the text will require in your display.*

In the Graphic Dynamic Attributes dialog box, click Text In from Control Engine (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object. The tagname you enter is affected by the setting for Setup By (**B**).

**(B) Setup By.** Choose whether the tag you're reading is a numeric value, a discrete value (with ON and OFF values), or a string. If you choose Value, the Deadband and Text Justification fields (**C** and **D**) are activated. If you choose Discrete, the Numerical Format group (**E**) is activated. The choice you make in this selection must match the choice you made in Name (**A**).

If you choose Value, the value read will be converted into a string based on the rules mentioned at the beginning of this "Text In" section.

If you choose Discrete, use Numerical Format group (**E**) to enter the strings that will be displayed for the ON and OFF states. If you choose String, the text string from the control engine is displayed.

**(C) Deadband.** If you selected Value in Setup By (**B**), enter the value to be added and subtracted from the previously read tag value to determine whether the new value is displayed.

**(D) Text Justification.** Select the format in which numeric values will be displayed: decimal, hexadecimal, binary, or exponential. Hexadecimal numbers are prefixed with "0X" and appear in uppercase letters. Float values may not be displayed as hexadecimal or binary.

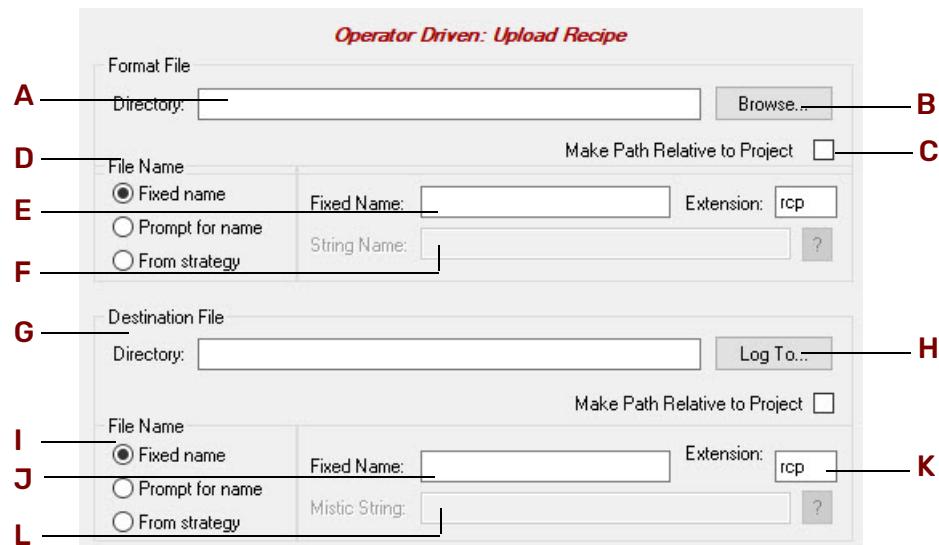
**(E) Numerical Format.** Select the text justification for the string from the control engine.

**(F) Discrete.** This section is highlighted if Discrete was chosen in Setup By (B). Enter the string to be displayed if the tag's discrete value is ON, and enter the string to be displayed if the tag's discrete value is OFF.

### Upload Recipe

Use this attribute to upload a recipe file from a control engine when graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. For more information about recipes, see ["on page 239](#).

In the Graphic Dynamic Attributes dialog box, click Upload Recipe (in the Operator Driven list) to display its features.



**(A) Name.** Enter the directory location of the recipe format file. Use the Browse button **B** to quickly select a directory name. The recipe format file is used to tell the control engine what data to read. Often, it's the original downloaded recipe. For example, the number of lines with data values represents how many values should be read from the control engine.

**(B) Browse.** Click to quickly find the recipe format file directory for **A**. The Select Format File Directory dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(C) Make Path Relative to Project.** When selected, if you copy the project and recipe format files to a different computer, PAC Display will look in the same relative location to find the recipe format files in Configurator and Runtime.

For example, if the project is saved in C:\proj\ and you configure recipes format files to be in C:\proj\recipes\, then the relative path would be this: .\recipes\

If you then saved the project to C:\temp\newproj\, PAC Display would look for recipe format files in the new location's relative path: C:\temp\newproj\recipes\

**(D) File Name.** Choose the source of the recipe format file name:

- If you choose Fixed name, the Fixed Name field (**E**) is highlighted.
- If Prompt for name is selected, the operator is prompted for the recipe format file name.
- If From strategy is selected, the String Name field (**F**) is highlighted.

**(E) Fixed Name.** If Fixed Name was selected in **D**, enter the name of the recipe format file located in directory **A**. Notice the file extension is .rcp.

**(F) String Name.** If From strategy was selected in **D**, use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name of type string that contains the recipe format file name.

**(G) Directory.** Enter the directory location of the recipe file that will receive the information. Use the button **(H)** to quickly enter a directory name.

**(H) (Basic only) Browse.** Click to quickly find the recipe file directory for **G**. The Select Destination File Directory dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(H) (Pro only) Log To.** Click to select whether to log to an ASCII recipe file or to a database table. If you click Log File in the pop-up menu:

- Use the Browse for Folder dialog box to navigate to the desired directory, and then click OK.
- Use the Select Database Table dialog box to select the desired table, and then click OK. For more information about logging to a database table, see "[Configuring an ODBC Data Source](#)" on page 55.

**(I) File Name.** Choose the file name for the recipe data that will be read from the control engine.

- **Fixed Name**—Check this if the template file is a file name you want to configure at this time. If this option is selected, the File Name edit box appears, prompting you for a file name. Make sure the file exists in the Directory entry, otherwise an error is posted. The file name may not be changed at Runtime. The "Extension" parameter also appears and prompts for a one to three character long extension that's appended to the "Fixed Name". The extension must not contain a period or a DOS wild card character. The default extension is "rcp".
- **Prompt For Name**—Check this if the template file name is to be prompted at Runtime when the trigger occurs. If this option is selected, the Extension parameter also appears. Enter a one to three character long extension which does not contain a period or a DOS wild card. This extension is used as a filter to select which files are displayed when prompting a user for the recipe name at Runtime, however files with different extensions may be selected.
- **From Strategy**—Check this option if you want to use a string tag name from the control engine strategy to specify the template file name. If this option is selected, the String Name dialog box appears, prompting for the tag name you want to use. Use the "?" button to enter the tag name from the Tag Selection dialog box.

**(J) Fixed Name.** If Fixed Name was selected in **I**, enter the name of the file to receive the information. This file will be located in the Directory field **(G)**.

**(K) Extension.** Specify the file extension for the recipe files available to this dynamic attribute by entering the extension in the File Extension field. The extension must be one to three characters long and must not contain a period or DOS wild card characters.

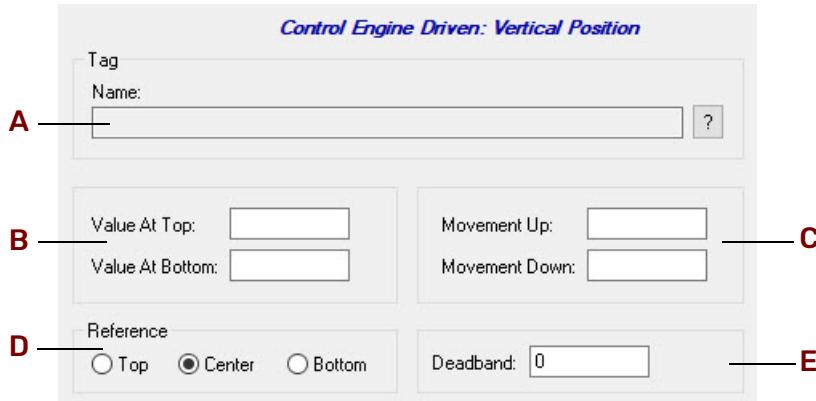
If Fixed Name is checked, this extension will append to the File Name entry to create the name for the recipe file. If Prompt For Name is checked, this extension will be used as a filter to select the files for display in a file selection dialog box when Runtime executes this dynamic attribute. However, you may override this filter if you wish to select a file with a different extension.

**(L) Mystic String.** If From strategy was selected in **I**, use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name of type string that contains the file name.

## Vertical Position

Use this attribute to adjust the vertical position of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons, polylines, curves, bitmaps, and text.

In the Graphic Dynamic Attributes dialog box, click Vertical Position (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes, the graphic object's horizontal position is changed.

**(B) Value at Top/Bottom.** Enter the top and bottom values for the graphic object. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range such as 0 to 50.

**(C) Movement Up/Down.** Enter the maximum top and bottom movement the object can change. The movement units are in pixels. For example, if your bottom and top values are 0 and 100, your bottom and top movements are 0 and 200, and your point of reference (**D**) is from the bottom when the tag value is 50, the object will be moved 100 pixels from the bottom.

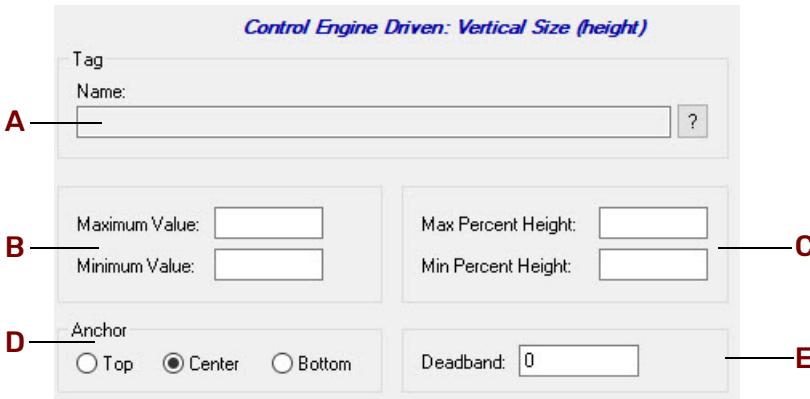
**(D) Reference.** Enter the reference point for the object. This is the reference point from which the object will move. The choices are top, center, and bottom. The Vertical Size (Height) dynamic attribute must also be configured in order for this option to affect the graphic object.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's position will actually change. Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next tag reading must be greater than 55 in order for the graphic object to move.

## Vertical Size (Height)

Use this attribute to change the height of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons.

In the Graphic Dynamic Attributes dialog box, click Vertical Size (height) (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object.

**(B) Maximum/Minimum Value.** Enter the maximum and minimum value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Max/Min Height.** Enter the maximum and minimum percentage the object can change. The percentage range is from 0 to 1,000. Suppose your minimum value is 0 and your maximum value is 10, and the minimum and maximum percentages range from 0 to 200. When the tag value is 10, the object will be twice as big as you've originally drawn it. When the tag value is 5, the object will be the same size you've drawn it, which is 100 percent.

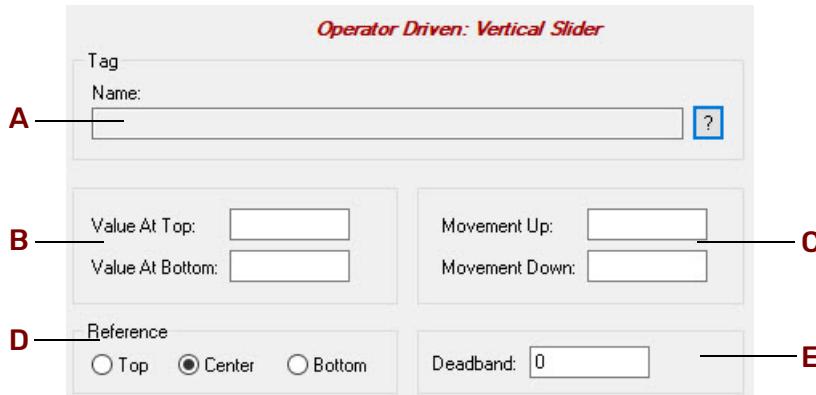
**(D) Anchor.** Enter the anchor point from which the object will "grow." The choices are Top, Center, and Bottom. For example, if you want to create a bar that grows up from the bottom, select Bottom. If you want to create an object that grows both up and down from the center, select Center. An object with a Top anchor grows down from the top.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's height will actually change. For example, let's say the values are 0 to 100, the percentages are 0 to 100, and the deadband is 5. A tag is read and has a value of 10. The next tag reading must be greater than 15 in order for the graphic object to change.

### Vertical Slider

Use this attribute to configure a vertical slider when a graphic object is clicked. This is an operator-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, and bitmaps.

In the Graphic Dynamic Attributes dialog box, click Vertical (in the Operator Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. The amount of movement the vertical slider makes affects the value sent to the tag in the control engine.

**(B) Value at Top/Bottom.** Enter the top and bottom values for the tagname in **A**. For example, if you know your tag values can be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Up/Down.** Enter the maximum top and bottom movement the object can change. The movement units are in pixels. This means if your bottom and top values are 0 and 100, and your bottom and top movements are 0 and 200, if you move the tag 100 pixels toward the bottom, the tag value sent will be 50.

**(D) Reference.** Select the reference point for the object. The choices are top, center, and bottom. Note that you must also separately configure the Vertical Size (Height) dynamic attribute to use this option.

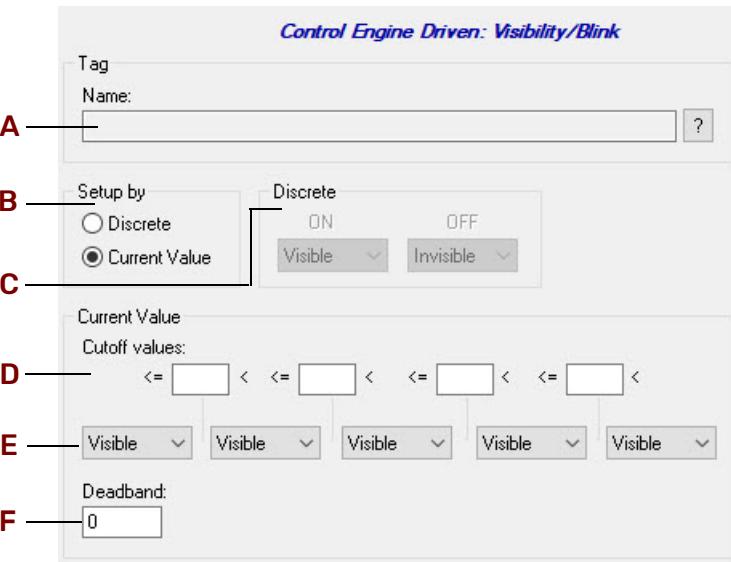
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the tag value should be changed.

Using our previous example in **C**, let's say the deadband is 5. A tag is written and has a value of 50. The next graphic object movement must be greater than 55 in order for the tag value to change.

## Visibility/Blink

Use this attribute to make a graphic object visible or invisible or to cause it to blink based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, curves, bitmaps, Windows button controls, and text.

In the Graphic Dynamic Attributes dialog box, click Visibility/Blink (in the Control Engine Driven list) to display its features.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object.

**(B) Setup By.** Choose whether the tag you're configuring is a discrete value (with ON and OFF values), or whether it's a current value you're looking for. If you choose Discrete, the **C** group is highlighted; if you choose Current value, the **D** group is highlighted. The choice you make in this selection must match the tag choices you made in the Name field (**A**).

**(C) Discrete.** Select the visibility state you want for the ON state from the drop-down list options. Your choices are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. In the same manner, choose the visibility state for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value field to specify the range of values for each visibility group configured in the visibility fields. Values entered must be in increasing order. Each Cutoff Value field must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value field requiring a value.

**(E) Visibility.** To configure a visibility state for the ranges set up in Cutoff Values (**D**), click a visibility field's drop-down button. Your choices are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. In the same manner, choose the visibility state for each range of values.

**(F) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's visibility will actually change.

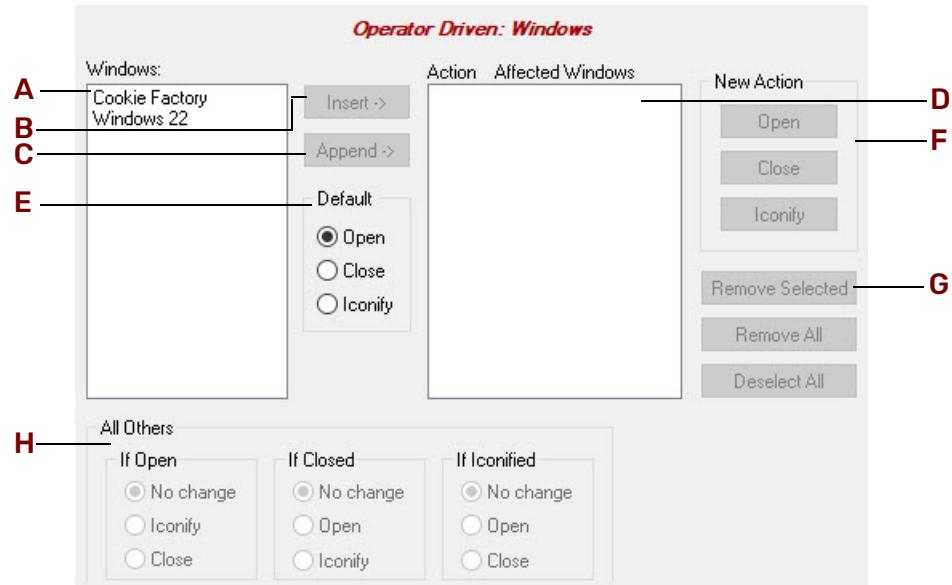
For example, let's say the Cutoff values are 1, 10, 20, and 30, and the visibility fields are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. The Deadband is 2. A tag is read with a value of 10. The next value read must be greater than 12 in order for the graphic object to change.

## Windows

Use the Windows attribute to change window states when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

## DYNAMIC ATTRIBUTES AND THEIR FEATURES

In the Graphic Dynamic Attributes dialog box, click Windows (in the Operator Driven list) to display its features.



**(A) Windows.** Initially, this list shows all the windows available for the project. Select the window that has the window state you want to change. You can also select more than one window by using a couple of key combinations. One way is to select a window, press Shift, and then click on another window name in the list. This selects all the windows in between the two window names. Another way is to select a window name, press the Ctrl key, and click on each window name you want selected.

**(B) Insert.** Use to insert the selected window(s) in Action/Affected Windows (D). The window name will be inserted above the highlighted window(s) in (A).

**(C) Append.** Use to add the selected window(s) to the bottom of the window list in Action/Affected Windows (D). The window name will be inserted after the last window in Action/Affected Windows (D).

**(D) Action/Affected Windows.** Lists the windows and what window state they will go to when the graphic object is clicked.

**(E) Default.** Use this group as a handy window state assignment key for the windows you've highlighted in (A). When the windows are copied over to Action/Affected Windows (D), you will see they all have the default window state you've assigned. The window state choices are Open, Close, and Iconify.

**(F) New Action.** Use this group to change any window states listed in Action/Affected Windows (D). Highlight one or more windows and select the new window state action. Your choices are Open, Close, and Iconify.

**(G) Remove/Deselect.** Use this group to modify the window name list in Action/Affected Windows (D). The Remove Selected option removes only those windows you've highlighted; the Remove All option removes all windows from the list; and the Deselect All option deselects and quickly unhighlights all window names.

**(H) All Others.** For all windows left in (A), use this grouping to affect their window states. For example, if a window state is open and the graphic object is clicked, the window state can stay the same, be iconified, or be closed. Likewise, you can alter the window states of closed and iconified windows.

## ASSIGNING A DYNAMIC ATTRIBUTE TO A GRAPHIC OBJECT

See also: Appendix , “F: Using the Old-Style Dynamic Attribute Dialog Boxes.”

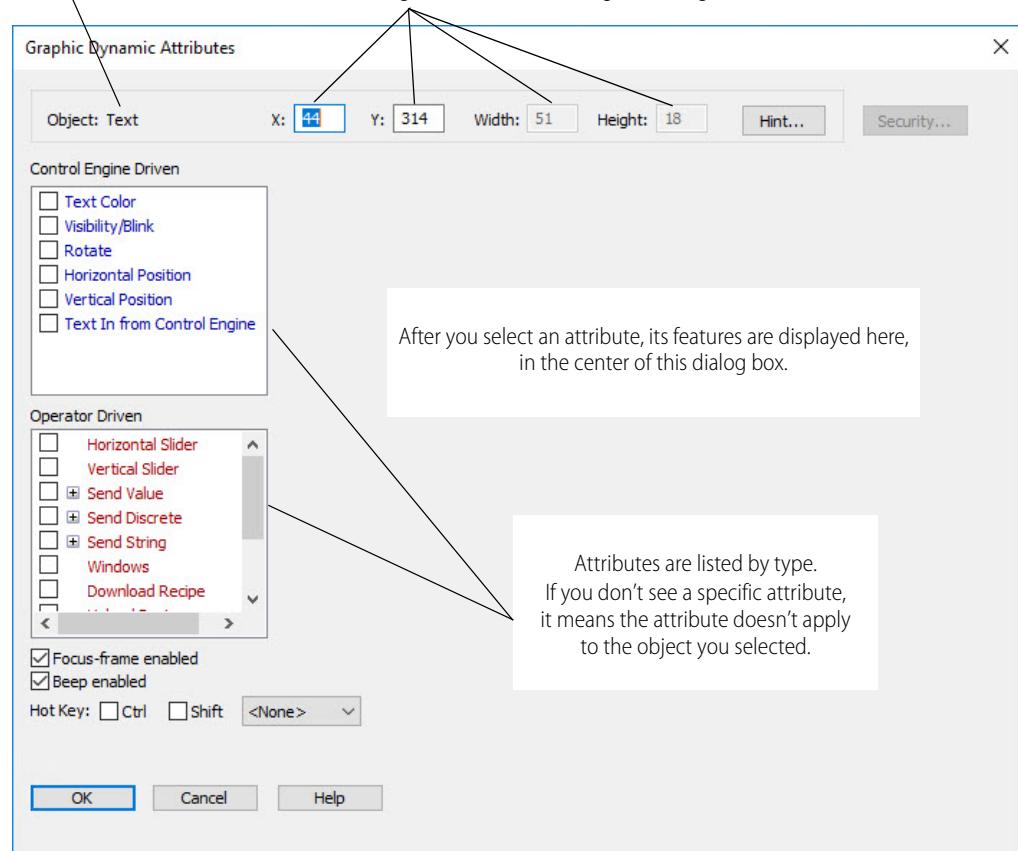
As you finish drawing your operator interface, you can start assigning dynamic attributes to graphic objects. Here's how:

- With the Select tool , double-click the graphic object that you want to assign a dynamic attribute to. (Or, you can click the object once, and then click Edit > Edit Dynamic Attributes in the PAC Display menu bar).

The Graphic Dynamic Attributes dialog box appears.

This label shows the type of object you selected.

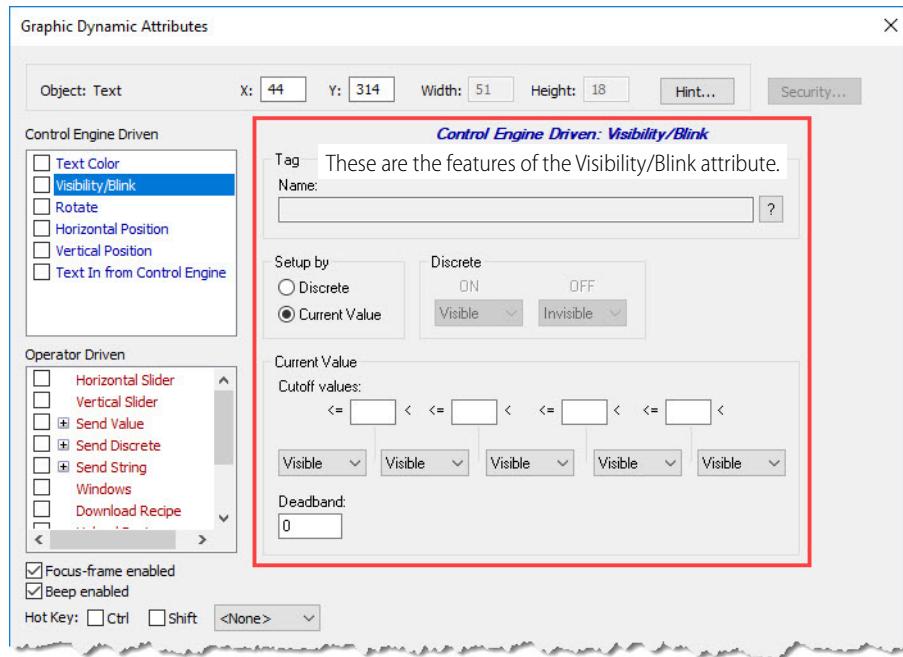
Use these fields to change the object's location (X and Y coordinates) and size. The Width and Height fields are grayed-out for this object because you can't change a Text Box's size using this dialog box.



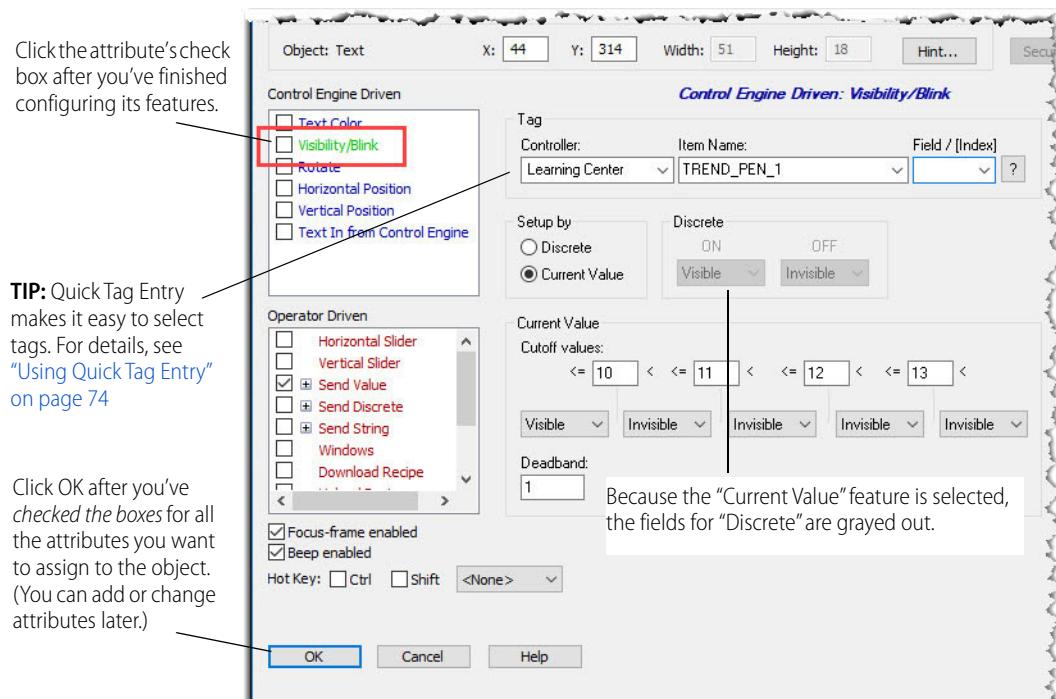
- Click the name of the attribute you want to assign to the object. (Note: Click its name, not its check box.) In this example, we'll select Visibility/Blink.

## ASSIGNING A DYNAMIC ATTRIBUTE TO A GRAPHIC OBJECT

The attribute's features are then displayed in the center of the dialog box.



3. Configure the features. As you start to make changes, the color of the attribute's name changes to green, indicating that configuration is in progress and the *changes have not yet been saved*. If you select a feature that can't be used with another of the attribute's features, the other feature is grayed out so you can't configure it.



4. When you're finished configuring the feature, **click the attribute's check box**. Any errors in configuration will be displayed in a message box, and you'll need to fix them before the check box will stay checked.  
If there are no errors, the green color disappears from the attribute's name.  
To assign another attribute to the object, repeat steps 2–4.
- NOTE: The Send Value, Send Discrete, and Send String attributes can be assigned more than once to the same object. For details, see "Assigning Send Value, Send Discrete, and Send String" on page 169.*
5. As long as you have assigned at least one attribute to the graphic object, you can also assign these options:
    - **Focus-frame enabled**—If this option is checked, a light border will appear around the object in Runtime when the operator moves the cursor over it. This border can be used as a visual aid to let the operator know that an event will occur when the object is clicked.
    - **Beep enabled**—If this option is checked, the operator will hear a beep when the object is clicked. Use this as an audio confirmation.
    - **Hot Key**—This option associates a keystroke sequence with the object. A *hot key* is a key on the keyboard (sometimes in combination with the Ctrl or Shift key) that when pressed, activates the object's operator-driver attributes. This lets the operator use a predefined keystroke sequence (instead of using a mouse click) to select a graphic object, thereby allowing PAC Display Runtime to be operated without a mouse or similar device.
- NOTE: The hot key works only for graphic objects that are in an opened or minimized window; closed windows are not affected.*
5. As long as you have assigned at least one attribute to the graphic object, you can also assign these options:
    - **Security**—This option defines whether the operator can use the object. For details, see "Security Settings for Graphic Objects and Dynamic Attributes" on page 176.
    - **Hint**—This option will display Toolbar text when the operator hovers the mouse pointer over the object. (Applicable only to basic objects such as lines, rectangles, ellipses, and text). For details, see "Adding Hint Text to a Graphic Object" on page 175.)
  6. When you've finished assigning attributes to the graphic object, check to see if any other attribute's name is green.
    - If you want to keep the attribute, finish configuring it, and then check the box next to its name.
    - If you don't want to keep it, just ignore it. It will be cleared (reset) when you close the dialog box.

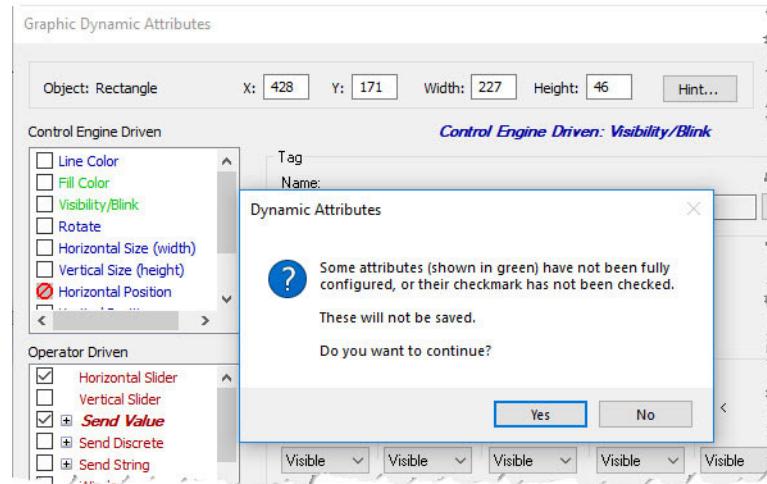
Then, click OK to save the configuration and close the dialog box.

#### Notes

- You can assign dynamic attributes to only one object at a time. If you want several objects to have the same attributes, select the objects, and then choose Edit > Group to make them one object. (You can also right-click the selected graphic objects and choose Group from the pop-up menu.)
- NOTE: If you ungroup the objects, the attributes you configured when they were a group aren't retained.*
- Sometimes after configuring an attribute and checking its check box, the Not Available indicator  appears in a different attribute's check box. This means that you can't configure the other attribute because the two attributes cannot be used together in the same graphic object.
  - When you assign more than one operator-driven dynamic attribute to a graphic object, the attributes are executed in the order they appear in the Operator Driven Attributes list.
  - The color of an attribute's name changes to green when:
    - A tag has been selected for the attribute.
    - One of the attribute's features has been changed.

## ASSIGNING A DYNAMIC ATTRIBUTE TO A GRAPHIC OBJECT

Its name remains green until you check its check box save the changes, or until you click OK and then click Yes on the dialog box that warns your changes will be lost.



- You don't need to completely configure one attribute before starting to configure another. You can start another by clicking its name. Just remember to complete the configuration and check the box next to the attribute's name before closing the Graphic Dynamic Attributes dialog box.

## Modifying a Graphic Object's Dynamic Attributes

*NOTE: For the Send Value, Send Discrete, and Send String attributes, see "Assigning Send Value, Send Discrete, and Send String" on page 169.*

To change a graphic object's dynamic attributes:

1. Open the object's Graphic Dynamic Attribute dialog box (either by double-clicking the object, or clicking Edit > Edit Dynamic Attributes in the PAC Display menu bar).
2. Click the name of the attribute you want to change. (*Note: Click its name, not its check box.*)
3. As you make changes, *the attribute's check box is cleared*.  
When you've finished changing features, click the attribute's check box to store the changes.
4. Click OK to save all changes and close the dialog box.

## Clearing a Single Dynamic Attribute

*NOTE: For the Send Value, Send Discrete, and Send String attributes, see "Assigning Send Value, Send Discrete, and Send String" on page 169.*

To clear (reset) a dynamic attribute for a graphic object:

1. In the Graphic Dynamic Attributes dialog box, click the name of the attribute you want to clear.
2. Then, uncheck the attribute's check box.
3. Click OK to save the changes and close the dialog box.

## Clearing All of a Graphic Object's Dynamic Attributes

To clear (reset) all dynamic attributes for a graphic object:

1. If the Graphic Dynamic Attributes dialog box is open, close it.
2. Using the Select tool, click the graphic object you want to clear.

*NOTE: If the graphic object is a group, clearing its attributes will clear the attributes of all objects in the group. To modify only one object in the group, first ungroup the objects (Edit > Ungroup), and then continue to step 3.*

3. In PAC Display's menu bar, click Edit > Delete Dynamic Attributes.

Another way you can do this is to right-click the graphic object (to display the pop-up menu), and then click Dynamic Attributes > Delete.

All of the attributes are instantly cleared. (Note that this action does not display a confirmation message.)

## COPYING CONFIGURED ATTRIBUTES TO OTHER GRAPHIC OBJECTS

Once a dynamic attribute has been added to a graphic object, you can easily assign those attributes to other objects using PAC Display menu options.

### Copying Dynamic Attributes from a Graphic Object

To copy a set of dynamic attributes from one graphic object to another:

1. With the Select tool , click the graphic object whose dynamic attributes you want to copy.
2. In the PAC Display menu bar, click Edit > Copy Dynamic Attributes (or use Shift+Ctrl+C) to copy the attributes to the Windows clipboard.

Another way you can do this is to right-click the graphic object (to display the pop-up menu), and then click Dynamic Attributes > Copy.

You can now assign these dynamic attributes to another graphic object using Edit > Paste Dynamic Attributes.

### Pasting Dynamic Attributes to a Graphic Object

*NOTE: Pasting will paste all attributes that are valid for the destination object. For example, if you attempt to paste a Text Color attribute and a Vertical Position attribute from a text object to a rectangle object, only the Vertical Position attribute will be pasted, because Text Color is not valid for rectangle objects.*

After copying dynamic attributes from a graphic object, follow these steps to paste them to another:

1. With the Select tool , click one or more graphic objects to which you want to paste the dynamic attributes.
2. In the PAC Display menu bar, click Edit > Paste Dynamic Attributes, and then do one of the following:
  - To delete any existing dynamic attributes the graphic object may already have, select Delete Existing.
  - To add the (valid) copied attributes to existing attributes and replace any that might be of the same type, select Replace Duplicates.
  - To add the attribute to existing attributes and not change any attributes that might be of the same type, select Ignore Duplicates.

Another way you can do this is to right-click the graphic object (to display the pop-up menu), and then click Dynamic Attributes > Paste.

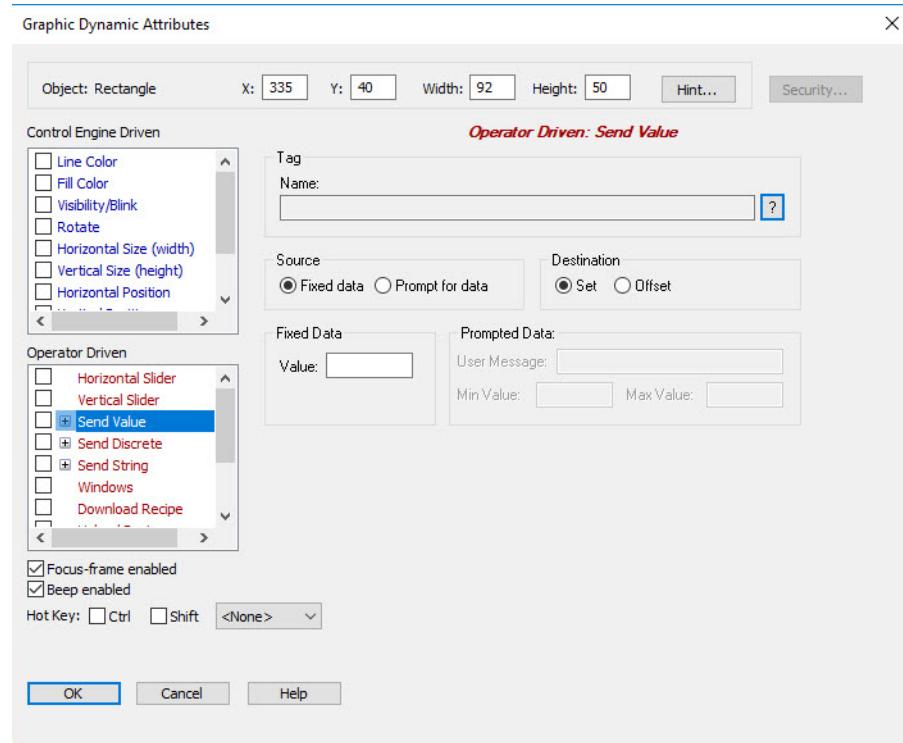
## ASSIGNING SEND VALUE, SEND DISCRETE, AND SEND STRING

*NOTE: For details about each of these attributes, see “Dynamic Attributes and Their Features” on page 140.*

You can assign more than one Send Value, Send Discrete, and Send String attribute to a graphic object. The steps are basically the same as assigning any other attribute.

## ASSIGNING SEND VALUE, SEND DISCRETE, AND SEND STRING

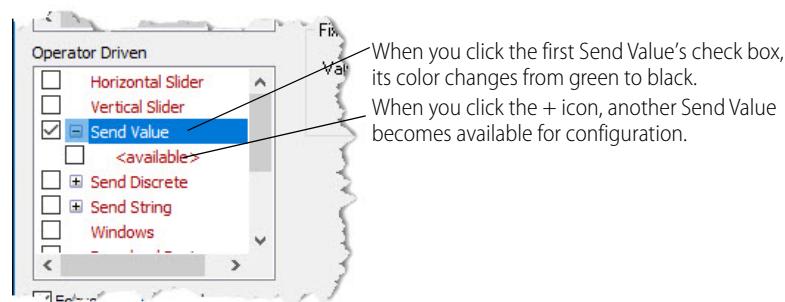
1. In the Graphic Dynamic Attribute dialog box, click the name of the attribute you want to assign to the object. (*Click the name, not the check box.*) In this example, we'll select Send Value. The attribute's features are then displayed in the center of the dialog box.



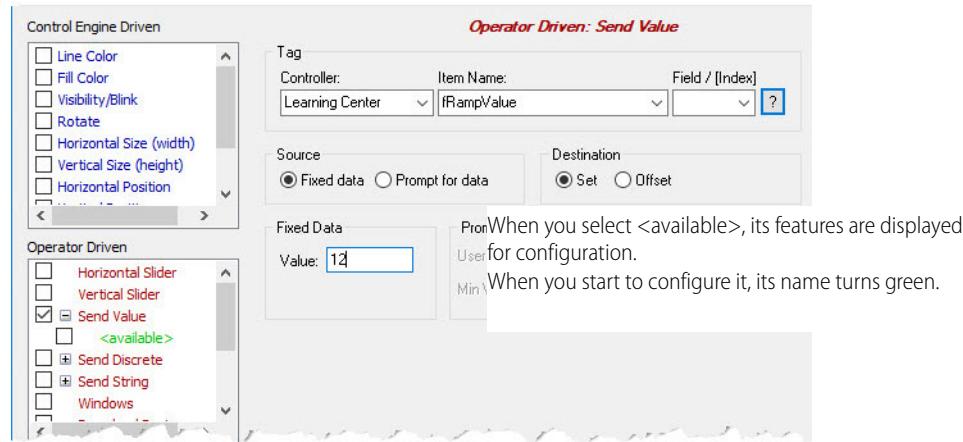
2. Configure the features. As you start to make changes, the color of the attribute's name changes to green, indicating that configuration is in progress and the *changes have not yet been saved*.
3. When you're finished configuring the features, **click the attribute's check box**. Any errors in configuration will be displayed in a message box, and you'll need to fix them before the check box will stay checked.

*TIP: To see the tag name of the first Send Value, Send Discrete, or Send String in the list, click the attribute name and look at its Name field.*

4. To assign another attribute to the object, , click the + icon next to attribute's name (in this example, Send Value).

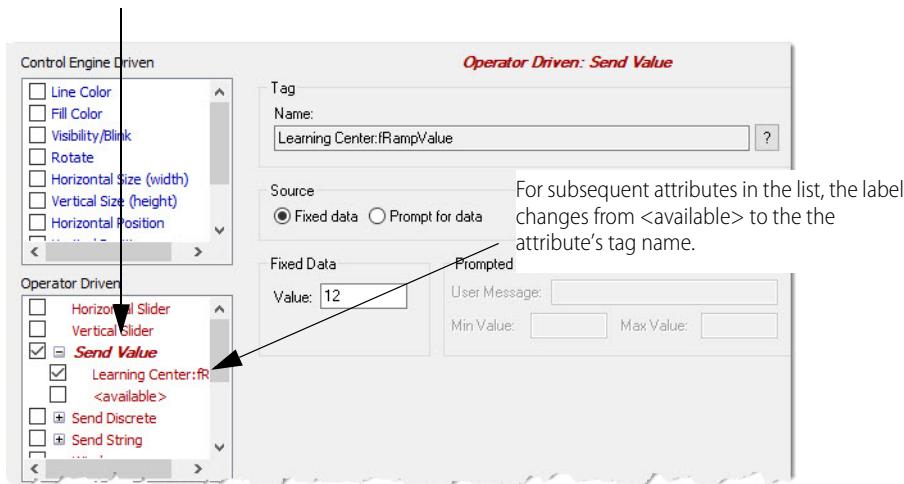


5. Now, click <available>, and then configure its features.



6. When you're finished configuring the features, **click the attribute's check box**. The tag name is now displayed in place of <available>.

To see the tag name for the *first* attribute in the list, click the attribute's name. The tag name is displayed in the Name field.



7. Click OK to close the dialog box and save the changes.

### Clearing an Individual Send Value, Send Discrete, or Send String

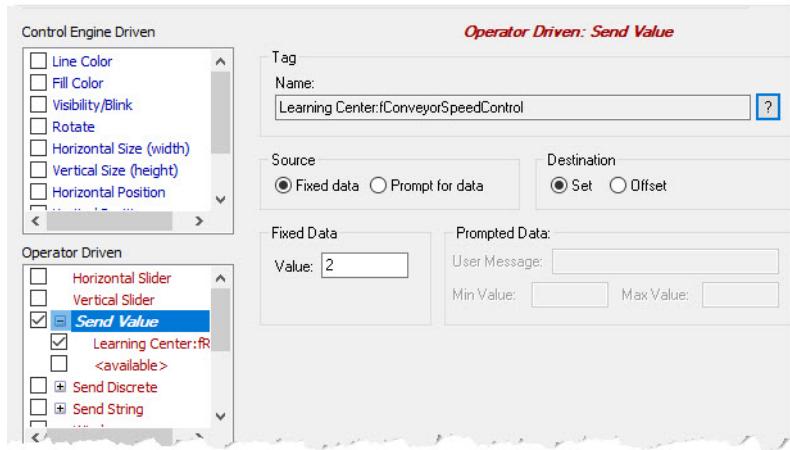
*See also "Clearing All of a Graphic Object's Dynamic Attributes" on page 168.*

To clear a single instance of a Send Value, Send Discrete, or Send String attribute:

1. Click the + icon next to the attribute name to expand the list.

## ASSIGNING A CHART STATE VALUE TO A GRAPHIC OBJECT

*NOTE: To see the tag name of the first attribute in the list, click the attribute name and look at its Name field.*



2. Uncheck the box next to the attribute you want to clear.

*NOTE: The attributes listed below the one you cleared now move up in the list.*

3. Click OK to close the dialog box and save the changes.

### Reordering Attributes

*NOTE: Top-level attributes (such as Send Value) cannot be moved.*

Multiple attributes of Send Value, Send Discrete, and Send String are sent to the device in the order displayed in the list. To change the order of the sends:

1. Click the + sign to expand the list.
2. Select an attribute, and then drag it to a new position in the list.
3. Click OK to close the dialog box and save the changes.

## ASSIGNING A CHART STATE VALUE TO A GRAPHIC OBJECT

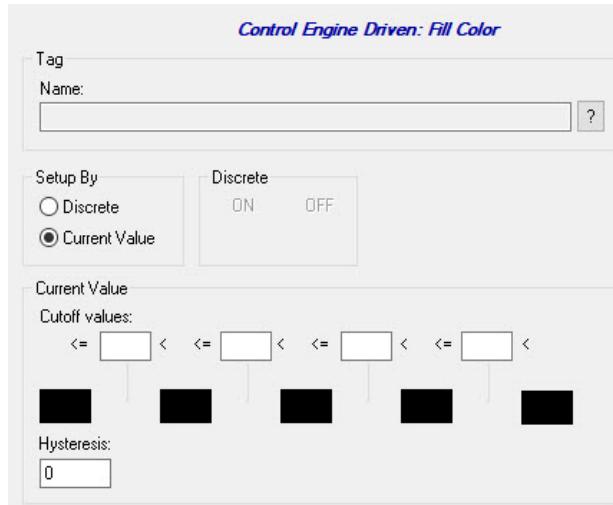
You can assign chart states (such as Stopped and Running) to a graphic object either as control engine-driven attributes or as operator-driven attributes.

### Control Engine-Driven

To assign chart states as control engine-driven attributes:

1. Double-click the graphic object to which you will assign a chart state attribute.

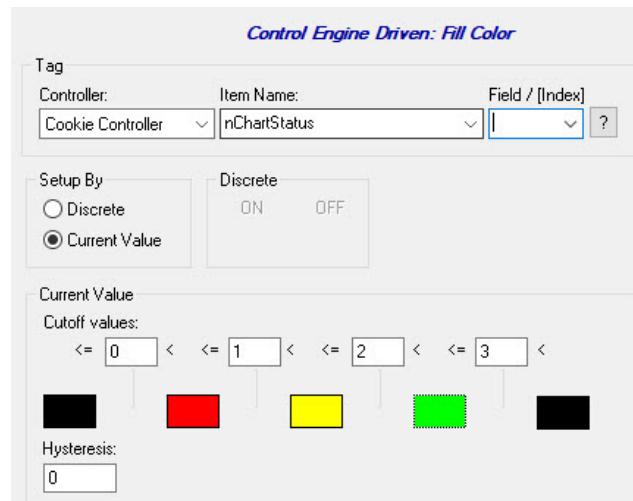
- In the Control Engine Driven list, click the name of one of the color attributes you want to use. In this example, we'll use Fill Color. (See also, "Fill Color" on page 144.)



- Configure a tag for this dynamic attribute. (See also, "Configuring Tags" on page 74.)
- In the Setup By area, leave the default setting (Current Value).
- In the Current Value area, enter values from the table below to represent the different states a chart can have, and then select a color for each value.

Value	Chart State
0	N/A*
1	Stopped
2	Suspended
3	Running

\* 0 is used to represent the range of values from 0 through to and including 1.



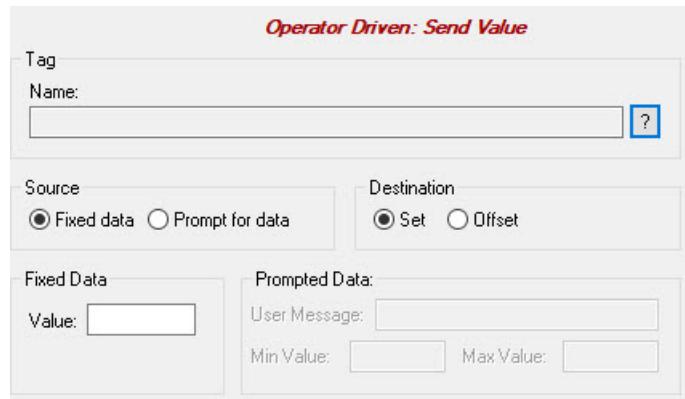
- When you've finished, click the check box next to the attribute name to save its configuration, and then click OK to close the dialog box.

## ASSIGNING A CHART STATE VALUE TO A GRAPHIC OBJECT

### Operator-Driven

To assign a chart state as an *operator-driven attribute*:

1. Double-click the graphic object to which you will assign a chart state attribute.
2. In the Operator Driven list, click Send Value (—its name, not its check box). (See also, "Send Value" on page 154.)



3. Configure a tag for this dynamic attribute. (See also, "Configuring Tags" on page 74.)
4. Under Source, select either Fixed data or Prompt for data.

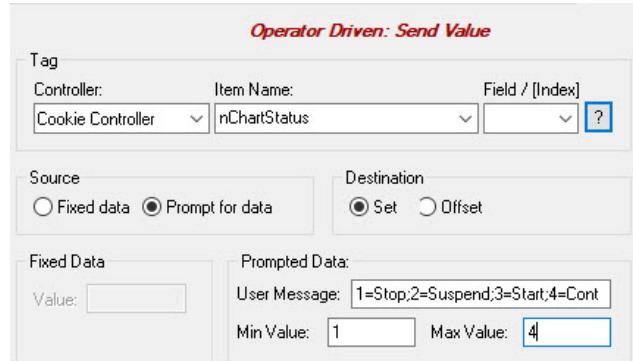
For Fixed Data, enter one of the following values:

Value	Chart State
1	Stop
2	Suspend
3	Start
4	Continue

Or, for Prompted Data:

- a. Create a User Message.
- b. Enter a Min Value of 1.
- c. Enter a Max Value of 4.

In Runtime, the user enters 1, 2, 3, or 4 to stop, suspend, start, or continue the chart as indicated in the table above. In this example, we selected Prompt for data.



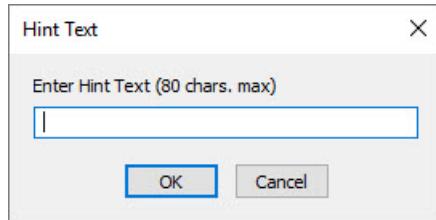
5. When you've finished, click the check box next to the attribute name to save its configuration, and then click OK to close the dialog box.

## ADDING HINT TEXT TO A GRAPHIC OBJECT

Follow the steps below to add hint text to the Tooltips box of a basic graphic object such as a *line*, *rectangle*, *ellipse*, or *text*. The hint is displayed in the Tooltips box when an operator hovers the mouse over the graphic object in Runtime.

*NOTE: Only one instance of hint text can be applied to a graphic object. Hint text is not attribute-specific.*

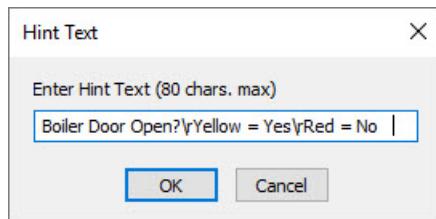
1. Double-click the graphic object to which you will provide hint text. This opens the Graphic Dynamic Attributes dialog box.
2. On the right side of the Graphic Dynamic Attributes dialog box, click the Hint... button to open the Hint Text dialog box.



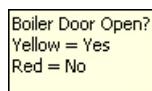
3. Enter the hint text. For example, you might enter, "To start the process, click the Start button." Hint text is limited to 80 characters.

To wrap text to the next line, add \r to the text. For example, if you enter the following text,

Boiler Door Open?\rYellow = Yes\rRed = No



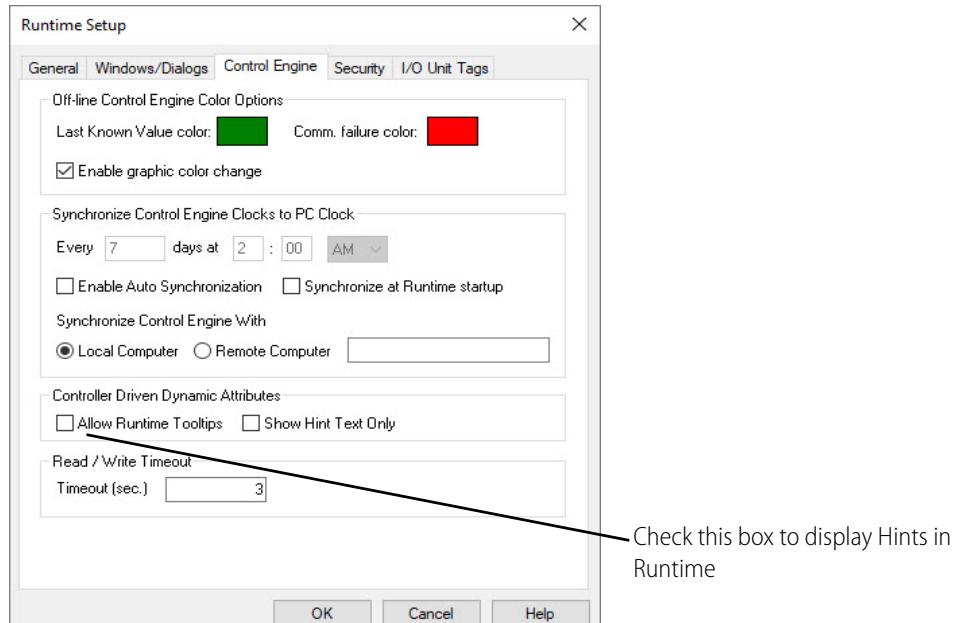
The portions of text beginning with "Yellow" and "Red" will each wrap to the next line. In Runtime, the Tooltips box in Runtime will appear like this:



4. Click OK to save the hint, and then click OK to close the dialog box.

## SECURITY SETTINGS FOR GRAPHIC OBJECTS AND DYNAMIC ATTRIBUTES

5. Next, in the PAC Display menu bar, click Configure > Runtime to open the Runtime Setup dialog box. Then click the Control Engine tab.



6. Select Allow Runtime Tooltips, and then click OK to close the dialog box and save the settings.

## SECURITY SETTINGS FOR GRAPHIC OBJECTS AND DYNAMIC ATTRIBUTES

For additional security features, see:

- ["Protecting a Project with a Password" on page 46](#) to assign a password to the PAC Display project to prevent unauthorized users from opening it in PAC Display Configurator.
- ["Modifying Draw or URL Windows" on page 94](#) to assign a password to individual windows in a PAC Display project to prevent unauthorized users from opening them.
- ["Runtime Setup: Security Tab" on page 297](#) to allow operator access to the HMI, as well as log all HMI use and operator actions to an encrypted archive.
- ["Viewing Logged-In Users in Runtime" on page 325](#) to view a list of the users currently logged in to PAC Display Runtime.

Your application requirements and the environment in which it is used may require strict control over access to the operator interface you create in PAC Display. You can configure PAC Display to provide this level of security by defining user authentication permissions for individual graphic objects.

When the PAC Display project is launched in PAC Display Runtime and an operator clicks a graphic object that is configured for security, Runtime prompts the operator for a username and password. If the login information is incorrect or if the operator is not permitted to use that object, an alert message is displayed. If Runtime operator logging is active for the project, the login attempt (successful or not) is added to the Runtime operator log.

### Important Considerations for User- and Group-Level Security Settings

There are several important considerations to keep in mind when configuring user- and group-level authentication for a graphic object.

- If you don't configure security (either Runtime user logins or security for a graphic object), anyone who can log in to PAC Display can use a graphic object in Runtime.

It isn't necessary to configure security if anyone in your company is allowed to use Runtime. But if that's not the case, you should configure Runtime user logins (see [page 301](#)) to prevent unauthorized users from accessing the graphic objects in your projects.

After you configure at least one Runtime user, Runtime displays a login screen each time a project is loaded in Runtime.

- By default, all operators have permission to use the graphic objects in a project. To prevent unauthorized users from using a particular graphic object, configure security permissions for the object (see [page 177](#)).
- Security permissions cannot be configured for the Send Discrete dynamic attribute when it is configured as "Direct" or "Reverse." See "[Send Discrete](#)" on page 153 for descriptions of these options.
- When the project is running in Runtime and a restricted graphic object is clicked, "Deny Access" security permissions have priority over "Grant Access" permissions. This means that if an operator has been granted access, but is a member of a group that has been denied access, the operator will not be able to use the on-screen object.

## Configuring Security Permissions for Graphic Objects

*NOTE: Security permissions are applied to all dynamic attributes selected before you click the Security button. If a graphic object needs to have multiple dynamic attributes, make sure to select and configure all attributes before configuring security settings.*

To assign user- and group-based security permissions to a graphic object:

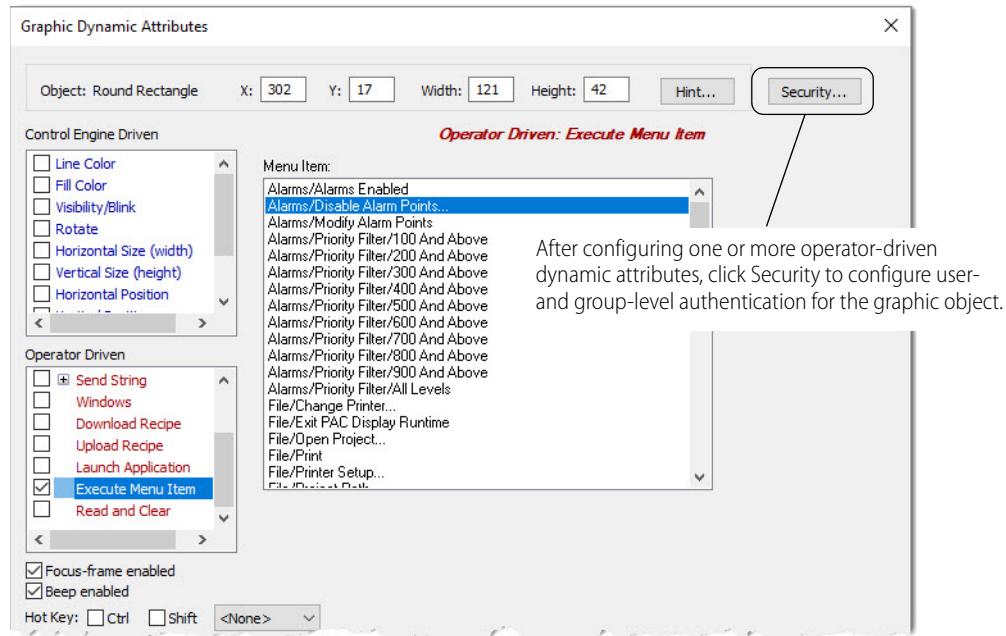
- Double-click the graphic object to which you will assign one or more operator-driven dynamic attributes. The Graphic Dynamic Attributes dialog box opens. Note that the Security button on the right side is not active.

The Security button isn't active until you've configured an operator-driven attribute



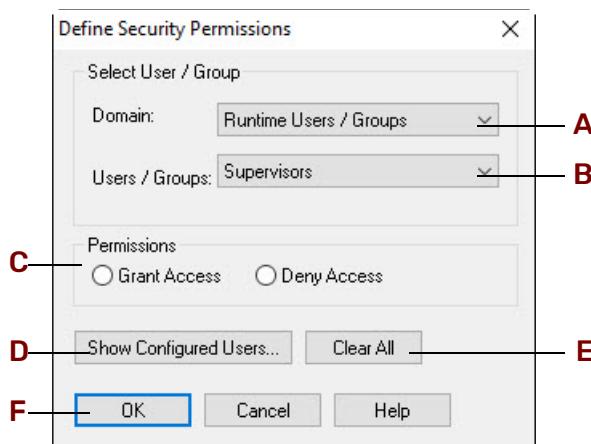
## SECURITY SETTINGS FOR GRAPHIC OBJECTS AND DYNAMIC ATTRIBUTES

- Configure an operator-driven attribute. When you click the attribute's check box to save its configuration, the Security button is enabled.



- Click Security to configure user- and group-level authentication for the graphic object.
- The Define Security Permissions dialog box opens.

**Define Security Permissions Dialog Box**



**(A) Domain.** To set permissions based on Windows authentication, select the Windows domain that contains the operator (or group) to whom you want to grant or deny access. To select a custom-configured user or user group, select Runtime Users / Groups.

**(B) User/Groups.** Select the user or group to whom you want to grant or deny access to the object.

**(C) Permissions.** For the selected user or group, select Grant Access or Deny Access.

**(D) Show Configured Users.** Click Show Configured Users to view all permissions currently assigned for the graphic object.

**(E) Clear All.** Click Clear All to erase all configured permissions for the graphic object.

**(F) OK.** Click OK to save changes, or click Cancel to close the dialog box without any changes being made.

## Copying Security Permissions to Other Graphic Objects

To make security configuration easier and less error-prone, you can copy a graphic object's security permissions and then apply them to:

- One or more selected graphic object
- All graphic objects in a PAC Display window
- All graphic objects in a project

### To copy and apply security permissions:

1. Click the graphic object whose security permissions you want to copy.  
(Sizing handles—the small black boxes around the graphic object—indicate that it has been selected.)
2. Copy the graphic object's permissions. There are two ways you can do this:
  - Click the graphic object, and from the menu bar, click Edit > Security Permissions > Copy.

*NOTE: This method is required when copying or applying permissions to Alarms, XY Plots, Trend, and SuperTrends.*

- Right-click the graphic object, and from the pop-up menu, click Security Permissions > Copy Security Permissions > Copy.

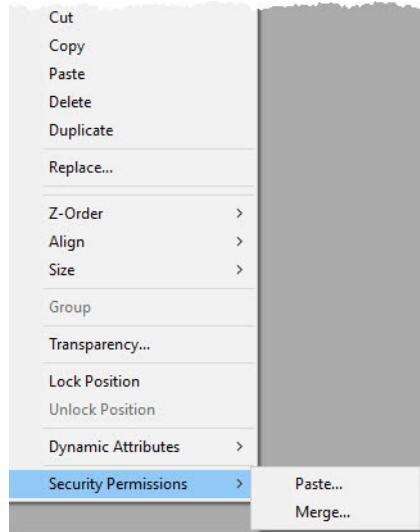
*NOTE: If the Copy selection is grayed out, it means the graphic object you selected doesn't have configured security permissions. First, you must configure permissions for the graphic object; then Copy will be enabled when you select the object.*

3. Select the graphic object to receive the copied security permissions.
  - To select more than one graphic object, press and hold the Shift key while clicking the objects.
  - To select all graphic objects in a window or all graphic objects in the project, click anywhere in the window.

*NOTE: In order to receive the copied permissions, the target graphic object must have at least one configured operator-driven dynamic attribute.*

## VIEWING TAGS AND DYNAMIC ATTRIBUTES

- Right-click to display the pop-up submenu (or in the menu bar, click Edit > Security Permissions).



- Select **Paste** to **overwrite** the target graphic objects' existing security permissions.
- Select **Merge** to **keep** the target graphic objects' existing permissions **and add** the copied permissions.<sup>1</sup>

The Security Attributes dialog box opens.



If you select Merge, the Merge Security Attributes dialog box opens.  
It has the same options as the Paste Security Attributes dialog box.

- Choose the target:
  - Chosen graphics—Selects only the currently selected graphic object (or objects).
  - This Window—Selects all graphic objects in the current window.
  - All windows—Selects all graphic objects in all windows in the project.
- Click OK to save the settings and close the dialog box.

## VIEWING TAGS AND DYNAMIC ATTRIBUTES

As you develop or document a PAC Display project, it can be useful to know about the dynamic attributes and tags used by the objects in the project's windows.

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<sup>1</sup>When permissions conflict—for example, when you paste a Grant Access permission to a graphic object that is already configured with Deny Access for the same user (or user group)—PAC Display always applies the most restrictive permission. In this example, the user (or group) would be denied access to the graphic object.

## Dynamic Attributes for Individual Objects

To view the dynamic attributes configured for an individual graphic object or a group of objects, select one or more objects in a window, right-click the mouse, and click Dynamic Attributes > View from the pop-up menu. The dynamic attributes assigned to that object or objects will be shown in the Dynamic Attributes window.

## Viewing Tags for One or More Objects

To view the tags that a particular object or objects is connected to, click the object (or group of objects), and move the cursor over it. The tags used will be shown next to the cursor.

## Dynamic Attributes for All Objects

To generate a report that lists the dynamic attributes for all objects in all project windows, as well as all the alarm points configured for a project:

1. In PAC Display Configurator, click View > Dynamic Attributes.
2. In the dialog box that opens, select one or more windows whose dynamic attributes you want to view and click OK.

The Microsoft Windows Notepad application opens and displays a report similar to the following example:

```
Project Name: C:\Opto22\PAC
Display\Examples\ioCookies\Display\cfactory.uui
```

---

```
Window: Cookie Factory
*****
GroupX = 530Y = 332W = 86H = 28
```

```
Operator-Driven Dynamic Attribute Tags
Send Value:
Cookie Control Engine:Conveyor_Speed_Control.Value
Refresh Group: Group 0
  Source : Prompt for Data
  Destination: Set
  Message : Enter Conveyor Speed
  Min. Value : 0.00
  Max. Value : 100.00
```

```
GroupX = 133Y = 213W = 21H = 3
```

```
control engine-Driven Dynamic Attribute Tags
Visibility/Blink:
Cookie Control Engine:Dough_Dispose_Valve.State
Refresh Group: Group 0
  Setup By : Discrete
  On       : Invisible
  Off      : Visible
```

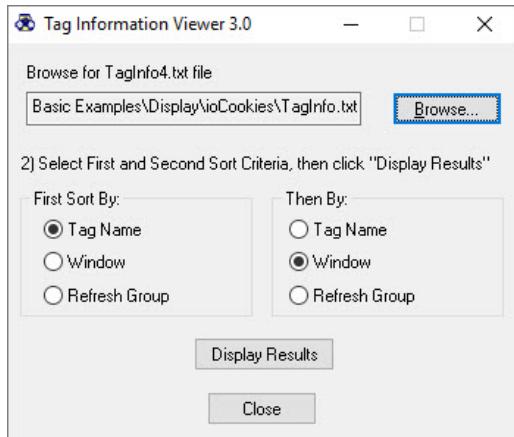
## Using the TagInfoView Utility Program

After you have selected View > Dynamic Attributes, you can use a small utility program called TagInfoView to sort and view the tag information in greater detail.

1. Click View > Launch TagInfoView Utility.

## SCANNING TO UPDATE GRAPHIC OBJECTS

2. In the Tag Information Viewer dialog box that opens, verify that the TagInfo.txt file appears in the file field at the top.



3. In the Sort By sections, select how you want the tag information sorted.
4. Click Display Results. The results should look something like this:

Tag Name		Window Name	Refresh
Group	Tag Type		
<hr/>			
	:bStartFlag Integer (Integer)	Cookie Factory	Group 0
	===== This Tag used in 1 windows		
	PAC Sim:Alarms:Alarms Chart (NULL)	Cookie Factory	Group 0
	===== This Tag used in 1 windows		
	PAC Sim:Start_Flag Integer (Integer)	Cookie Factory	Group 0
	===== This Tag used in 1 windows		
	PAC Sim:bChipDispenseValve	Cookie Factory	Group 0

## SCANNING TO UPDATE GRAPHIC OBJECTS

As you configure your project and connect PAC Control tags to PAC Display graphic objects, you are setting up the connections that will animate your objects in PAC Display Runtime as the tag data changes. PAC Display acquires this tag data using an internal scanner that monitors one or more control engines. Understanding how the scanner works and how it gets its data will help you optimize your system's performance.

Scanning is PAC Display's process of requesting data about I/O points and variables from the Opto 22 control engine. When the control engine receives this request, it must first determine if its data for the requested tags is current. If the data is not current, the control engine will access the I/O units connected to it and request the latest readings. This tag information is then sent back to PAC Display. Depending on the data and how it is connected to objects in your PAC Display project, graphic objects then change their attributes.

## Refresh Time Groups

Each tag connected to a PAC Display graphic object belongs to a refresh time group that determines how often the tag is scanned. You define the characteristics of refresh time groups by setting a scan rate. See “[Configuring Scan Rates](#)” (below) to learn how to set these values.

System performance is affected by how a refresh time group is set up, so it’s important to define refresh time groups carefully. Follow these guidelines when configuring refresh time groups for your project:

- Select scan rates that reflect the rate at which the process variables change. For example, the outside air temperature changes slowly, and could be scanned every 15 minutes or so.
- As a good engineering practice, select the slowest possible scan rate that is acceptable for your application. This will help prevent the system from being overloaded by needlessly scanning too much information too quickly.
- If the amount of data being scanned is too much for the selected scan rate, decrease the scan rate to better match what the actual throughput will allow.

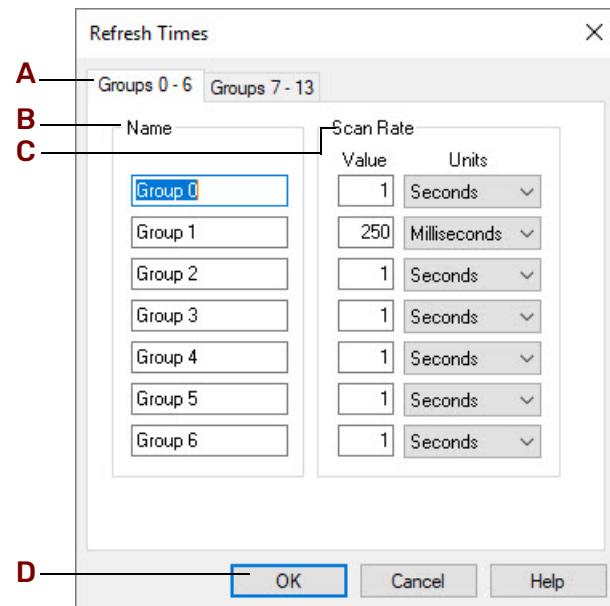
If you have tried the preceding guidelines and scanning speed does not improve, then there may be too much data being requested from one control engine, or there may be too much data being scanned by one computer, or both. To eliminate the bottlenecks, you may need to add more control engines, divide the PAC Display projects over multiple computers, or both.

## Configuring Scan Rates

You assign refresh time groups whenever you configure a tag based on how often you think it makes sense to update the tag. (Note that the same refresh time group is usually used by several tags.) For example, an analog point reading an outside temperature would use a longer scan rate since the temperature isn’t likely to change suddenly. On the other hand, a digital point that’s monitoring the on/off state of a valve would need a shorter scan rate to accurately reflect whether a valve is open or closed.

To configure scan rates, click Configure > Refresh Times. The Refresh Times dialog box appears.

**Refresh Times Dialog Box**



**(A) Group Tabs.** Up to fourteen refresh time groups are available, divided between two tabs in the Refresh Times dialog box.

**(B) Name.** In the Name column, you will see the refresh time group names. By default, their names are "Group 0", "Group 1", and on up to "Group 6." You can change these default names if you wish.

Names can be up to 15 characters long, but avoid using the exclamation point (!) and vertical bar (|) characters in the name. Spaces are also valid characters, but when referencing names with spaces, don't omit the spaces or substitute the underscore (\_) character for spaces.

**(C) Scan Rate.** In the Value field of the Scan Rate column, enter a number from 1 to 9999. In the Units field, select a unit of time from the Units drop-down list. (Unit options are milliseconds, seconds, minutes, hours, days, and months.)

The greater the value, the more time between I/O readings and the fewer times the control engine is scanned.

**(D) OK.** Click OK to save your settings.

## Improving Data Throughput For PAC Display

When using PAC Display on a system with Ethernet I/O Units, the default configuration is for PAC Display to scan I/O tags directly from the I/O units and only scan strategy tags (variables and tables) from the control engine. This default configuration provides the best overall throughput. It is possible to change the configuration to scan all tag types, including I/O tags, through the control engine, however this reduces overall throughput.

To optimize data throughput for PAC Display, do the following:

- Identify and correct any configuration issues. In PAC Display Configurator, open the project and choose Configure > AutoCorrect Tags. Correct any discrepancies that are identified.
- Use the default PAC Display option of scanning Ethernet I/O unit tags directly from the I/O units. This requires an Ethernet network configuration where the I/O units are accessible by the PAC Display computer. This can be configured by viewing Configure > Runtime > I/O Unit Tags.
- Keep I/O tags in refresh groups that are separate from PAC Control strategy tags. Group strategy variable and table tags into refresh groups that do not have I/O tags.
- Use reasonable Refresh Group time intervals.
- For Serial I/O units, the most efficient method is to use I/O Unit commands (instead of individual I/O point commands) in strategy logic to move serial I/O unit tags into tables. Then scan the data from the tables instead of scanning I/O points directly. If you must scan serial I/O tags directly, you should keep this to a minimum because serial I/O tags must be scanned through the control engine. In addition, only one command can be active on a serial port at a time. If a host scans serial I/O information through the control engine, it causes the controller to have to scan all of the appropriate serial I/O units at that time, and it can only reply to the host after getting the responses from all appropriate I/O units.

For more optimization tips, see the [Optimizing PAC Project System Performance](#) technical note (form 1776).

# 8: Working with Trends

## INTRODUCTION

This chapter describes how you can create and configure graphs that display real-time and historical information about selected I/O points.

### In This Chapter

<a href="#">About Trends</a> .....	page 185
<a href="#">Types of Trends</a> .....	page 185
<a href="#">Working with Basic Trends</a> .....	page 186
<a href="#">Working with SuperTrends</a> .....	page 190
<a href="#">SuperTrend Historical Log Files</a> .....	page 200
<a href="#">Using XY Plots</a> .....	page 210

## ABOUT TRENDS

PAC Display *trends* are objects that visually plot control engine values, including I/O points and results of a calculation. Using a trend, you can show how real-time and historical data changes over time, or how one set of data relates to another one. In PAC Display Runtime, trends are created when active I/O point values, or tags, are read from a PAC Control strategy running on a control engine and visually plotted.

Tag values are graphed on a two-dimensional x-axis and y-axis coordinate system. Depending on the type of trend used, the x-axis can represent time or a set of tag values. The y-axis can represent either the range of values for a tag or a set of tag values. You can set features for each trend line used, and there is no limit to the number of trends that can be displayed in a window. For trends that graph data over time, the maximum time span supported is 14 days.

You can easily set or modify the following elements in a trend:

- x- and y-axis ranges and the major and minor divisions that appear on the graph
- Graph backgrounds and border colors
- Pen colors for trend lines
- Tag value scanning, which can be turned on or off for a specific trend.

## TYPES OF TRENDS

There are three types of trends that you can use in a PAC Display project: basic trends, SuperTrends, and XY plots. Basic trends and SuperTrends display tag values as trend lines plotted over time; XY plots graph data

from two numeric tables, using data from one table for x-axis values and data from the other table for y-axis values.

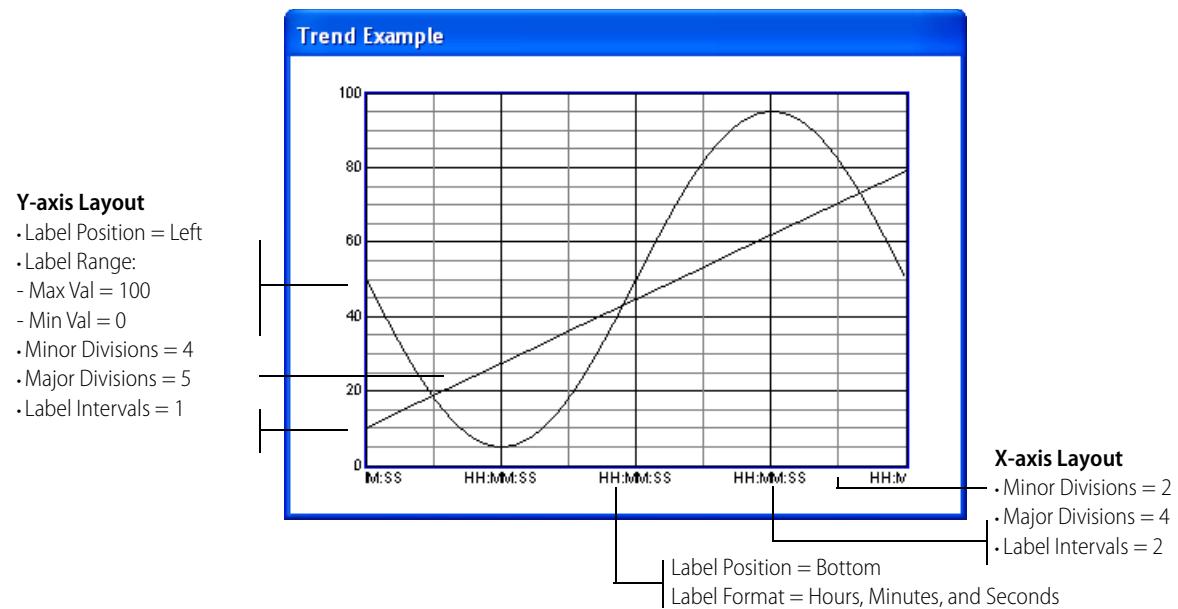
- **Basic Trends**—Using a basic trend, up to four trend lines can be displayed on a graph. Basic trends can plot only real-time data (not historical data). For details, see “[Working with Basic Trends](#)” (below).
- **SuperTrends**—Using a SuperTrend, up to 16 trend lines can be displayed on a graph. SuperTrends can plot both real-time and historical data. For details, see “[Working with SuperTrends](#)” on page 190.
- **XY Plots**—Using an XY plot, up to six individual trend lines can be displayed on a graph. XY plots can plot only data in numeric tables. For details, see “[Using XY Plots](#)” on page 210.

## WORKING WITH BASIC TRENDS

You use basic trends to plot real-time values for up to four tags.

### Creating a Basic Trend

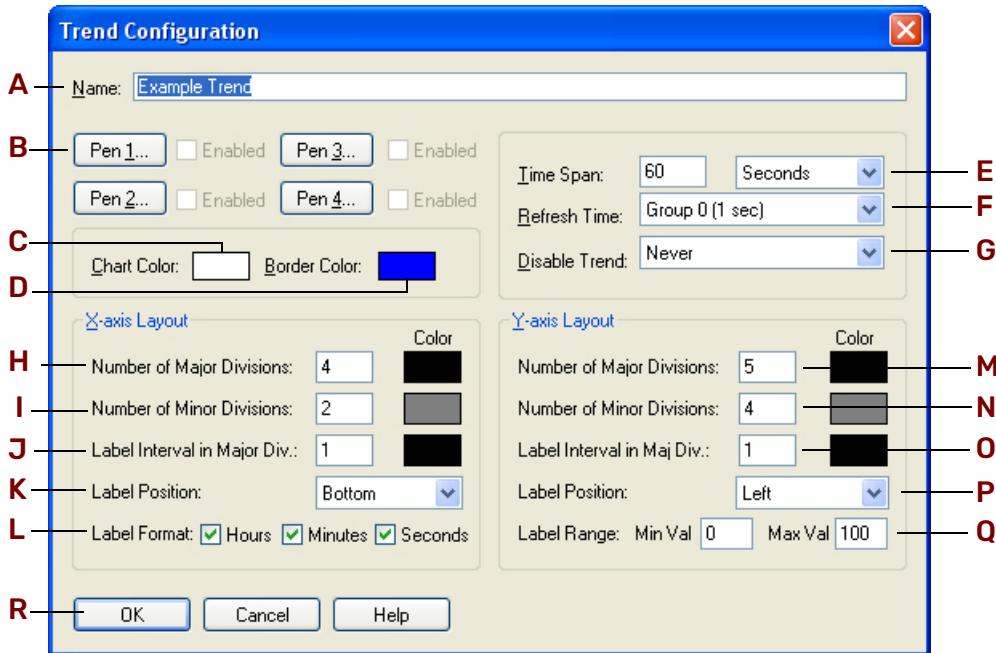
1. Select the basic trend tool  from the toolbox and position the cursor where you want the trend to begin in the window.
  2. Click the mouse button, drag the mouse to the desired size, and then release the mouse button.
- The trend that appears should resemble the example below:



### Modifying a Basic Trend

Choose the Select tool and double-click the trend to open the Trend Configuration dialog box.

## Trend Configuration Dialog Box



**(A) Name.** Enter the name of the trend here.

**(B) Pen Configuration Buttons.** Use these pen configuration buttons to associate each pen with one PAC Control tag, to define its pen color and width, and to specify a range of values for the tag. You can configure up to four pens per trend. See “[Optimizing Pen Settings](#)” on page 190 for more information.

**(C) Chart Color.** Click here to select a background color for the trend graph. In the Color dialog box that appears, choose a color and click OK.

**(D) Border Color.** Click here to enter the graph’s border color. In the Color dialog box that appears, choose a color and click OK.

**(E) Time Span.** Enter the time span the trend represents. (Remember that the time span is indicated on the x-axis). Choose the time units from the drop-down list. Your choices are seconds, minutes, or hours. The maximum time span is 14 days, or 336 hours.

**(F) Refresh Time.** Select one of fourteen refresh time groups. The scan rate appears in parentheses alongside the refresh group number. All tags associated with the pens in **B** are scanned at the same rate.

You can find out more about refresh times in “[Scanning to Update Graphic Objects](#)” on page 182. Also see “[Optimizing Pen Settings](#)” on page 190 to learn how pen settings affect how PAC Display communicates with a control engine.

**(G) Disable Trend.** Choose whether to disable a trend based on the state of its window. If you disable the trend, the tags associated with the pens in **B** won’t be updated with new data from the PAC Control strategy until the trend is enabled again. Disabling a trend saves the control engine processing time, since it doesn’t have to respond to regular requests from PAC Display for tag updates.

*NOTE: Trends that are enabled are always updated, regardless of the window’s visual state (normal, iconified, etc.). This means PAC Display continually requests data from the control engine to update its trends. Keep this in mind.*

when you're considering the number of enabled trends you are including in the project. The more enabled trends you have, the more the control engine has to spend time reading its I/O to update the data.

**(H) Number of Major Divisions (X Axis).** Enter the number of major x-axis divisions for the trend. This is the number of main sections the trend is divided into. You can also choose a color for the major divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

*NOTE: For both x- and y-axis divisions, the lines dividing the major divisions appear thicker than the minor divisions.*

**(I) Number of Minor Divisions (X Axis).** Enter the number of minor x-axis divisions for the trend. This will be the number of sections the major divisions are divided into. The minimum number of divisions is one.

You can also choose a color for the minor x-axis divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

**(J) Label Interval in Major Divisions (X Axis).** Enter how often you want the major x-axis labeled.

*NOTE: For both x- and y-axis labels, if you enter 1, every major division is labeled; if you enter 2, every other major division is labeled.*

**(K) Label Position (X Axis).** Choose the label position for the x-axis. By default, the x-axis is labeled at the bottom, but you can choose to label the top, top and bottom, or have no labeling at all.

**(L) Label Format (X Axis).** Enter the label format by checking off any combination of hours, minutes, and seconds. The label appears in the following format: HH:MM:SS, where HH is hours, MM is minutes, and SS is seconds.

**(M) Number of Major Divisions (Y Axis).** Enter the number of major y-axis divisions for the trend. This is the number of main sections the trend is divided into. You can also choose a color for the major divisions by clicking the Color field. In the dialog box that appears, choose a color and click OK.

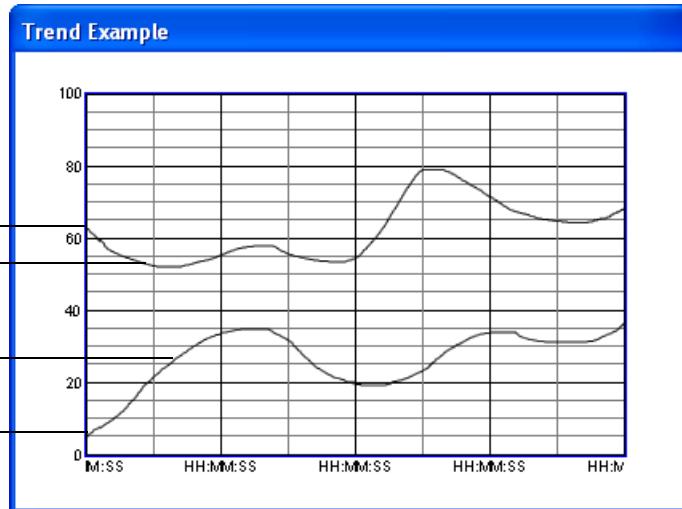
**(N) Number of Minor Divisions (Y Axis).** Enter the number of minor y-axis divisions for the trend. This will be the number of sections the major divisions are divided into. The minimum number of divisions is one.

You can also choose a color for the minor y-axis divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

**(O) Label Interval in Major Divisions (Y Axis).** Enter how often you want the major y-axis labeled.

**(P) Label Position (Y Axis).** Choose the label position for the y-axis. If you choose Left, Right, or Left and Right, only pens that fall within the minimum and maximum values of the Label Range are displayed; pen data outside the range is not displayed.

However, if you choose None, no labels are shown on the y-axis, multiple ranges appear to overlap, and all pens are displayed. As shown in the following example, if pen A has a range of 0-100 and pen B has a range of 300-400, the y-axis has a range of 0-100 *and* 300-400 simultaneously and both pens are displayed.



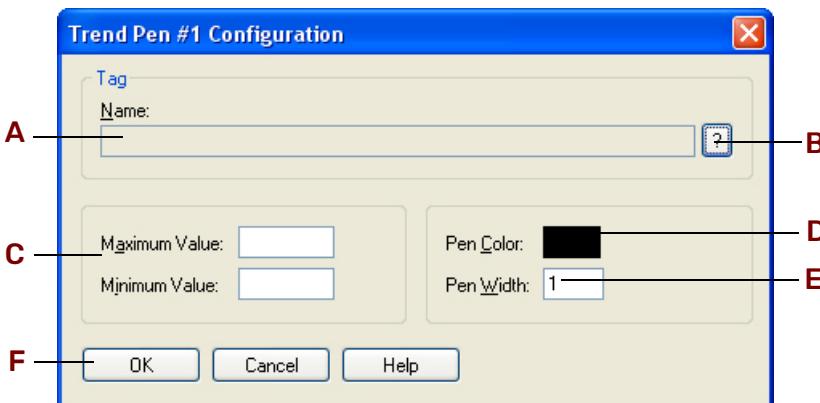
**(Q) Label Range (Y Axis).** Enter the minimum and maximum values for the y-axis.

**(R) OK.** Click OK to save your settings.

### Configuring Basic Trend Pens

Click a pen configuration button in the Trend Configuration dialog box to open the Trend Pen Configuration dialog box.

Trend Pen Configuration Dialog Box



**(A) Name.** Enter a PAC Control tagname here by clicking the Tag Selection Button (**B**).

**(B) Tag Selection Button.** To enter a tagname in **A**, click here. The Tag Selection dialog box is displayed so you can select a tag. See “Configuring Tags” on page 74 to learn more about configuring tags in your project.

**(C) Maximum/Minimum Value.** Enter the maximum and minimum value the tag selected in **A** can be.

**(D) Pen Color.** Click here to choose a pen color. In the Color dialog box that appears, choose a color and click OK.

**(E) Pen Width.** Enter the width of the line you want created by the pen. The width is specified in pixels.

**(F) OK.** Click OK to save your settings.

### Optimizing Pen Settings

The scan rates you select when configuring a pen can impact the speed and performance of your PAC Display project and the control engine. When selecting scan rates for long trends, you should choose optimal scan times for the pens as follows:

1. Determine the trend width in pixels by using the X: value in the Coordinates window.

First, subtract the X: value of the left trend border from the X: value of the right trend border. Then divide the trend width in seconds by the trend width in pixels.

For example, an eight-hour trend that is 500 pixels wide yields a number of 57.6 seconds ( $8 \times 3600 / 500$ ).

2. Round this to the nearest increment of 10.

In the example, the value would be rounded up to 60 seconds. This means that for optimum PAC Display performance, the trend should not be updated more frequently than every 60 seconds.

*NOTE: A small compromise to increase the accuracy of the trend is to divide the result by four. In our example, this would result in a scan time of every 15 seconds. Using a 15-second scan time allows a maximum of four readings per pixel on the trend. Updating any faster than that is counterproductive; the excess data is discarded, and the extra requests for data from the control engine add overhead to the control system.*

## WORKING WITH SUPERTRENDS

SuperTrends are trends that can track both real-time and historical data. You can also use up to 16 pens with a SuperTrend; basic trends support only four pens. SuperTrends are drawn and configured in PAC Display Configurator, like any other on-screen object, but the graphs can also be manipulated by the operator in PAC Display Runtime. See “[Using Runtime](#)” on page 320 to learn how to use SuperTrend options in Runtime.

[“Memory Requirements for SuperTrend Pens” \(below\)](#)

[“Creating a SuperTrend” on page 191](#)

[“Configuring SuperTrend Setup Parameters” on page 191](#)

[“Configuring X-Axis Parameters” on page 193](#)

[“Configuring Y-Axis Parameters” on page 194](#)

[“Configuring Zoom Parameters” on page 196](#)

[“Configuring Hot Keys” on page 196](#)

[“Configuring SuperTrend Pens” on page 197](#)

[“Setting an Individual Pen” on page 199](#)

### Memory Requirements for SuperTrend Pens

**When several SuperTrends—each using several pens—are used in a PAC Display project, the memory requirements for the PC running the project can become very high.** Keep this in mind when developing your PAC Display project. Use the following formula to determine the amount of RAM required for each pen in a SuperTrend:

$$\text{RAM required per pen (bytes)} = \frac{19.2 \times \text{SuperTrend's x-axis time span (sec.)}}{\text{SuperTrend's scan rate (sec.)}}$$

For example, the memory required for each pen in a SuperTrend having a six-hour scan time (21,600 sec.) and a 500 ms scan rate (0.5 sec.) would be calculated as follows:

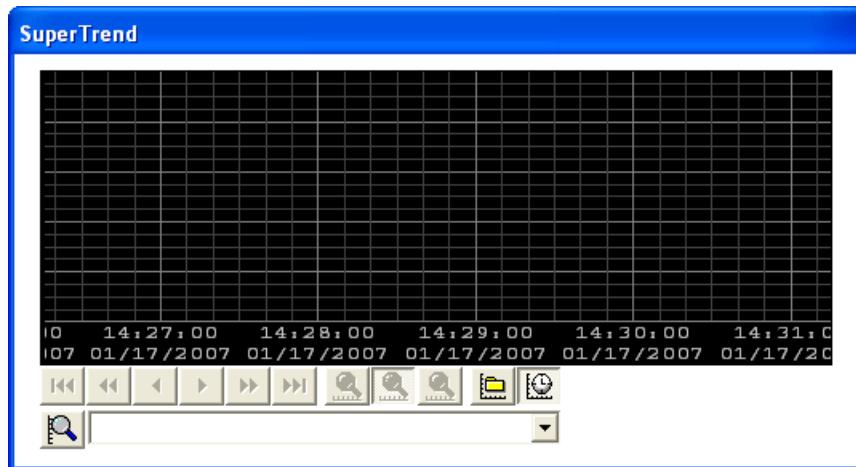
$$\frac{19.2 \times 21600 \text{ sec.}}{0.5 \text{ sec.}} = 829,400 \text{ bytes}$$

This is approximately 800 KB for each pen. If this example SuperTrend contains five pens, it would use approximately 4,000 KB of RAM, or just under 4 MB.

Each time you configure a SuperTrend, the approximate amount of RAM required for that object is displayed.

### Creating a SuperTrend

1. Select the SuperTrend tool  from the toolbox and position the cursor where you want the trend to begin in the window.
2. Click the mouse button, drag the mouse to the desired size, and then release the mouse button.  
The SuperTrend appears.

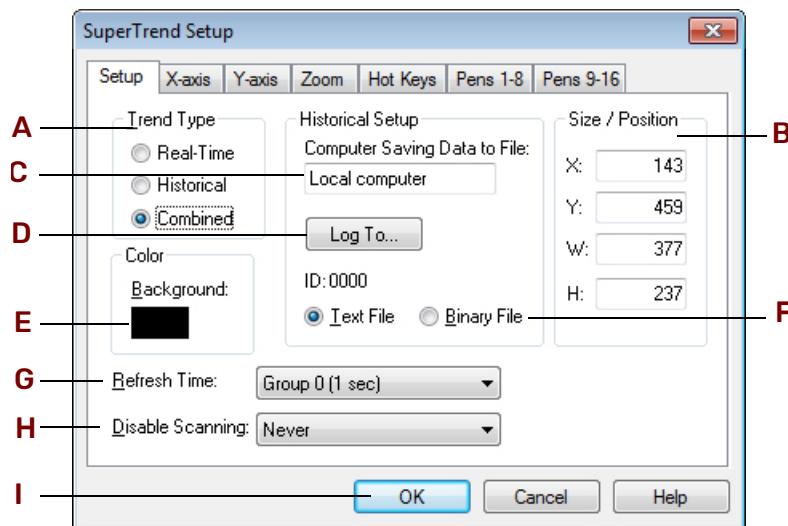


If you do not draw the SuperTrend wide enough, some of the command buttons are placed in a second row.

### Configuring SuperTrend Setup Parameters

To configure a SuperTrend, choose the Select tool, and then double-click the SuperTrend.

SuperTrend Setup Dialog Box, Setup Tab



**(A) Trend Type.** Select Real-Time to configure the selected SuperTrend graph to display real-time data in Runtime; select Historical to display SuperTrend historical data. When a Runtime operator clicks a SuperTrend historical graph, Runtime prompts the operator for the historical log file that contains the data to display. If you select Combined, you can configure one SuperTrend graph that allows the Runtime operator to switch between real-time and historical trending when the project is running.

**(B) Size / Position.** Enter the X and Y coordinates to position the SuperTrend. To change the size, enter the width in pixels (W) or height (H).

**(C) Computer Saving Data to File.** This read-only field displays the computer that is configured to collect and process data for SuperTrend historical log files. “Local Computer”—the default value—means that the computer running PAC Display Runtime will collect and process the SuperTrend data. Any other value in this field means that one specific PAC Display Runtime computer (sometimes called the “remote computer”) has been configured to process the data.

*IMPORTANT: In a system with multiple nodes of PAC Display Runtime, Opto 22 recommends designating a remote computer to handle SuperTrend historical data logging. This way, only the remote computer will be writing to the log file, and this avoids file access issues when more than one computer is configured to write to the same destination. For details, see “[SuperTrend Logging](#)” on page 200.*

Note that the *location* where the files are saved is configured in the Historical Log File Configuration dialog box. For details, see “[Configuring SuperTrend Log Files](#)” on page 202.

**(D) Log To.** Allows you to log to a file or to a database.

- **Log File**

Displays the Historical Log File Configuration Dialog Box. (See “[Defining the Historical Data Log File](#)” on page 221.) In this dialog box, you can specify file parameters such as the rollover period and the amount of data to buffer in memory. For details, see “[SuperTrend Historical Log File Names](#)” on page 202.

- **(PAC Display Professional only) Log to Database**

Displays the Database Table dialog box that allows you to configure a table for logging SuperTrend data. For details, see “[Saving a SuperTrend to a Database](#)” on page 208.

**(E) Color.** Click here to select a background color for the SuperTrend graph. In the Color dialog box that appears, choose a color and click OK.

**(F) Text File/Binary File.** Select whether the SuperTrend historical log will be saved to a file in text or binary format. When the SuperTrend data is saved in ASCII text format, the data in the file is human-readable, and the file includes a header that contains information about tags assigned to the SuperTrend pens. When the data is saved in binary format, the data in the file is not human-readable, and the file does not include a header.

*NOTE: Trend data from a binary file usually plots more quickly than trend data from a text file.*

If there are existing data files for a SuperTrend and you reconfigure the SuperTrend to switch the file format between text and binary, the Select Log File To Convert To dialog box appears. In this dialog box, you can select a log file to convert to the appropriate format. See [page 205](#) to learn more about switching between text and binary file formats.

**(G) Refresh Time.** Choose one of fourteen refresh time groups. The scan rate appears in parentheses alongside the refresh group number. You can find out more about refresh times in ["Scanning to Update Graphic Objects" on page 182](#). All tags associated with the pens in this trend are scanned at the same rate.

**(H) Disable Scanning.** Choose whether to disable a trend based on its window's state. If you disable the trend, the tags associated with the pens won't be updated with new data from the PAC Control strategy until the trend is enabled again. Disabling a trend saves processing time since the control engine doesn't have to respond to regular requests for tag updates from PAC Display.

The trend retains its recorded data at the time the trend was disabled.

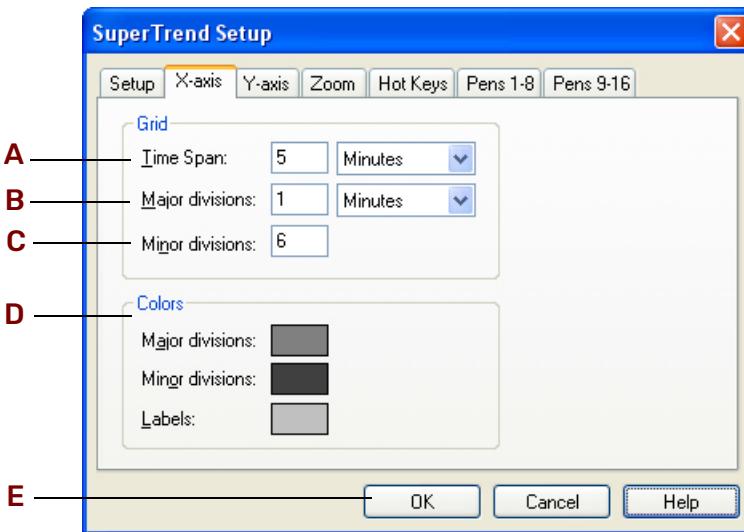
- **Never:** The trend is never disabled. It always collects data.
- **When Window Closed:** The trend stops scanning when its window is closed. It starts scanning again when the window is restored.
- **When Window Minimized:** The trend stops scanning when its window is minimized. It starts scanning again when the window is restored.

**(I) OK.** Click OK to save your settings.

## Configuring X-Axis Parameters

Click the X-axis tab to configure x-axis parameters for the SuperTrend.

## SuperTrend Setup Dialog Box, X-axis Tab



**(A) Time Span.** Enter the time span (x-axis) the trend represents. Choose the time units from the drop-down list. Your choices are seconds, minutes, hours, and days. The maximum time span is 49 days, or 1,176 hours.

**(B) Major Divisions.** Enter the number of major x-axis divisions for the trend. The trend will be divided into this number of main sections. You can choose a color for the main section dividers in Colors (D). The lines dividing the main sections will appear thicker than the lines dividing the minor sections.

**(C) Minor Divisions.** Enter the number of minor x-axis divisions for the trend. The major sections will be divided into this number of minor sections. The minimum number of divisions is one. You can choose a color for the minor section dividers in Colors (D).

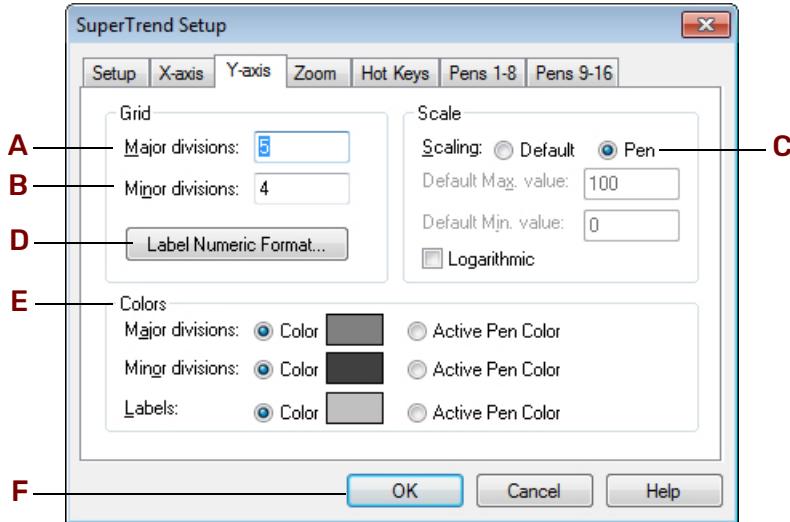
**(D) Colors.** Click on the boxes to set the colors for the major divisions, minor divisions, and labels. In the Color dialog box that appears for each item, choose a color and click OK.

**(E) OK.** Click OK to save your settings.

### Configuring Y-Axis Parameters

Click the Y-axis tab to configure y-axis parameters for the SuperTrend.

SuperTrend Setup Dialog Box, Y-axis Tab



**(A) Major Divisions (Grid).** Enter the number of major y-axis divisions for the trend.

**(B) Minor Divisions (Grid).** Enter the number of minor y-axis divisions for the trend.

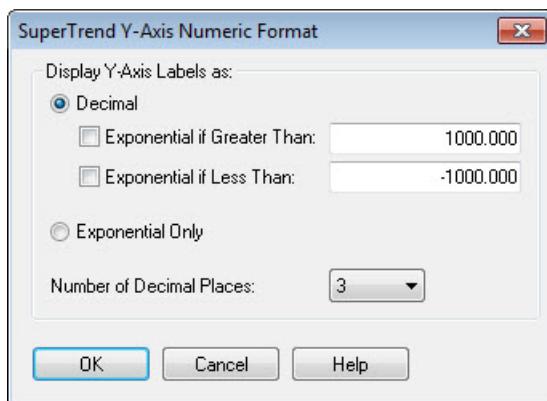
**(C) Scale.** Click here to select the scaling.

- If you choose Default, the trend will always have the same fixed scale. You must enter values for the Default Max. Value and Default Min. Value. These values specify the range of pen tag values. This scaling is static and cannot be changed in Runtime.
- If you choose Pen, the trend will have the scale of the active pen.

*NOTE: To see all pens scaled the same in Runtime when using Pen scaling, see “Using SuperTrends in Runtime” on page 333.*

- If you select the Logarithmic check box, the trend will have a logarithmic y-axis based on the scale of the active pen. The logarithmic y-axis is determined by rounding down the minimum pen value to the next lowest factor of ten, and rounding up the maximum pen value to the next greatest factor of ten. For example, if a pen’s range has a minimum value of 500 and a maximum value of 8500, the y-axis will have a minimum value of 100 and a maximum value of 10,000.

**(D) Label Numeric Format.** Click this button to open the Y-Axis Numeric Format dialog.



Fill in the options as you like for displaying the Y-axis labels. Y-axis values can be shown in decimal or exponent form, or a mixture of both.

**(E) Colors.** Click on the boxes to set the colors for the major divisions, minor divisions, and labels in the trend. If you want the y-axis to use the color of the pen that's currently active, select Active Pen Color.

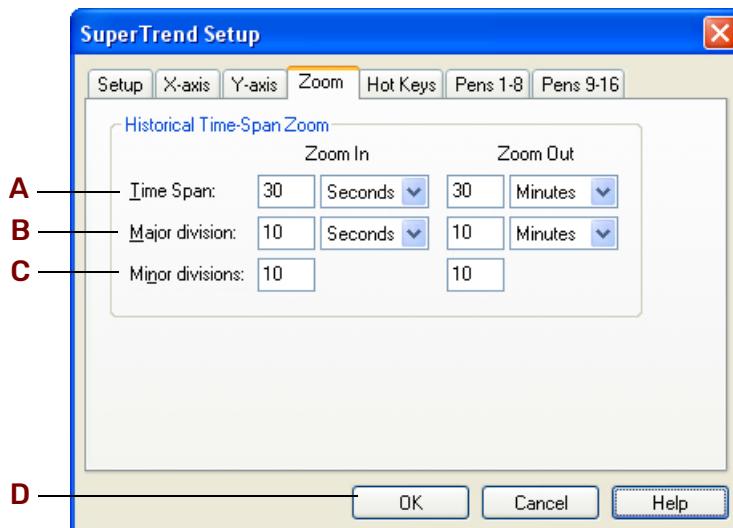
In the Color dialog box that appears for each item, choose a color and click OK.

**(F) OK.** Click OK to save your settings.

## Configuring Zoom Parameters

When a SuperTrend is in historical mode, the operator can zoom in to view a more detailed section of the trend, or zoom out to view a less detailed section of the trend. Click the Zoom tab to set magnification levels. The Zoom page, shown below, configures the zoom levels by defining scales for the x-axis.

SuperTrend Setup Dialog Box, Zoom Tab



**(A) Time.** Enter the amount of time to display on the trend while in zoom in/zoom out mode. Unit choices, selected from the dropdown box, are seconds, minutes, hours, or days.

**(B) Major Divisions.** Enter the amount of time that constitutes one major division while in zoom in/zoom out mode. Unit choices, selected from the dropdown box, are seconds, minutes, hours, or days.

**(C) Minor Divisions.** Enter the number of minor divisions per major division while in zoom in/zoom out mode. This number must be 1 or greater.

**(D) OK.** Click OK to save your settings.

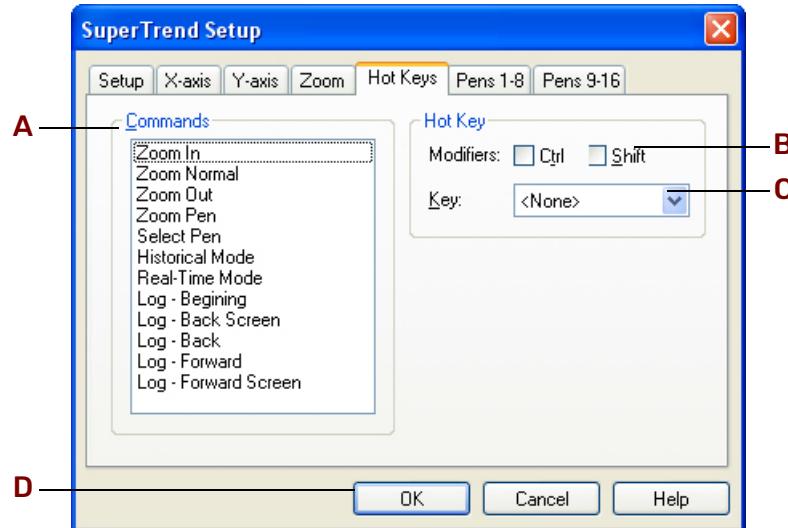
## Configuring Hot Keys

All of the buttons that appear at the bottom of a SuperTrend can be associated with a combination of keystrokes called a *hot key*. Hot keys allow the Runtime operator to use the SuperTrend without needing a mouse. If a button has a hot key configured, the operator can either click the button or press the hot key combination.

*NOTE: If a command is available only in historical mode, its associated hot key will work only in historical mode.*

To configure hot keys, click the Hot Keys tab.

#### SuperTrend Setup Dialog Box, Hot Keys Tab



**(A) Commands.** This field displays the Runtime commands that may be associated with a hot key. Highlight a command to configure a hot key for it, or to view the existing hot key settings.

**(B) Modifiers.** Check the box labeled Ctrl if you want the Ctrl key to be part of the hot key. Check the box labeled Shift if you want the Shift key to be part of the hot key. You may select none, one, or both.

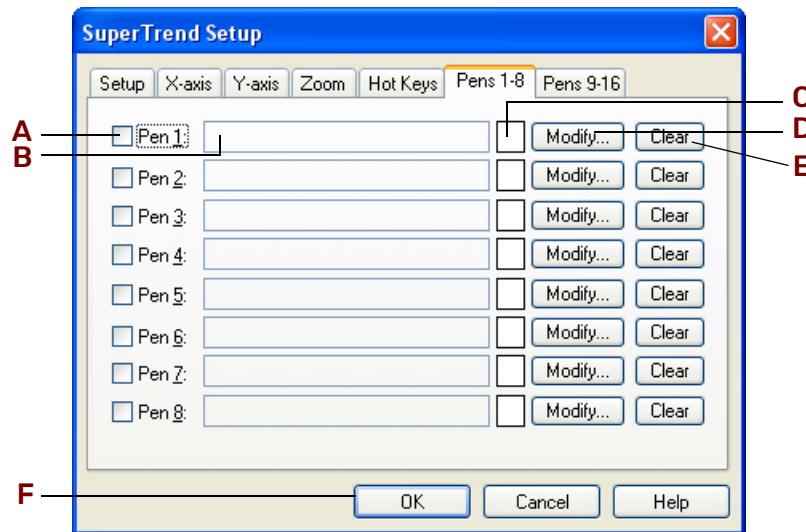
**(C) Key.** This drop-down box lists all available keys that can be hot keys. Make sure not to assign the same hot key to more than one SuperTrend command.

**(D) OK.** Click OK to save your settings.

#### Configuring SuperTrend Pens

Unlike a basic trend, a SuperTrend can plot trend lines for up to 16 tag values (pens). Pens 1 through 8 are configured on the "Pens 1-8" tab shown below. Pens 9 through 16 are configured identically on the "Pens 9-16" tab. There is one row for each pen.

SuperTrend Setup Dialog Box, Pens 1–8 Tab



**(A) Pen #.** Check this box to enable the pen in this row (or uncheck the box to disable the pen). The pen is enabled automatically when it is first created.

**(B) Name.** Once a pen is configured, its name appears here.

**(C) Color.** Click here to select the pen color. In the Color dialog box that appears, choose a color and click OK.

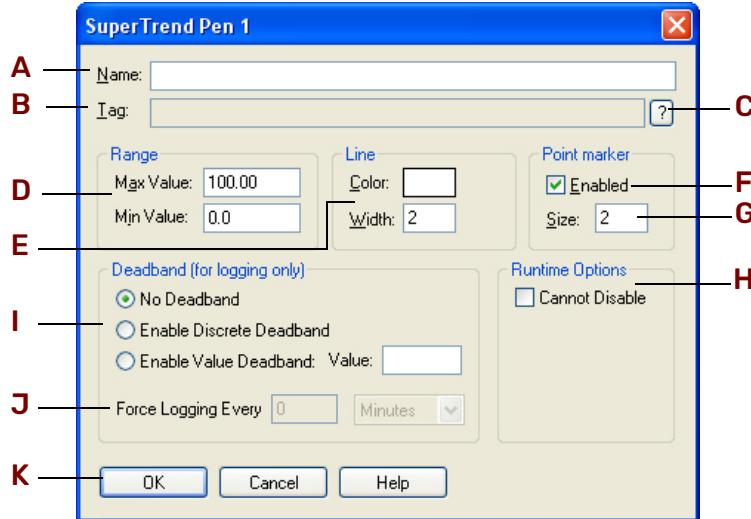
**(D) Modify.** Click here to configure a pen or to modify its configuration. The SuperTrend Pen # configuration dialog box appears. Configure the pen and click OK. The pen name will be listed in **B**.

**(E) Clear.** Click here to clear the pen configuration.

**(F) OK.** Click OK to save your settings.

## Setting an Individual Pen

In the SuperTrend Setup dialog box, click the Modify button for a pen to open the SuperTrend Pen dialog box. (The number of the pen to be configured is shown in the title bar.)



**(A) Name.** Enter a SuperTrend pen name, if desired. By default, when a tag is selected in **B**, the name will be the same as the tagname. In Runtime, this name is displayed in the SuperTrend's Active Pen drop-down list.

**(B) Tag.** Enter a PAC Control tagname here by clicking the Tag Selection button in **C**.

**(C) Tag Selection Button.** To enter a tagname in **B**, click here and select a tag in the Tag Selection dialog box that appears. See "[Configuring Tags](#)" on page 74 for more information about selecting and configuring tags.

**(D) Range.** These fields configure the range of displayed data points:

- The Max Value, or maximum value, is the tag value that will position the pen at the top of the trend. If a scanned value of the tag is greater than the Max Value, the point will be plotted but will not be visible on the trend.  
*When graphing integers*, the Max Value must be a multiple of the y-axis major divisions, otherwise there will be rounding errors. For example, if the y-axis major divisions is 7, the Max Value might be 21 (3x7), 49 (7x7), or 84 (12x7). The y-axis major divisions is set on the Y-axis tab. See "[Configuring Y-Axis Parameters](#)" on page 194.
- The Min Value, or minimum value, is the tag value that will position the pen at the bottom of the trend. If a scanned value of the tag is less than the Min Value, the point will be plotted but will not be visible on the trend.

**(E) Line.** Click in the box next to Color to choose a pen color. In the Color dialog box that appears, choose a color and click OK. Enter the width of the line you want created by the pen. The width is specified in pixels.

**(F) Point Marker Enabled.** Click here to have point markers displayed for every scanned point. Point markers make it easy to identify scanned data. In historical mode, you can click on a scanned point to display its data (value, time scanned, etc.).

**(G) Point Marker Size.** Choose a point marker width, which is measured in pixels.

**(H) Runtime Options.** Select Cannot Disable to prevent the pen from being manually disabled in Runtime.

## SUPERTREND HISTORICAL LOG FILES

**(I) Deadband.** If a SuperTrend's Trend Type is set to Combined on the Setup tab of the SuperTrend Setup dialog box, use Deadband to produce smaller, more manageable log files. Without deadbanding, a combined SuperTrend writes point data to a log file even when the data does not change. The resulting log file might contain many hundreds or even thousands of identical entries.

*No Deadband:* Choose this option if you do not want deadbanding.

*Enable Discrete Deadband:* Logging occurs only when the specified discrete value toggles either a tag's on or off state, or the bit in an integer.

*NOTE: Use Enable Discrete Deadband only for discrete values. PAC Display actually uses a value of 0.5 for the deadband amount. If a floating point value is being trended, and Enable Discrete Deadband is selected, unexpected results may occur.*

*Enable Value Deadband:* Logging occurs only at the specified refresh time if the newly plotted point value exceeds the previous point by more than this value. Only positive values are accepted.

**(J) Force Logging.** When deadbanding is enabled, use this option to force a log file entry to be generated even if the value for the pen has not exceeded the specified deadband amount. This is useful for logging values that rarely change more than the deadband amount, but you need verification that logging occurred over a set time span.

Enter a positive whole number, and select either Minutes or Hours.

**(K) OK.** Click OK to save your settings.

## SUPERTREND HISTORICAL LOG FILES

*NOTE: In PAC Display Professional, data can also be logged to a database. For details, see [page 208](#).*

Runtime operators use the buttons and controls on a SuperTrend graph to open and view SuperTrend historical log files. (For details, see [page 333](#).) Tag data from SuperTrend graphs can also be saved to historical log files for later viewing and analysis.

SuperTrend historical log files are similar to historical data log files; the major difference is that SuperTrend historical log files also contain the additional pen information that a SuperTrend collects.

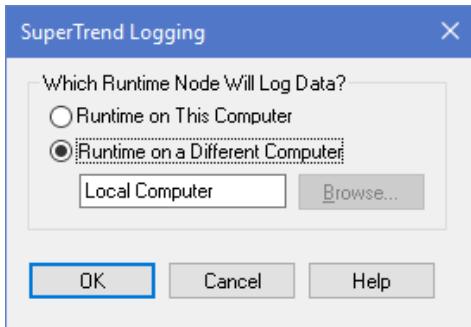
This section shows how to configure options for creating and saving SuperTrend historical log files.

### SuperTrend Logging

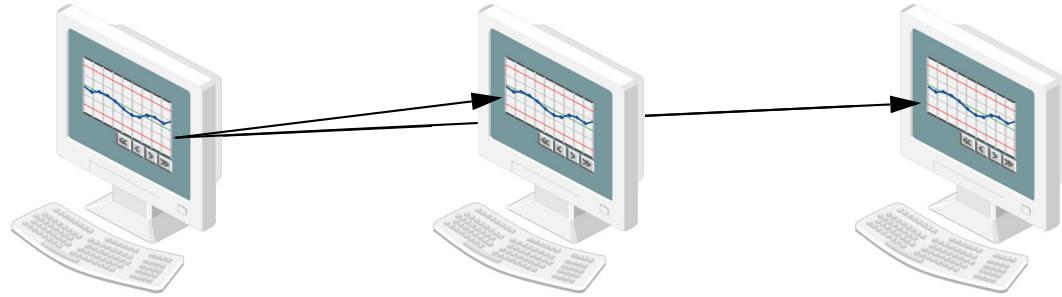
When you run a PAC Display project on more than one Runtime computer, all of the Runtime computers can plot and display trend data in SuperTrend graphs. As data is received, a date/time stamp is recorded, and the date/time stamp and data are buffered in the computer's memory until they reach the configured buffer-size limit. When the limit is reached, the buffer contents are written to a SuperTrend historical log file. (To select the location where the log files are saved, see "[Configuring SuperTrend Log Files](#)" on page 202.)

You can configure whether each individual Runtime computer performs the work to process the data for SuperTrend historical log files, or if just one of them does all the work.

*IMPORTANT: In a system with multiple nodes of PAC Display Runtime, Opto 22 recommends designating a remote computer to handle SuperTrend historical data logging. This way, only this one computer will be writing to the log file, and this avoids file access issues when more than one computer is configured to write to the same destination.*



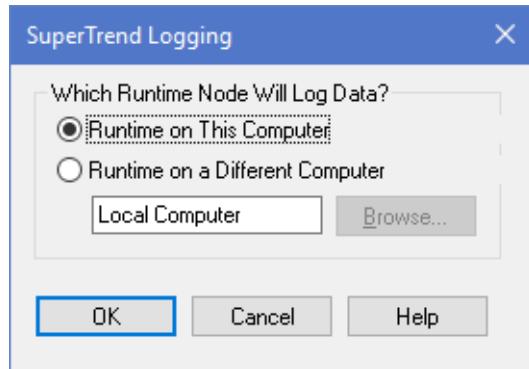
- Configure a remote computer for Super Trend logging.
- Copy the project to Runtime computers.
- The remote computer must also run the project to collect and process the data.
- The remote computer processes SuperTrend data.
- All Runtime computers can display the data in SuperTrend graphs.



**SuperTrend Logging Dialog Box**

To configure which computer will process SuperTrend historical log files:

- In the PAC Display Configurator menu bar, click Configure > SuperTrend Logging to open the SuperTrend Logging dialog box.



- Select the computer:
  - If only one computer will run the project in Runtime, select Runtime on This Computer, and then click OK. By default, SuperTrend historical log files are saved in the PAC Display project folder.
  - If more than one computer will run the project and you select Runtime on This Computer, each computer running the project will collect, process, and save SuperTrend historical log files in the configured destination.
  - When more than one computer will run the project in Runtime, Opto 22 recommends you choose Runtime on a Different Computer. Having one computer process SuperTrend historical log files can prevent issues caused by multiple computers sending data to the same destination.
- Select Runtime on a Different Computer, and then click Browse.
- In the Choose Logging Computer dialog box, expand the network computer tree until you find the computer you want.
- Click the computer to select it, and then click OK.

In a multi-computer environment, the “different computer” (typically, a remote computer) must be running the project in order to collect the data and create and save the log files to the configured location.

## SuperTrend Historical Log File Names

See also, (PAC Display Professional only) “[Saving a SuperTrend to a Database](#)” on page 208.

SuperTrend historical log file names are created automatically. Because the file names are referenced internally by the PAC Display application, you should never manually change the name of a SuperTrend historical log file.

SuperTrend historical log file names are based on the date the file was created and a configured *rollover period*. File rollover is used to separate data log files according to configured time periods; when a rollover period ends, the active log file is closed and a new data log file is created. You can configure monthly, weekly, daily, and hourly rollover periods; you can even configure logs to be created when a PAC Control strategy tag's value matches configured conditions. You can also choose a “None” rollover period, in which case all data is stored in a single file.

### Key

yyyy = four-digit year

yy = 2-digit year

mm = month

pp = day that the file was started (applicable only to weekly rollovers)

dd = day

hh = hour (0–23)

MM\_SS = minutes and seconds

.H = file extension prefix for a historical data log

.T = file extension prefix for a SuperTrend historical data log

##### = an internal ID number for the historical data log or SuperTrend.

Rollover period	Naming Format
Monthly	RMymm.H##### RMymm.T#####
Weekly	RWyymmpp.H##### RWyymmpp.T#####
Daily	RDyymmdd.H##### RDyymmdd.T#####
Hourly	RHyyy_mmddhh.H##### RHyyy_mmddhh.T#####
Trigger	RT_yy_mm_dd_hh_MM_SS.H##### RT_yy_mm_dd_hh_MM_SS.T#####
None	HISTLOG.H##### STREND.T#####

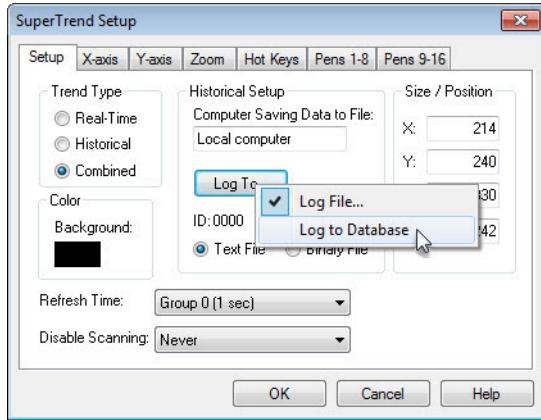
For more information, see “[When Are Rollover Files Created?](#)” on page 231.

## Configuring SuperTrend Log Files

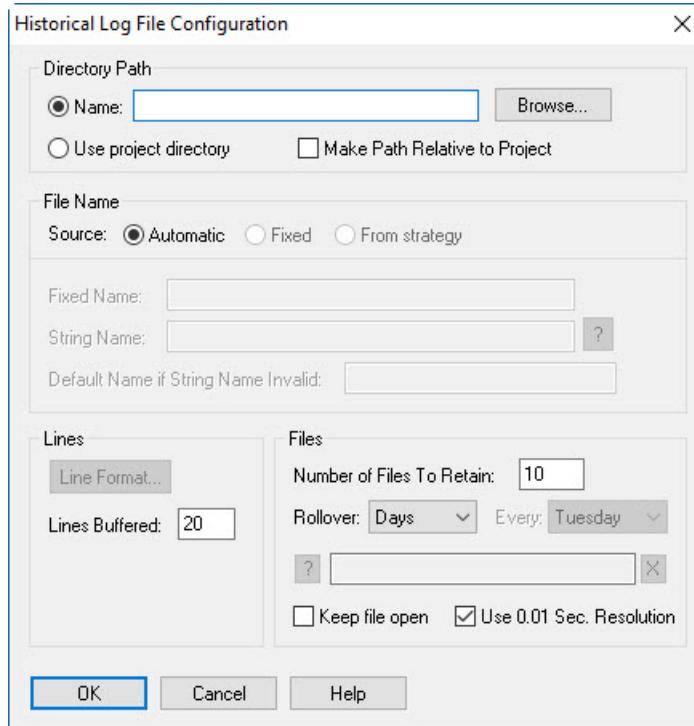
To save SuperTrend historical data:

1. Choose the Select tool and double-click the SuperTrend.  
The SuperTrend Setup dialog box appears.
2. Click Log To.
  - In PAC Display Basic, the Historical Log File Configuration dialog box appears.  
Continue to [step 3](#).
  - In PAC Display Professional, a pop-up menu appears.

Select Log File to display the Historical Log File Configuration dialog box. (To log to a database, see "Saving a SuperTrend to a Database" on page 208.)



Note that in the File Name area, only the Automatic option is available; user-defined names are not allowed for SuperTrend historical log files. Likewise, in the Lines area, Line Format is grayed out because you can't change the log file format of a SuperTrend historical log file.



**3.** Do one of the following:

- To save the log files for this SuperTrend locally in the PAC Display project directory, select Use Project Directory and click OK.

SuperTrend historical log files will now be saved locally in the same directory as your PAC Display project. The Use Project Directory setting applies to each computer that is running this PAC Display project, which means that each computer will save SuperTrend historical log files in its local project directory.

*NOTE: If you have configured a remote computer to save SuperTrend historical log files, the Use Project Directory option is not available. You must click Browse and select a directory from the list of network directories that appears, even if the directory you select is the same as the project directory.*

- To save the files to a folder *relative* to the folder that the project is in, select Make Path Relative to Project. If you then save the project to a different folder (or even to a different computer), PAC Display will save the files to the relative path.

For example, if the project is saved in C:\proj\ and you configure the files to be saved in C:\proj\data\, then the relative path would be this: \data\

If you then saved the project to C:\temp\newproj\, the files would be saved to the new location's relative path: C:\temp\newproj\data\

- To save the log files for this SuperTrend in a location other than the PAC Display project directory, perform the steps below. If there are lots of log files, you can speed up the display time by saving the log files for each SuperTrend in its own folder.

>Select Name and click Browse.

If you have selected remote SuperTrend logging, the Choose Remote Logging Location dialog box appears. Otherwise, the Select Directory dialog box appears.

→ Navigate in the file dialog box that appears until you find a computer and directory (Choose Remote Logging dialog box) or mapped local or network drive and directory (Select Directory dialog box) where you want to save the log files for this SuperTrend.

>Select the directory where the files will be saved and click OK.

When your project is running, SuperTrend historical log files are saved in the directory path you configured. This setting applies to each computer that is running the PAC Display project; each computer will save SuperTrend historical log files in the directory path you configured.

### Saving a Log in Text or Binary Format

When you configure the SuperTrend object, you can choose to save a SuperTrend historical log file in either text or binary format.

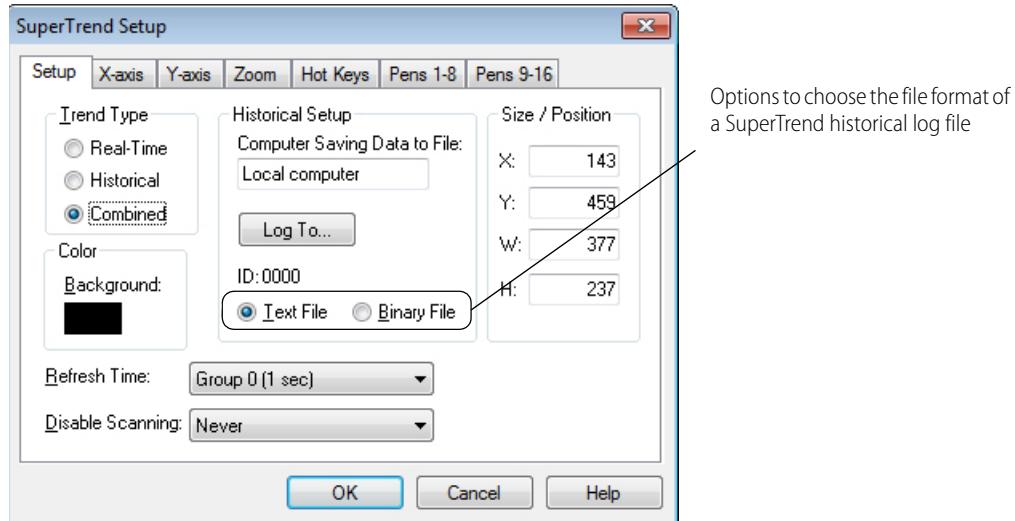
**Text**—When saved as an ASCII text file, a SuperTrend historical log file includes a header with information about tags assigned to the SuperTrend pens. One advantage of saving a log file in text format is accessibility—the file can be opened and viewed using any text editor, such as Windows Notepad. The disadvantage to this file format is that when a large amount of historical trend information is opened and plotted in a SuperTrend graph, the graph may be drawn slowly.

**Binary**—When a SuperTrend historical log file is saved in binary format, the file does not include a header containing information about tags assigned to the SuperTrend pens. A major advantage to saving a log file in binary format is speed—historical trend information from a binary file is usually graphed much more quickly than when using the same information from a text file. A disadvantage to binary file format is that the data cannot be opened and read using a text editor.

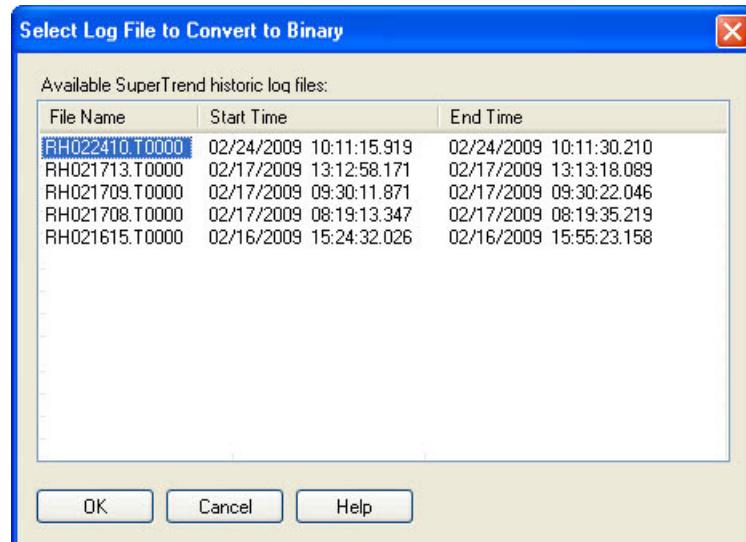
**To change the file format** of an existing SuperTrend historical log file between text and binary in PAC Display Configurator, perform the steps below. (For log files to be present, you will need to have previously run your PAC Display project and collected historical data.)

1. Double-click a previously configured SuperTrend object that has generated one or more log files.

The SuperTrend Setup dialog box appears with either Text File or Binary File selected, depending on how you originally configured the SuperTrend.



2. If Text File is selected, choose Binary File; if Binary File is selected, choose Text File. The Select Log File to Convert to dialog box appears. In the example below, text files that can be converted to binary format appear in the list:



3. Highlight a log file to convert and then click OK.
4. Now click OK to close the SuperTrend Setup dialog box.

### Converting SuperTrend Historical Log Files to Text Format for Viewing

While you can't view the contents of a SuperTrend historical log file saved in binary format, a simple software utility (including source code) is included with PAC Display that lets you convert binary log files to text format in order to view their contents. (The utility can also convert text files to binary format.) Once you have

## SUPERTREND HISTORICAL LOG FILES

converted a binary SuperTrend historical log file to text format, you can easily view its contents using a text editor or other application.

*NOTE: This utility creates a separate, new file in text (or binary) format that is not used by PAC Display. The format of the original SuperTrend historical log file is not changed. If you want to change the format in which this original log file is saved, see "Saving a Log in Text or Binary Format" on page 204.*

### Important Guidelines for Using This Utility

- **Do not rename or modify any original SuperTrend historical log files.** These are files with the file extension .T#### (for example, .T0003, .T0004, and so forth). PAC Display uses the file names to access and update log files.
- If you rename the new files that are created by the utility, **do not use the name or file extension of the original SuperTrend historical log file.**
- **If you convert a text file to binary format, the header information in the text file will be removed.** This information cannot be recovered, even if you convert the binary file back to text format.

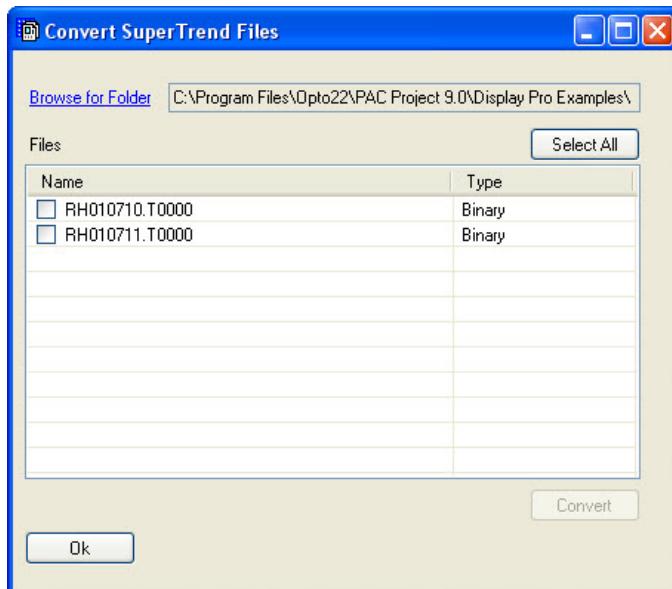
### Converting a SuperTrend Historical Log File for Viewing

The utility for converting SuperTrend historical log files is available in PAC Display and also in a command line version.

#### To use the PAC Display version:

This utility is available in both PAC Display Configurator and Runtime.

1. Click Tools > Convert SuperTrend Files to open the Convert SuperTrend Files application.



The current project folder is selected by default. To browse to a different folder, click the Browse for Folder link. All SuperTrend files located in that folder are listed with either Text or Binary shown as the type.

2. Check the box next to one or more file names, and then click Convert.

The files are converted to the correct format even if files of both types are selected.

Files are converted as follows:

- *Text to Binary:* Each new binary file has the same name as the original with ".bin" appended to the end. For example, RD160319.T0000 becomes RD160319.T0000.bin.

- *Binary to Text:* Each new text file has the same name as the original with “.txt” appended to the end. For example, RD160319.T0000 becomes RD160319.T0000.txt.

To use the command line version of the conversion utility:

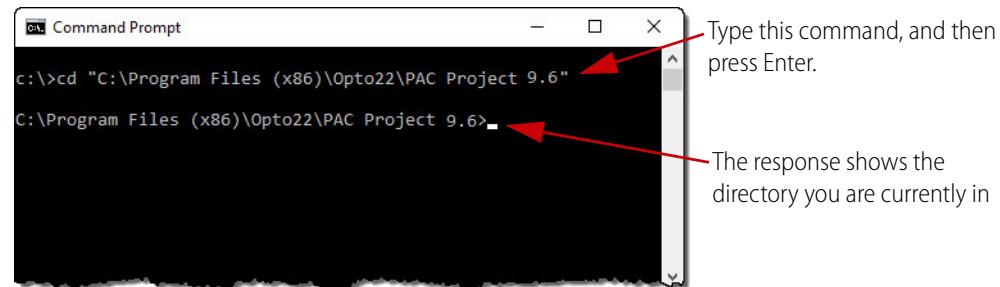
1. Open a command prompt window.

To open a command prompt window, press and hold the Windows Start key , and then press R.

2. At the command prompt, enter the command to navigate to the folder where PAC Display is installed. For example, if PAC Display version 10.5 is installed on your computer’s C:\ drive, the command would be:

```
cd "C:\Program Files (x86)\Opto22\PAC Project 10.5"
```

This image shows the command and the response:



3. At the command prompt, enter the conversion command and the log file’s path and filename.

Syntax: STRNDCVT.EXE [path\log filename]

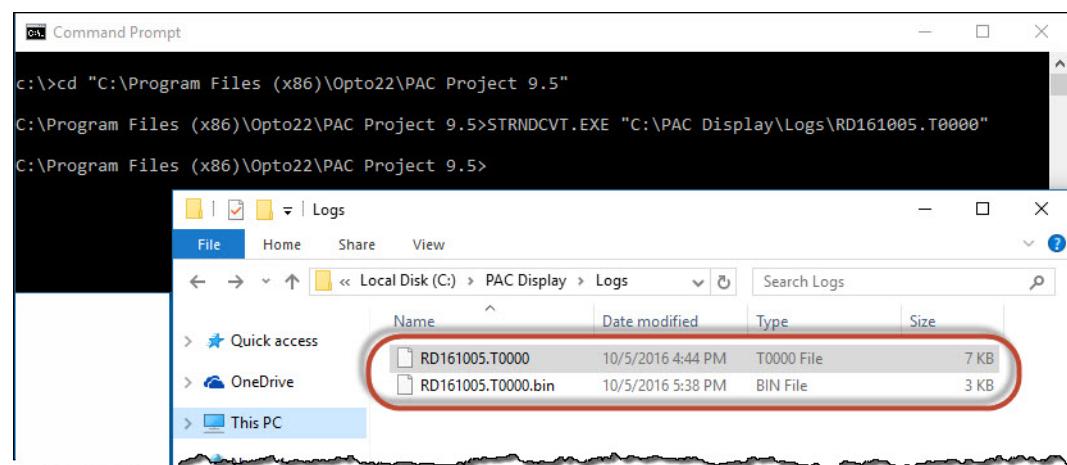
where STRNDCVT.EXE is the conversion command

and [path\log filename] is the name of the SuperTrend historical log file to be converted.

For example, to convert a log file named RD161005.T0000 and located in the C:\PAC Display\Logs folder, you would enter:

```
STRNDCVT.EXE "C:\PAC Display\Logs\RD161005.T0000"
```

The format change occurs automatically: If the log file is in binary format, it will be converted to text; the new text file has the extension .txt. If the file is in text format, it will be converted to binary; the new binary file has the file extension .bin.

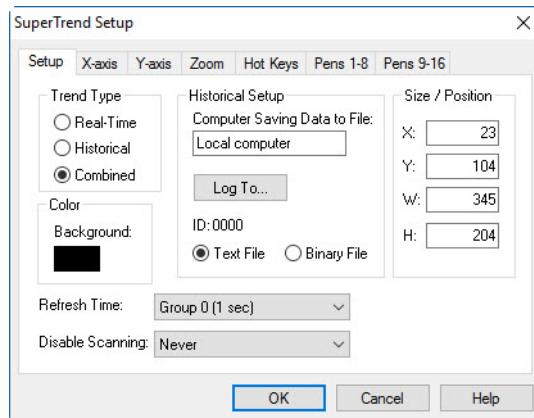


## Saving a SuperTrend to a Database

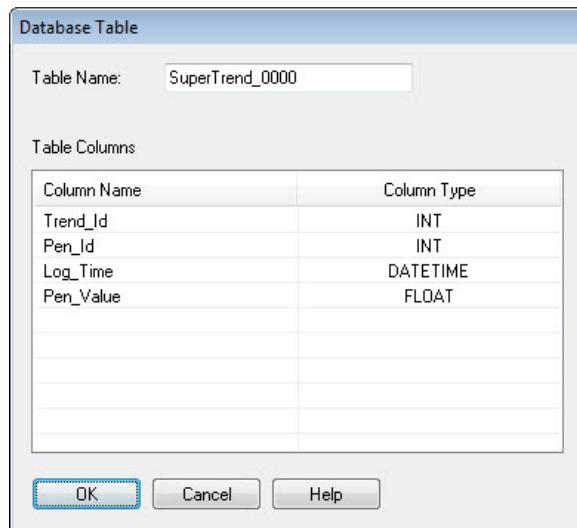


**(Pro only)** If you have configured an ODBC-compliant database (such as Microsoft SQL Server, MySQL, or Microsoft Access), you can also log SuperTrend data to a database. For information about configuring ODBC data sources, see [page 55](#).

- From the SuperTrend Setup dialog, click the Log To button and choose Log to Database from the popup menu.



If a database is configured, a dialog shows the default settings for the table that will be created and logged to.

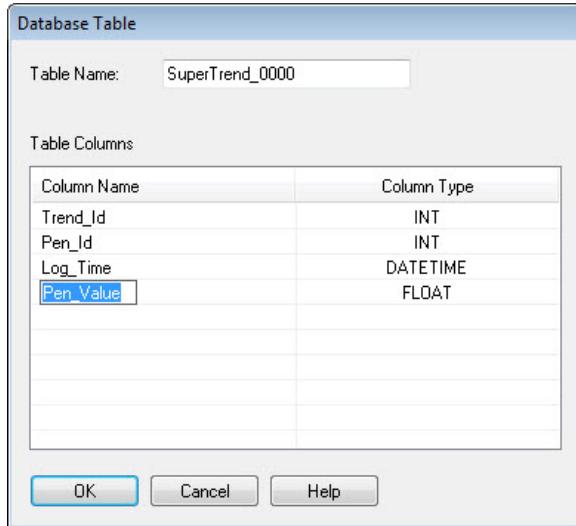


- If desired, modify the table name or the column names.

To modify a column name:

- Click the name to highlight the row.

- b.** Click the name once again to make it editable.



- c.** Type a new name, and then press Enter.  
**d.** Click OK to confirm your changes and close the dialog box.

#### NOTES

- *Table and column names may not contain the following characters: (space) [ ]:*
- *Column names cannot begin with a SQL reserved word for that database type.*  
*Examples: INTEGER, VALUE, BACKUP, CURRENT\_DATE*

Here is a sample of a table created using a Microsoft Access database:

	Trend_Id	Pen_Id	Log_Time	Temperature
▶	1		114 10:23:29 AM	77.6915588379
	0		114 10:23:30 AM	77.7220764160
	0		114 10:23:31 AM	77.7220764160
	0		114 10:23:32 AM	77.6915588379
	0		114 10:23:33 AM	77.7220764160
	0		114 10:23:34 AM	77.6915588379
	0		114 10:23:35 AM	77.6915588379
	0		114 10:23:36 AM	77.7220764160
*			114 10:23:37 AM	77.6915588379

Record: 1 ▶◀◀▶▶\*

#### Changing the Database Table Name

When you create or modify a table for logging SuperTrend data in a database, you can change the database table name. However, after Runtime logs data to the database, if you then try to change the database table name in Configurator, a message is displayed, that says the table already exists.

When the message appears, do one of the following:

- Click Yes to create a new table and start logging to that table.
- Click No to rename the existing table and continue logging to that table.

## USING XY PLOTS

You can use XY plots to graph real-time tag information. XY plots do not graph data over time, but instead plot points on a two-dimensional graph using data from two float or integer tables in the PAC Control strategy. (For information on using numeric tables in a strategy, see the *PAC Control User's Guide*, form 1700.)

The value in each element of the numeric tables defines the coordinates for a single point on the x-axis and y-axis coordinate system. The example below shows how two numeric tables, each having three elements, would be used to draw three consecutive points on an XY plot.

Table Element	Numeric_Table_1	Numeric_Table_2	XY Coordinates
0	3	8	(3,8)
1	5.25	10	(5.25,10)
2	2	3.3	(2,3.3)

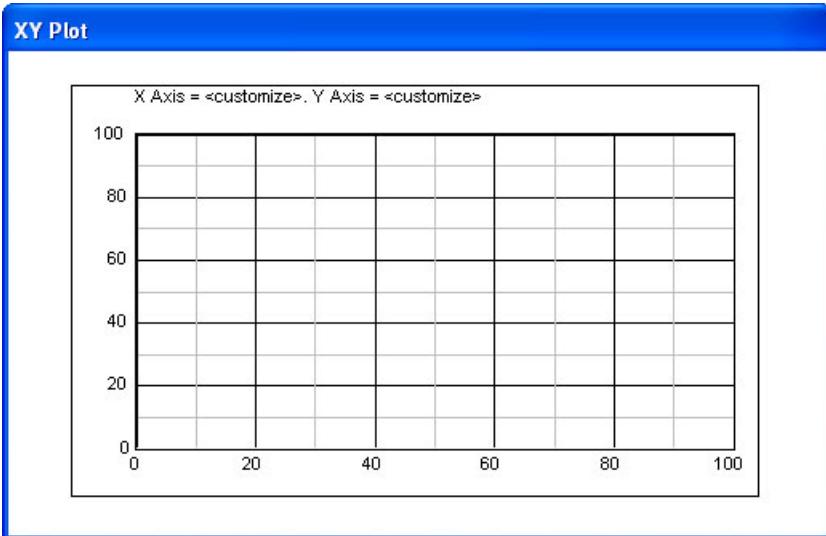
An XY plot is useful in applications where one value must be graphed against another value. Common examples in industrial settings include graphing temperature versus pressure, displacement versus input, or voltage versus current.

### Creating an XY Plot

1. Select the XY Plot tool  from the toolbox and position the cursor where you want the XY plot object to begin in the window.
  2. Click the mouse button, drag the mouse to the desired size, and then release the mouse button.
- The XY plot that appears should resemble the example below:

#### Y-Axis Layout

- Label Position = Bottom
- Max. Val = 100
- Min. Val = 0
- Major Divisions = 5
- Minor Divisions = 2



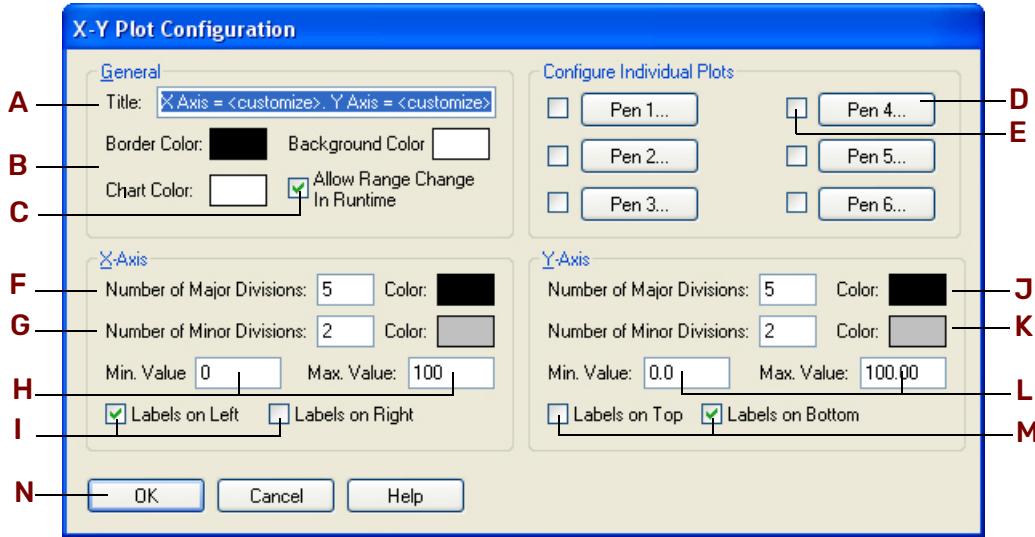
#### X-Axis Layout

- Label Position = Left
- Major Divisions = 5
- Min. Val = 0
- Minor Divisions = 2
- Max. Val = 100

### Modifying an XY Plot

Choose the Select tool and double-click the XY plot to open the XY Plot Configuration dialog box.

## XY Plot Configuration Dialog Box



The XY Plot Configuration dialog box is used to set the parameters of an XY plot, including the number of plotted lines that are displayed and the scaling used for the x-axis and y-axis.

**(A) Title.** Enter the title of the XY plot here.

**(B) Border and Chart Color.** Click a color button to enter the color for the chart, the chart's background, and the chart's border. In the Color dialog box that appears, choose a color and click OK.

**(C) Allow Range Change in Runtime.** Select the Allow Range Change in Runtime check box to allow the user to change the x-axis and y-axis range values in PAC Display Runtime.

**(D) Pens.** Use the plot configuration buttons to define up to six individual plotted points in the XY plot. Each individual plot uses x-axis and y-axis coordinates from two PAC Control tags. You can also define the plotted point's color and width, and specify line style and whether a legend should appear. See ["Configuring Individual Plots in an Object" on page 212](#) for more information.

**(E) Pen Check Box.** Check this box to display a configured individual plot. Uncheck the box to hide the plot.

**(F) X-Axis Number of Major Divisions.** Enter the number of major x-axis divisions for the XY plot. This is the number of main sections the graph is divided into. You can also choose a color for the major divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

*NOTE: For both x- and y-axis divisions, the lines dividing the major divisions appear thicker than the minor divisions.*

**(G) X-Axis Number of Minor Divisions.** Enter the number of minor x-axis divisions for the XY plot. This will be the number of sections the major divisions are divided into. The minimum number of divisions is one.

You can also choose a color for the minor x-axis divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

**(H) X-Axis Min/Max Value.** Enter the minimum and maximum values for the x-axis. In addition to whole numbers and decimals, you can also use negative exponents for numbers less than 1. For example, for the number .0000001, you would enter 1.00e-07.

**(I) X-Axis Labels on Left/Right.** Enter the label position for the x-axis. By default, the x-axis is labeled on the left, but you can also choose to have the label on the right or on both sides.

**(J) Y-Axis Number of Major Divisions.** Enter the number of major y-axis divisions for the XY plot. This is the number of main sections the graph is divided into. You can also choose a color for the major divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

*NOTE: For both x- and y-axis divisions, the lines dividing the major divisions appear thicker than the minor divisions.*

**(K) Y-Axis Number of Minor Divisions.** Enter the number of minor y-axis divisions for the XY plot. This will be the number of sections the major divisions are divided into. The minimum number of divisions is one.

You can also choose a color for the minor y-axis divisions by clicking the Color field. In the Color dialog box that appears, choose a color and click OK.

**(L) Y-Axis Min/Max Value.** Enter the minimum and maximum values for the y-axis. In addition to whole numbers and decimals, you can also use negative exponents for numbers less than 1. For example, for the number .0000002, you would enter 2.00e-07.

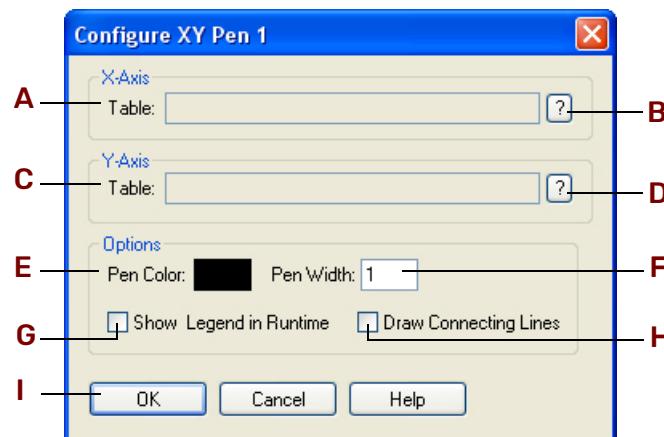
**(M) Y-Axis Labels on Top/Bottom.** Enter the label position for the y-axis. By default, the y-axis is labeled at the bottom, but you can also choose to have the label at the top, or at both top and bottom.

**(N) OK.** Click OK to save your settings.

## Configuring Individual Plots in an Object

In the XY Plot Configuration dialog box, click the configuration button for an individual plot (for example, Pen 1) to open the Configure XY Plot dialog box.

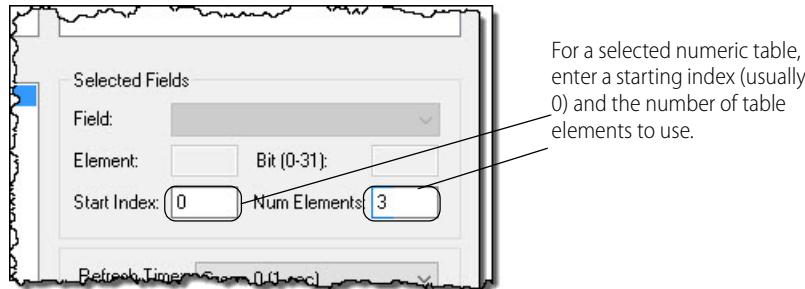
### Configure XY Plot Dialog Box



**(A) X-Axis Table.** Enter a PAC Control tagname here that will provide the x-axis values. Click the Tag Selection Button (**B**) to open the Tag Selection dialog box.

**(B) Tag Selection Dialog Button (X-Axis).** To enter a tagname in **A**, click here. The Tag Selection dialog box is displayed so you can select a tag for a numeric table. For the table you select, also enter the starting index (usually 0) and the number of table elements to be used in the plot.

The fields for these values are shown in the illustration below. To learn more about configuring tags in your project, see ["Configuring Tags" on page 74](#).



**(C) Y-Axis Table.** Same as the X-Axis Table setting (**A**) above, but sets the tag for the y-axis.

**(D) Tag Selection Dialog Button (X-Axis).** Same as the x-axis tag selection (**B**) above, but selects the tag used for the y-axis.

**(E) Pen Color.** Click here to choose a pen color. In the Color dialog box that appears, choose a color and click OK.

**(F) Pen Width.** Type the width of the line for the pen to create. The width is specified in pixels.

**(G) Show Legend in Runtime.** Select the Show Legend in Runtime check box to have the names of the tags used appear under the graph's x-axis.

**(H) Draw Connecting Lines.** Select Draw Connecting lines to have lines connect each x-y coordinate.

**(I) OK.** Click OK to save your settings.

## USING XY PLOTS

# 9: Configuring Trigger-Based Events

## INTRODUCTION

In this chapter, you will learn how to make different types of events occur based on the value of a tag in a PAC Control strategy. These events include saving a historical data log, launching an application, playing a sound, changing a window's state, downloading and uploading a recipe to the control engine, and starting an alarm.

### In This Chapter

<a href="#">What is a Trigger-Based Event?</a> .....	page 215
<a href="#">Historical Data Logs</a> .....	page 215
<a href="#">Launching Applications</a> .....	page 233
<a href="#">Sounds</a> .....	page 236
<a href="#">Configuring Trigger-Based Window States</a> .....	page 238
<a href="#">Configuring Recipes</a> .....	page 239
<a href="#">Configuring Alarm Points</a> .....	page 258
<a href="#">Adding Alarm Graphics</a> .....	page 273
<a href="#">Configuring Project Alarms</a> .....	page 277

## WHAT IS A TRIGGER-BASED EVENT?

In PAC Display, you can make things happen based on the value of a tag in a PAC Control strategy. When the tag equals a specific value or falls within a defined range of values, it starts, or *triggers*, an event that you have specified.

You can use trigger-based events in many different ways. Here are a few examples:

- **Monitoring temperature**—Play a recorded warning sound to indicate an alarm condition if a tag exceeds a value.
- **Changing control system parameters for different products**—Download a new recipe (series of values) to a control engine when a tag reaches a set value.
- **Logging non-standard conditions or errors**—Print a log whenever monitored tags fall outside a previously defined range of values.

## HISTORICAL DATA LOGS

A historical data log lets you collect and store data from your control process to a file on your computer, or on a remote computer on a network. Once it is saved in a file, historical data about your control process can be

used by spreadsheet applications (such as Microsoft Excel) to generate reports, or the data can be archived for later reference.

By default, PAC Display saves historical data logs as text files in Unicode (UTF-16) format. To save all logs in ASCII format, select the Save log files in ASCII format check box in the Runtime Setup dialog box. For details, see “[Runtime Setup: General Tab](#)” on page 290.

*NOTE: To ensure that the correct time and date information appear in a historical data log, make sure to set the time and date on your PC prior to starting PAC Display.*

Historical data logging begins when PAC Display starts scanning the control engine for data, and ends when PAC Display stops scanning the control engine for data. (Scanning starts when the PAC Display project is opened in Runtime, and stops when the project is closed.) You can use a start or stop trigger, however, to start or stop historical data logging only (for example) when a tag is within a range of preset values, or a preconfigured number of samples have been taken. Start and stop triggers may be attached to any control engine variable.

### Tag Types You Can Save to a Historical Data Log

You can record the following types of tags in a historical data log:

- Integers and integer tables
- Floats and float tables
- Strings and string tables

*NOTE: If a historical data log is logging string tables, make sure that only string tables are used in that log. You cannot log string tables and integers in the same log file.*

- Discretes

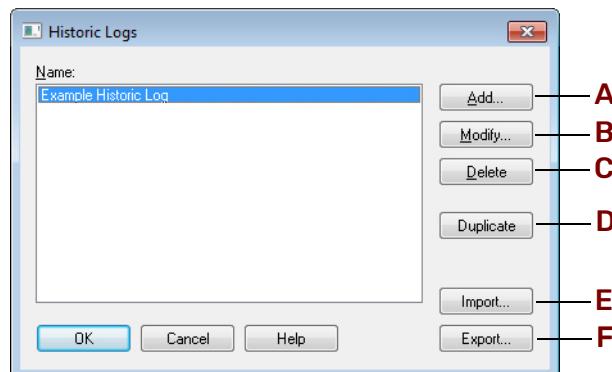
With integer tables and float tables, you can select individual elements, groups of elements, or all elements in the table. For more information on working with tables in a PAC Control strategy, see the [PAC Control User’s Guide](#) (form 1700).

*NOTE: To save data from more than one control engine, you must create a separate historical data log file for each control engine that will be monitored. Data from multiple control engines cannot be saved in the same historical data log file.*

### Configuring a Historical Data Log

To configure a historical data log in your PAC Display project, choose Configure > Historical Data Log.

The Historical Logs dialog box that appears allows you to add new historical data logs to the project or modify or delete previously configured historical data logs. You can add up to 1000 historical data logs per project.



*IMPORTANT: To save data from more than one control engine in a historical data log file, you must create a separate historical data log file for each control engine that will be monitored. If data from multiple control engines is saved in the same historical data log file, it is difficult to extract and use the log data from each control engine.*

If there are no historical data logs in the project, the Modify and Delete buttons cannot be selected. Selecting a configured historical data log enables the Modify, Delete, and Duplicate buttons.

**(A) Add.** Click Add to create a new historical data log in the Historical Log Configuration dialog box that appears.

**(B) Modify.** Highlight an existing log and click Modify to change it in the Historical Log Configuration dialog box that appears.

**(C) Delete.** Highlight an existing log and click Delete to remove it.

**(D) Duplicate.** Highlight an existing log and click Duplicate to create a copy of the log.

**(E) Import.** Click this button to display the following import options.

**Import from Subfolder:** Select one or more binary (.hle) files import into the current project.

**Import from Comma Delimited File:** Select one or more comma-delimited (.csv) files to import into the current project.

**(F) Export.** Highlight one or more files you want to export, then click this button to display the following options.

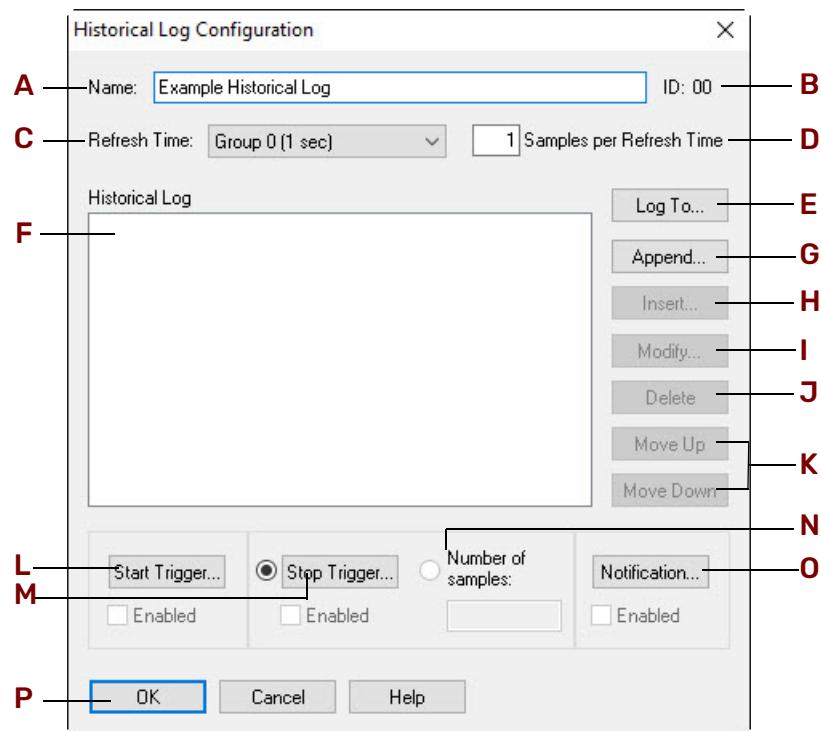
**Export to Subfolder:** Exports the selected historical data logs in binary format to the current project's Exported Historical Logs subfolder. Each file has the name of the historical data log with the .hle extension. For example: Pressures Log.hle

**Export to Comma Delimited File:** Exports the selected historical data logs in binary format to the current project's Exported Historical Logs subfolder. Each file has the name of the historical data log with the .csv extension (so it automatically opens in Excel).

For example: Water Log.csv

### Historical Log Configuration Dialog Box

To open the Historical Log Configuration dialog box, choose Configure > Historical Data Log, and then click the Add button.



**(A) Name.** Enter the name of the historical data log here. Use this name to refer to the historical log group you're configuring. (This name does not affect the name of the historical data log file that is saved to disk.)

*NOTE: The name in this field must be different from all historical data logs within the project or you will get an error message when you exit the dialog box.*

**(B) ID.** This field shows a unique numeric identifier for the historical data log. This identifier, which starts out at 00 and increases sequentially, is used as the last two characters of the three-character file name extension for a historical data log file. The first character of this file name extension is an uppercase "H", so with the identifier, a typical file name extension for a historical data log would be ".H00"

**(C) Refresh Time.** Select a previously configured refresh time group to scan the historical log point tags. This scan rate applies to every log point configured within this historical data log. For more information on setting up refresh time groups, see ["Refresh Time Groups" on page 183](#).

**(D) Samples per Refresh Time.** Enter the number of times per each Refresh Time unit that a tag value is scanned. This does not change how often the historical data log is written to (the Refresh Time); it only changes how often a tag value is scanned.

To calculate the actual time interval between each scan, divide the Refresh Time by the Samples per Refresh Time. For example, if the Refresh Time scan rate is 1 second, a Samples per Refresh Time value of 3 will sample the tag value every .333 seconds. If the Refresh Time scan rate is 2 seconds, a value of 3 will sample the tag value every .666 seconds. To ensure that the freshest data is added to the historical data log, enter an odd number greater than 1 and less than 10.

**(E) Log To.** Allows you to specify where to log the file.

If you're using PAC Display Basic, clicking this button opens the Historical Log File Configuration dialog box. (See ["Defining the Historical Data Log File" on page 221](#).)



**(Pro only)** If you're using PAC Display Pro, clicking this button prompts you to select one of the following:

- **Log File**

Click to specify the directory where the historical data log file should be saved, the file name and format, and, if applicable, the rollover parameters for the file. See ["Defining the Historical Data Log File" on page 221](#) for more information.

- **Log to Database**

Click to configure a table for logging SuperTrend data. See ["Saving a SuperTrend to a Database" on page 208](#).

**(F) Historical Log Points.** This list shows all configured historical log points for this log file. The order of the points in the list (top to bottom) is the order in which the points will be logged. To change the order of the list, select a point, and then choose one of the Move buttons in **J**.

**(G) Append.** Click to add a historical log point to the end of the historical log point list **(E)**. See ["Configuring a Historical Log Point" on page 228](#) for more information.

**(H) Insert.** Click to insert a historical log point above a highlighted historical log point.

**(I) Modify.** Lets you modify the highlighted historical log point.

**(J) Delete.** Deletes the highlighted historical log point from the list **(E)**.

**(K) Move Up/Down.** Highlight the log point you want to move, and then click Move Up or Move Down to change the position of the point in the historical log point list.

**(L) Start Trigger.** Using a start trigger is optional. Click to configure the PAC Control tag that will start scanning the listed historical log points. Check the Enabled box to make the start trigger active. See ["Configuring a Start or Stop Trigger" on page 228](#) for more information.

Since the start trigger can be activated only from a non-triggered state, you must also configure a stop trigger at **L** or a number of scan times at **M**.

**(M) Stop Trigger.** Click to configure the PAC Control tag that will stop scanning the listed historical log points. Check the Enabled box to make the stop trigger active. A stop trigger is required only when you have configured a start trigger. Additionally, a stop trigger is edge-sensitive and only activates on a false-to-true state transition. See ["Configuring a Start or Stop Trigger" on page 228](#) for more information on setting up a stop trigger.

**(N) Number of Samples.** Another way to stop scanning the historical log points is to set the number of samples, or times the points are scanned. Select Number of Samples, and then enter a discrete number of samples to take once the start trigger occurs.

**(O) Notification.** Click this button to assign a value to a tag when historical log sampling has stopped. Check the Enabled box to make notification active. See ["Notification When a Trigger Has Stopped" on page 229](#) for more information.

**(P) OK.** Click OK to save your settings and close the dialog box.

Now we'll look at the additional steps needed to complete the settings in the Historical Log Configuration dialog box.

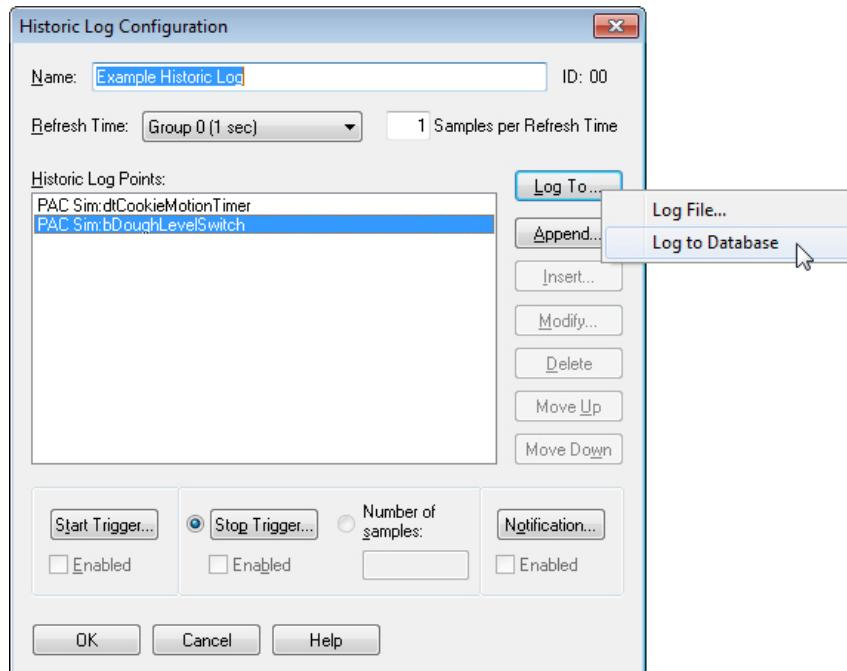
## Logging Historical Data to a Database

**Pro**

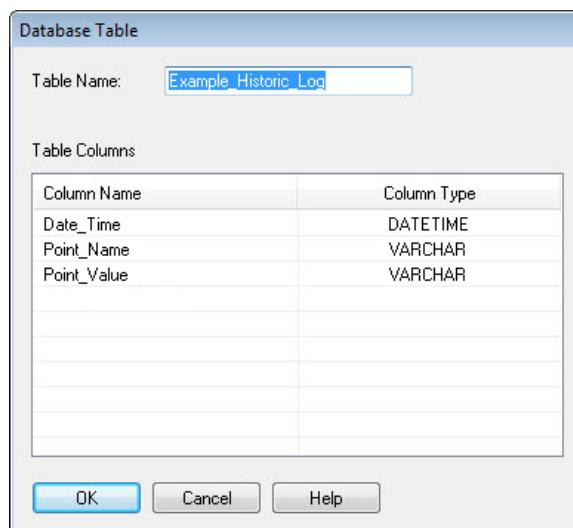
**(Pro only)** If you have configured an ODBC-compliant database (such as Microsoft SQL Server, MySQL, or Microsoft Access), you can also log historical data to a database. For information about configuring ODBC data sources, see [page 55](#). Also, see “[Defining the Historical Data Log File](#)” on page [221](#).

To log to a database:

1. Choose Configure > Historical Data Log.
2. Click the Add button to display the Historical Log Configuration dialog box.
3. Click the Log To button and then choose Log to Database from the popup menu.



If there is a database configured, a dialog shows the default settings for the table that will be created and logged to.

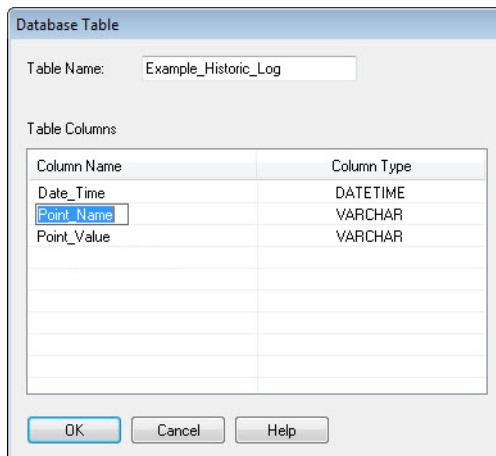


No matter what the point names are, they appear under the Point\_Name column, and the values appear under the Point\_Value column. The Point\_Value column is always a string representation of the value. So if the point is a FLOAT (for example, temperature) the Point\_Value might show 78.4, but this is not a FLOAT. It is the literal string "78.4". Any queries performed against this table will need to convert the string to a float (if needed).

4. If desired, modify the table name or the column names.

Modify a column name as follows:

- a. Click the name to highlight the row.
- b. Click the name once again to make it editable.



- c. Type a new name, and then press Enter.
- d. Click OK to confirm your changes and close the dialog box.

#### NOTES

- *Table and column names may not contain the following characters: (space) [] :*
- *Column names cannot begin with a SQL reserved word for that database type.*  
*Examples: INTEGER, VALUE, BACKUP, CURRENT\_DATE*

#### Changing the Database Table Name

When you create or modify a table for logging historical data in a database, you can change the database table name. However, when some data has been logged in Runtime, if you then change the database table name in Configurator, a message will appear saying that the table already exists.

When the message appears, do one of the following:

- Click Yes to create a new table and start logging to that table.
- Click No to rename the existing table and continue logging to that table.

#### Defining the Historical Data Log File

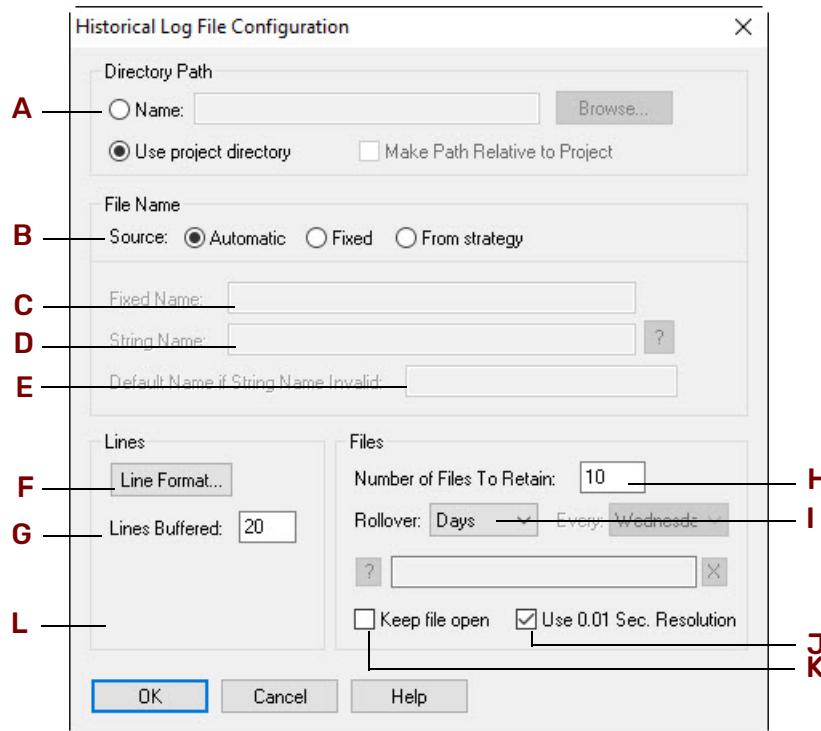
You can name the historical data log file, determine where it will be located, configure how the data lines will appear, and define its rollover parameters in the Historical Log File Configuration dialog box.

Note that a historical data log file is not the same log file used to record data from a SuperTrend. A SuperTrend historical log file contains different data about log points, and is configured separately from a historical data log file. See "["SuperTrend Historical Log Files" on page 200](#)" for more information. Alarm log files, which contain data about alarms that have been triggered, are also different from Historical data log files. See "["Alarm Logging Options" on page 284](#)" for more information.

## HISTORICAL DATA LOGS

If you want to save data from more than one control engine, you should create a separate historical data log file for each control engine that will be monitored. If data from multiple control engines is saved in the same historical data log file, it is difficult to identify data that corresponds to a specific control engine.

To define a historical data log file, click the Log To button in the Historical Log Configuration dialog box and enter information in the Historical Log File Configuration dialog box that appears.



**(A) Name.** Choose the directory where the historical data log file will be saved. Click Name and enter the directory path in the field next to it, or click Browse to find a directory path.

Click Use Project Directory to save the historical data log file to the PAC Display project directory. (This occurs by default if you don't specify a location.)

Select Make Path Relative to Project to save the files to a folder *relative* to the folder that the project is in. If you then save the project to a different folder (or even to a different computer), PAC Display will save the files to the relative path.

For example, if the project is saved in C:\proj\ and you configure the files to be saved in C:\proj\logs\, then the relative path would be this: .\logs\

If you then saved the project to C:\temp\newproj\, the files would be saved to the new location's relative path: C:\temp\newproj\logs\

**(B) Source.** Select Automatic, Fixed, or From strategy to determine how the historical data log file name will be created, and then fill in additional information as needed for that option.

If the Automatic option is used, historical data log files are named based on internal naming rules described in "Naming Historical Data Log Files" on page 230. If rollover is not used, the file is named "HISTLOG.H####," where #### is the four-digit historical data log ID number. The Automatic option is used by default if you do not select another option.

**(C) Fixed Name.** If you selected the Fixed option in **B**, enter a file name here. The file name can be any valid, eight-character DOS file name and doesn't require a three-character file extension. Note that if you don't specify an extension, one is *not* added automatically.

You must configure and enable a Start Trigger for this type of file (see [page 228](#)). When the trigger starts the historical data log, the new data is appended to the file if the file already exists. If the file doesn't already exist, it is created. The rollover naming convention doesn't apply to this type of file name.

**(D) String Name.** If you selected the From strategy string option, enter a PAC Control string tagname here. Use the Tag Selection button  to quickly enter the tag containing the name of the historical data log file. You must configure and enable a Start Trigger for this type of file (see [page 228](#)). When the trigger starts the historical data log, the string containing the file name is read, and the new data is appended to the log file if the file already exists. If the file doesn't already exist, it is created. The rollover naming convention doesn't apply to this type of file name.

If the string name in **D** is an invalid file name, the default name of the log file is created using the following rules:

- If the string is empty, the project directory is added to the Default Name (**E**) and the extension is an uppercase "H" followed by the historical data log ID number.
- If the string is not empty and a project directory is not specified as the directory path, the Name in **A** is added to the Default Name (**E**).
- If the project directory is specified as the path, or the previous step failed, the project directory is added to the Default Name (**E**) and the extension is an uppercase "H" followed by the historical data log ID number. If the project directory is read-only or there is not enough room left on the drive containing the project directory, an error message indicates the file could not be created.

**(E) Default Name.** Enter a default file name in **E** in case the file name in String Name (**D**) is invalid. The file name can be any valid, eight-character DOS file name. The five-character file extension is assigned by PAC Display, and will start with an uppercase "H" followed by the historical data log's ID (for example: .H0000, if the ID is 0000).

**(F) Line Format.** Click to configure the character, or delimiter, used to separate the data in the log file, to choose the type of quotes used for each data line, and where to insert carriage returns. You configure these parameters in the Line Format dialog box that appears. See [page 230](#) for more information.

**(G) Lines Buffered.** Enter the number of lines of data your PC will save to a memory buffer before writing the information to the historical data log file. When choosing a number, keep in mind that the lower the number of buffered data lines, the more frequently the computer has to write to the file. Alternately, the higher the number of data lines buffered in memory, the more data that will be lost if your PC loses power or has a system failure. A valid entry is any number between 0 and 999; the default is 20 lines.

**(H) Number of Files to Retain.** Enter the maximum number of historical data log files that can be created using rollover before the oldest file is overwritten. For example, if you enter 10 and your rollover time period is set to hours, you will have 10 historical data log files created for 10 hours of data before the oldest file is overwritten with new data. See [page 230](#) for more information on rollover settings.

**(I) Rollover.** Choose the rollover time period here. Select None to have all logged data placed in a single data file named HISTLOG.H####, where #### is the ID number assigned to the historical data log. If you select Weeks, also select the day of the week to have the files rollover. Logging begins when the PAC Display project is loaded, and data collected will be appended to the existing data file. The size of the file is limited only by available disk space.

To use the Trigger option, see [page 227](#). Logging begins when the Start Trigger is activated, and data collected is appended to the existing data file. For more information about rollover files, see "[Naming Historical Data Log Files](#)" on [page 230](#).

**(J) Use 0.01 Sec Resolution.** Select this option to log the time in hundredths of a second.

**(K) Keep File Open.** Select Keep file open to leave the log file open to allow data to be appended to the historical data log file more quickly. If you leave this box unchecked (the default setting), the file is closed after each time data is written to it. This provides greater data integrity than leaving the file open.

**(L) OK.** Click OK to save your settings and close the dialog box.

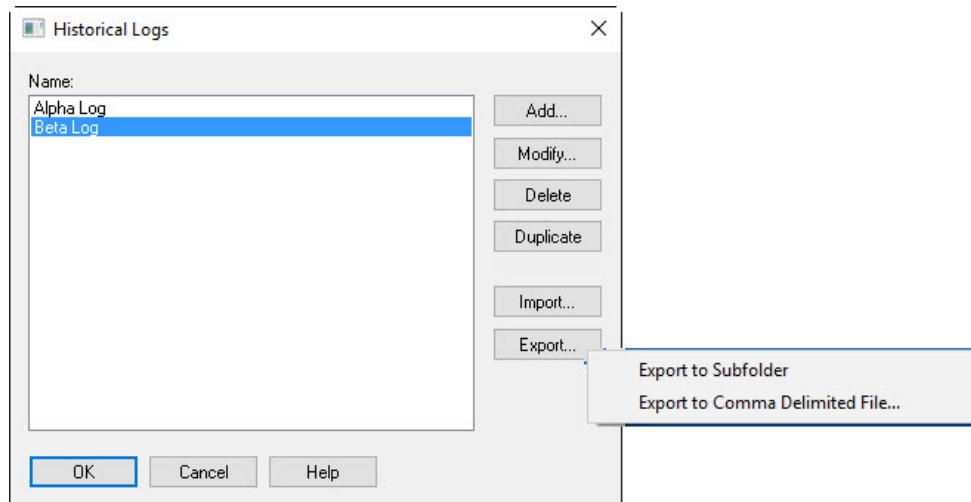
### Exporting Historical Data Logs to Binary or Comma-Delimited Files

You can export the historical data logs from your project to either a binary file or a comma-delimited file, and then import the file into another project. Both projects must refer to the same tag database(s) for the historical data logs that are to be imported. The database may be a PAC Control, ioControl (**Pro only**), or OptoControl tag database file.

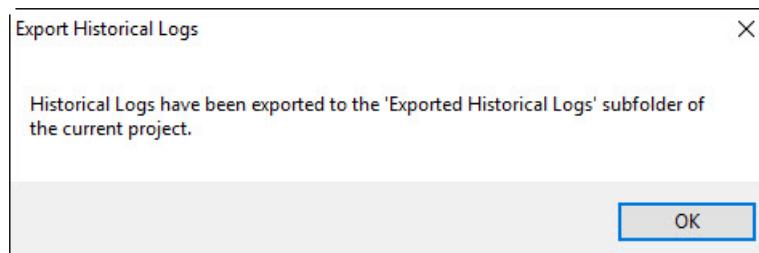
If you want to export and import historical data logs quickly, use a binary file (the Export to Subfolder command) to export and import historical data logs. However, if you want to use a spreadsheet program (such as Excel) to view, edit, or create the attributes of the historical data logs before importing them into another project, use a comma-delimited file.

To export one or more historical data logs to a file:

1. In Configurator, choose Configure > Historical Data Log to display the Historical Logs dialog box.
2. Select one or more historical data logs from the list.
3. Click Export, and then choose from the pop-up menu either Export to Subfolder (for a binary file) or Export to Comma-Delimited File.



A message confirms success.



Each historical data log is automatically exported in a separate file to the Exported Historical Logs subfolder of the current project.

Comma-delimited files have the format:

<Name of historical data log>.csv

Binary files have the format:

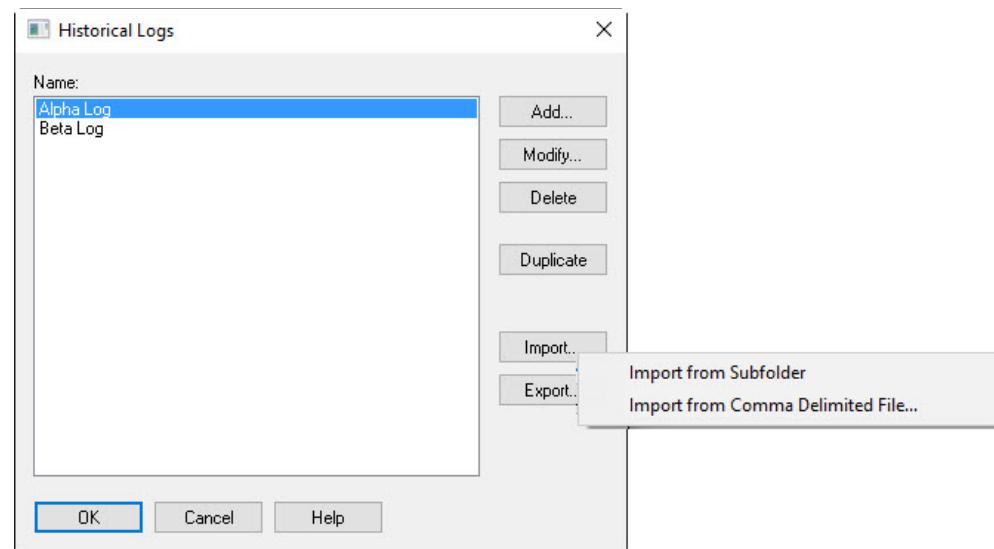
<Name of historical data log>.hle

To import the alarm points into another project, see the next section, “[Importing Historical Data Logs](#).”

## Importing Historical Data Logs

Historical data logs may be imported from one project into another project that both refer to the same tag database. Before importing, you must export the historical data logs to a file as described in “[Exporting Historical Data Logs to Binary or Comma-Delimited Files](#)” on page 224.

1. In Configurator, choose Configure > Historical Data Log to open the Historical Logs dialog box.
2. Click the Import button.
3. Select either Import from Subfolder (for a binary file) or Import from Comma-Delimited File from the pop-up menu.



An Import Historical Log dialog box opens for you to navigate to the folder containing the file.

4. Select the file (either .hle or .csv) to import.
5. Click Open. The files are imported and added to the list.
6. Click OK to confirm.

*NOTE: If there are errors during the import, PAC Display displays a message indicating the error. The import fails at the first error. PAC Display makes no attempt to guess what the intended field should contain nor does it try to correct the error or present possible solutions. If an error is encountered, check the contents of each field with the table in “[Exported CSV File Format](#).” The table details the possible values for the fields.*

## Structure of Historical Data Log Comma-Delimited File

The structure of the comma-delimited file for historical data logs is described below. The length of the data will be a minimum of 58 fields, plus an additional 14 fields for each historical log point configured.

**Tag Definition Format.** The following table describes a single Tag definition in the comma-delimited file. There are ten fields, all of which are required for tags that are configured.

If tags are *not* configured, *only the first three* fields may be blank. The remaining fields (4-10) *must* have the default values indicated. See “[Tag Definition Format](#)” on page 263.

**Notification Definition Format.** This table describes the definition for the notifications. There are a total of 13 fields per notification. See “[Notification Definition Format](#)” on page 264.

*NOTE: If notifications are not configured for an alarm point, the seven required tag fields (fields 4-10 in the previous table) are still required.*

**Exported CSV File Format.** This table shows the format of an exported comma-delimited (.csv) historical data log file.

Field	Description	Values
1	Historical Log Name	Name of the historical data log
2	Refresh Time Group	Refresh group for the historical data log
<b>Entries 3-28 are the Log File Settings:</b>		
3	Log Path	Path to file location if not project directory; otherwise blank
4	Rollover	Index of rollover drop-down menu
5	Lines Buffered	# lines buffered
6	Keep File Open	0=unchecked; 1=checked
7	Max Files	Maximum # of files to keep
8	Delimiter	ASCII value of delimiter character
9	QuoteType	Index of “Quotes around strings” drop-down menu
10	UseCREvery	1 = checked; 0 = not checked
11	Nth Element	Value of the “carriage return every [value] elements” entry
12	Add Space	Value of “Include space after delimiter”; 0=not checked; 1=checked
13	Use Project Dir	0=false; 1=true
14	File Source	0=Automatic; 1=Fixed; 2=From Strategy
15	Fixed Name	User defined fixed name of file (if “File Source” = 1)
16	Default if Bad	Default Name if “Name from Strategy” String is invalid (i.e., File Source = 2)
17	Weekday	0=Sunday; 6=Saturday
18	Use.01	Value of “Use.01 sec resolution” option; 0=false; 1=true
19-28	Strategy tag for file name	See Tag Definition Format table
<b>The following fields are for each historical log point configured:</b>		
1-10	Tag to be logged	See Tag Definition Format table
11	Name	User defined name
12	FloatResolution	Floating point resolution
13	reserved	Do not edit this value

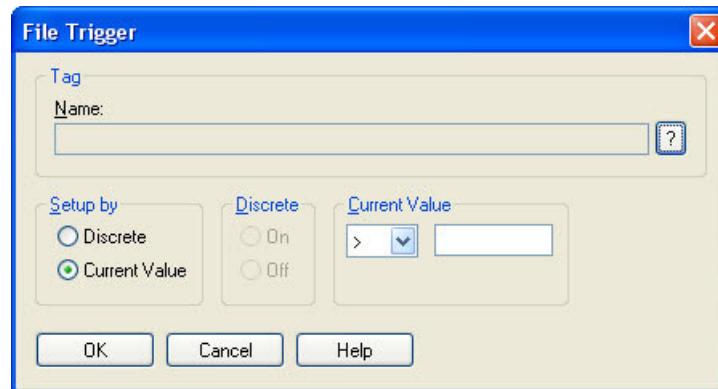
Field	Description	Values
14	LogFormat	Integer64 display format 0=decimal; 1=hexadecimal; 2=binary
<b>After the Historical Log Point information is the Trigger information:</b>		
1-10	Start Trigger Tag	See Tag Definition Format table
11	Value	The value that the start trigger is tested against (if not using a Discrete test)
12	Condition	0: > 1: = 2: < 3: >= 4: <= 5: not=
13	SetupType	0=Discrete; 1=Value
14	DiscreteCond	0=On; 1=Off
15	Enabled	0=no; 1=yes
16	StopT	Stop trigger type 0=from tag; 1= number of samples
17	NumSamples	Number of samples collected if no stop trigger
<b>After the Trigger information is the Notification information:</b>		
1-13	Notification	See Notification Definition Format table

### Using the Rollover Trigger Option

When configuring a historical data log or a SuperTrend log, in addition to the time frame rollovers (such as Hours, Days, Weeks, etc.), you can configure the files to rollover based on a user-defined trigger.

To use a tag to trigger a rollover:

1. Open the Historical Log File Configuration dialog box (see “Defining the Historical Data Log File” on page 221).
2. In the Files group, select Trigger from the combo box next to Rollover.
3. Click the question mark  to open the File Trigger dialog box.



4. Use either Quick Tag Entry (see page 74) or the Tag Selection dialog box (see page 75) to choose a tag to trigger the rollover.

5. In the Setup by area, select Discrete or Current Value.

**Discrete** triggers the rollover based on the tag's on or off state (which you choose in the Discrete area). **Current Value** allows you to choose the tag value that triggers the rollover. To configure the value, select an operator in the Current Value drop-down list, and then enter the trigger value. When the tag's current value meets the configured conditions, PAC Display creates the rollover file.

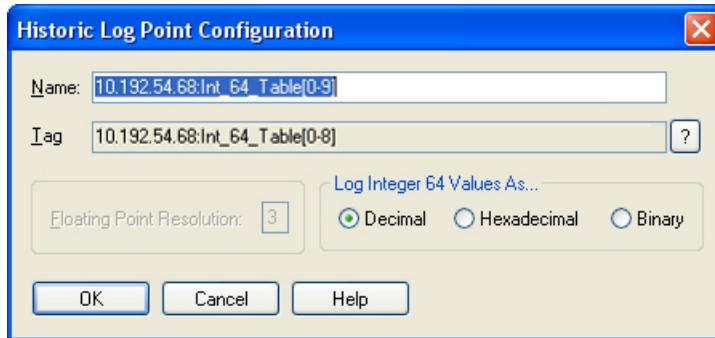
### Configuring a Historical Log Point

This dialog box allows you to select tags whose values are recorded to the historical data log file during runtime.

*IMPORTANT: Although you can select tags from different control engines that have been configured for your PAC Display project, it is not recommended to do so. To save data from more than one control engine in a historical data log file, create a separate historical data log file for each control engine that will be monitored.*

1. To add or change a historical log point in the Historical Log Configuration dialog box, click Append or Insert to add a point, or click Modify to change a point.

The Historical Log Point Configuration dialog box appears.

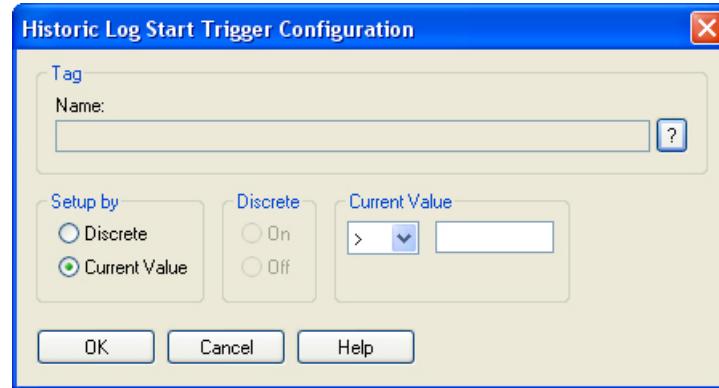


2. (Optional) Enter a user-defined name for the historical log point.
  3. Click the Tag Selection button and select a PAC Control tag to be a historical log point. See "Configuring Tags" on page 74 for more information about selecting tags.
- NOTE: When creating log tables using table variables, the number of elements can be modified in the Tag Selection dialog box. The maximum number of elements in a log table is 1 million.*
4. (Optional) If you picked a float tag type, enter a number in the Floating Point Resolution box to specify how many places to the right of the decimal point are recorded for floating point numbers.
  5. (Optional) If you picked an Integer 64 tag type, select the format: Decimal, Hexadecimal, or Binary.
  6. Click OK to save your settings and close the dialog box.

### Configuring a Start or Stop Trigger

1. To configure which tag and value will start or stop historical logging, click Start Trigger or Stop Trigger in the Historical Log Configuration dialog box.

The Historical Log Configuration dialog box for either Start Triggers or Stop Triggers appears. These dialog boxes are identical. (The Historical Log Start Trigger Configuration dialog box is shown below.)

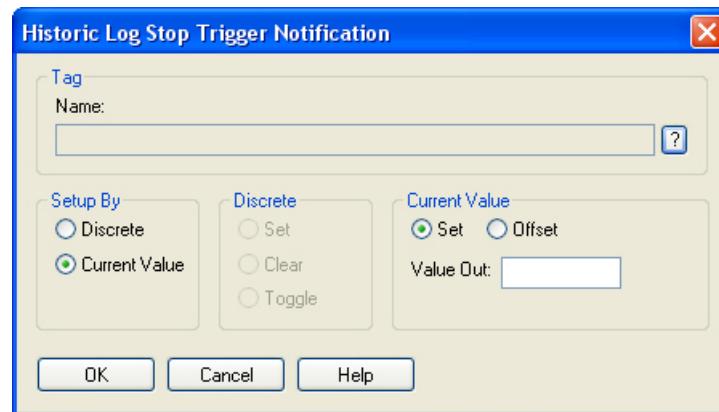


2. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag to be a Start or Stop Trigger.
3. Select Discrete or Current Value in the Setup By group.  
Discrete makes the tag's on or off state trigger the log. Current Value sets the tag value that will trigger the log. To set a Current Value, select an operator in the drop-down menu, and then enter a value to compare the tag to.

### Notification When a Trigger Has Stopped

When logging has stopped, you can set a tag to a given state or value. This tag setting will act as a flag to indicate data isn't being added to the log file anymore.

1. In the Historical Log Configuration dialog box, click Notification to open the Historical Log Stop Trigger Notification dialog box.



2. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.
3. In the Setup By group, select Discrete or Current Value.

**Discrete.** Select the Discrete option to specify an on/off trigger state for tags that have a discrete base type. Once Discrete is selected, choose one of the following options to define the desired trigger state.

- **Set:** Switches the trigger state to On.
- **Clear:** Switches the trigger state to Off.

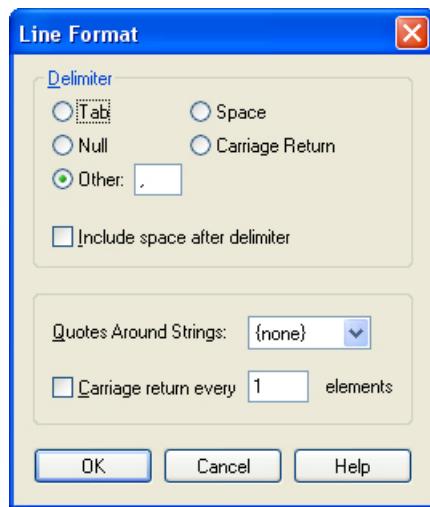
- **Toggle:** Switches the trigger state from its current condition to the opposite (for example, an On setting is switched to Off).

**Current Value.** Select the Value option to define the floating point or integer value written to the specified tag. The specific value is defined using the Set/Offset options and the Value Out field.

- **Set:** Select Set if you want the value used as a replacement for the tag's current value.
- **Offset:** Select Offset if you want the value added to the tag's current value.
- **Value Out:** Enter the floating point or integer value to be written to the specified tag.

### Setting Log File Line Format

1. To define how lines of data are stored in the historical and log file, click Line Format in the Historical Log File Configuration dialog box. The Line Format dialog box appears.



2. In the Line Format dialog box, select from the choices in the Delimiter group a character (delimiter) that will separate data in the log file. To use a delimiter that's not listed, choose Other and enter the character you want to use. Select Include space after delimiter to put a space after each delimiter.
3. From the choices in the drop-down list "Quotes Around Strings," select the quotes that will appear around each string in the log file.
4. To insert a carriage return after a certain number of data elements, select the check box "Carriage return every" and enter the number of data elements.  
The maximum number of elements that can be entered is 99,999. This option is intended for historical logs with very long data lines which are read by programs that cannot handle long data lines. The date and time information at the beginning of a data line are not counted as data elements. See "[Historical Data Log Elements](#)" below for more information about data elements in log files.

### Naming Historical Data Log Files

There are three ways to name a historical data log file: by using a fixed name, by using a PAC Control strategy string tag name, or by using the File Rollover feature (described below) which bases the file name on the date the file was created and a configured *rollover period*. (Note that PAC Display automatically creates files name for SuperTrend historical log files. For details, see [page 202](#).)

### File Rollover

File rollover is used to separate data log files according to configured time periods; when a rollover period ends, the active log file is closed and a new data log file is created. You can configure monthly, weekly, daily, and hourly rollover periods; you can even configure logs to be created when a PAC Control strategy tag's value matches configured conditions. You can also choose a "None" rollover period, in which case all data is stored in a single file.

#### Key

yyyy = four-digit year  
 yy = 2-digit year  
 mm = month  
 pp = day that the file was started (applicable only to weekly rollovers)  
 dd = day  
 hh = hour (0–23)  
 MM\_SS = minutes and seconds  
 .H = file extension prefix for a historical data log  
 .T = file extension prefix for a SuperTrend historical data log  
 ##### = an internal ID number for the historical data log or SuperTrend.

Rollover period	Naming Format
Monthly	RMyymm.H##### RMyymm.T#####
Weekly	RWyymmpp.H##### RWyymmpp.T#####
Daily	RDyymmd.H##### RDyymdd.T#####
Hourly	RHyyy_mmddhh.H##### RHyyy_mmddhh.T#####
Trigger	RT_yy_mm_dd_hh_MM_SS.H##### RT_yy_mm_dd_hh_MM_SS.T#####
None	HISTLOG.H##### STREND.T#####

#### When Are Rollover Files Created?

When you enable data file logging in your PAC Display project, logging begins when the project is loaded—or, in the case of trigger-based logging, when a configured start trigger occurs.

For historical data logs, logging continues until either a specific number of samples has been collected, or a tag's value matches the conditions of a configured stop trigger. (Note that SuperTrend historical log files stop when Runtime is stopped.) You can also use the Notification feature to configure a flag to write a value to a tag when logging stops (see “[Notification When a Trigger Has Stopped](#)” on page 229).

**Hours.** If you select Hours, a new data file is created at the top of every hour. For example, if data logging begins at 8:30 a.m., the first data file will contain data from 8:30 a.m. through 8:59:59 a.m. After that, data files contain one hour's worth of data for every hour thereafter: 9:00 a.m. through 9:59:59 a.m.; 10:00 a.m. through 10:59:59 a.m.; and so forth.

**Days.** Select Days for a new data file to be created at the beginning of every day at 12:00 a.m. For example, if data logging is triggered at 7:00 p.m. on the 5th, the first data file will contain data from 7:00 p.m. through 11:59:59 p.m. on the 5th. After that, data files contain data from 12:00 a.m. through 11:59:59 p.m. on the 6th; 12:00 a.m. through 11:59:59 p.m. on the 7th; and so forth.

**Weeks.** If you select Weeks as the rollover period, logging begins when the project is loaded, and a new data file is created every week at the beginning of the selected day at 12:00 a.m. For example, if data logging starts on a Wednesday and the rollover period is set for every Monday, the first data file will contain data from

Wednesday through 11:59:59 p.m. on Sunday night. After that, the weekly data files contain data from Monday at 12:00 a.m. through Sunday at 11:59:59 p.m.

In the weekly rollover file name, *pp* represents the day that the log file was started. For example, if weekly logging is set to rollover every Saturday, and the project is loaded on Tuesday, October 4, 2016, a log file named RW161004.T0001 is created (assuming 0001 is the SuperTrend's internal ID). The file will contain data collected from Tuesday through 11:59:59 p.m. on Friday night. At 12:00 a.m. on Saturday, October 8, a new file named RW161008.T0001 is created. The new file will contain a week's worth of data, from Saturday, October 08 through 11:59:59 p.m. on Friday, October 14.

**Months.** Select Months for a new data file to be created on the first day of every month at 12:00 a.m. For example, if data logging started on January 27th, the first data file will contain data from the 27th of January through 11:59:59 p.m. on January 31st. After that, data files contain data from 12:00 a.m. on February 1st through the end of February, 12:00 a.m. on March 1st through the end of March, and so forth.

**Trigger-based.** Trigger-based log files are created when the configured tag's value matches the conditions configured in the Historical Log Start Trigger Configuration dialog box (see [page 228](#)).

**None.** If you select None, logging begins when the project is loaded. All logging is done in a single file, and logging continues until the conditions of a configured stop trigger are met. If you don't configure a stop trigger, data logging continues indefinitely. (Note that SuperTrend historical log files stop when Runtime is stopped.)

### Historical Data Log Elements

Historical data logs consist of header lines and data lines.

**Header Line.** The first line of the file, a header line shows the name of each data field. Lines of data samples then follow the header line.

Here's an example:

```
Date,Time,CNTR1:Float.TEMP208,CNTR1:Float.PRES209,CNTR1:Float.LEVEL218
```

**Date** and **Time** show where time stamp information will appear in the data lines.

**CNTR1:TEMP208**, **CNTR1:PRES209**, and **CNTR1:LEVEL218** show that information will be recorded for three PAC Control tags: TEMP208, PRES209, and LEVEL218. These tags are all on the control engine named CNTR1.

**Data Lines.** Data lines follow a header line, and have the following format:

```
Date<delimiter>Time<delimiter>TAG1<delimiter>TAG2...TAG1000<crlf>
```

**Date** is the current system date with the format: YYYY/MM/DD, where YYYY=year, MM=month, DD=day.

**Time** is the current system time with the format: hh:mm:ss, where hh=hour, mm=minute, ss=seconds.

**TAG1...TAG1000** are valid PAC Control tags with the format: control engine\_Name:Item\_Type.Tag.

<delimiter> is any printable ASCII character.

<crlf> is a carriage return, line feed.

Here's an example of what the file might look like:

```
Date,Time,Cookie:Float.TEMP208,Cookie:Float.PRES209,Cookie:Float.LEVEL  
218  
2010/03/01,17:00:00,120.02,14.96,12.09  
2010/03/01,18:00:00,120.06,14.98,12.03
```

2010/03/01, 19:00:00, 120.03, 14.99, 12.02

2010/03/01, 20:00:00, 120.04, 15.01, 12.05

In this sample file, data is being sampled every hour from a control engine named "Cookie," and a temperature (TEMP208), pressure (PRES209), and tank level (LEVEL218) are being recorded.

## LAUNCHING APPLICATIONS

You can use PAC Display to start, or launch, other applications in two ways:

- By configuring a dynamic attribute for a graphic object, and then selecting the object during Runtime. See "[Chapter 7: Using Animated Graphic Objects](#)" on page [139](#) to learn how to do this in PAC Display Configurator.
- By configuring an application manager to associate a tag with an application, and then launching the application using triggers. See "[Configuring an Application Launch](#)" below.

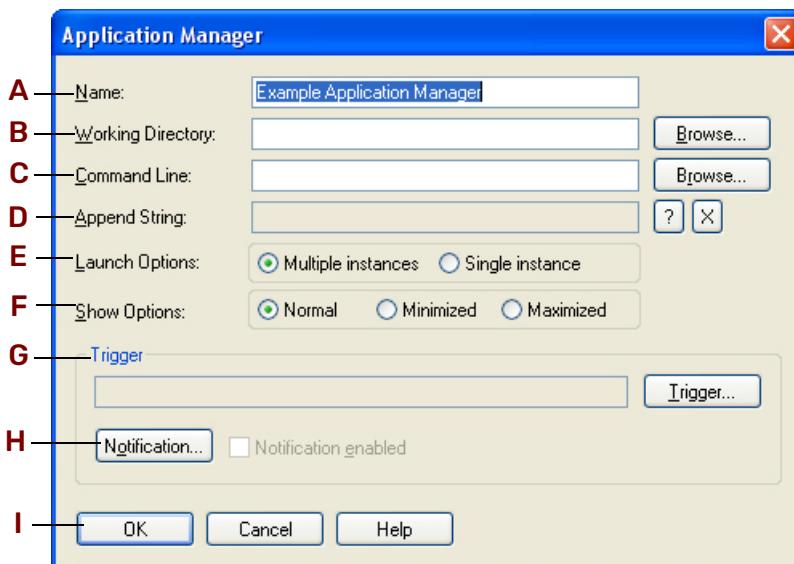
### Configuring an Application Launch

To use PAC Display Configurator to configure an application launch using a trigger, choose Configure > Applications, and in the Application Managers dialog box that appears do the following:

- To create a new application manager, click Add. You can configure up to 1,000 application managers per project.
- To change an existing application manager, highlight it and click Modify.
- To remove an existing application manager, highlight it and click Delete.

If you are creating or changing an application manager, the [Application Manager Dialog Box](#) will open (see below).

**Application Manager Dialog Box**



**(A) Name.** Enter the name of the application manager here. This name refers to this application launch setup, and must be different from all application managers within the project.

**(B) Working Directory.** Enter the path name of the working directory to use after launching the application. If a working directory isn't specified, the current project directory is used. Click Browse to quickly choose a directory path in the Working Directory Selection dialog box (see [page 234](#)).

**(C) Command Line.** Enter the path and file name of the program you want to run when the trigger condition occurs. Click Browse to quickly choose the path and file name in the standard Windows file selection dialog box.

**(D) Append String.** (Optional) Select a string tag from the PAC Control strategy to be appended to the Command Line string in **C**. If the appended string is a command line option, a space must be included in the Command Line string to separate it from the main command line.

Use the Tag Selection button  to select the string tag name. See "[Configuring Tags](#)" on page 74 for more information on tags. Click the Clear button  to quickly remove an entry from **D**.

**(E) Launch Options.** Select Single instance to have PAC Display Runtime check whether the trigger has already launched a session, or instance, of an application. If the trigger hasn't already launched the application, it will be started. Select Multiple instances to let the trigger start any number of sessions of the same application.

The Single Instance option doesn't prevent an application from being launched by other graphic objects and triggers, so multiple instances of an application can still occur. For example, if a trigger launches a Microsoft Word session, it can't launch any other application until this Word session ends. A toggled graphic object or another trigger, however, could launch another session of Word, so two instances of the same application would be running concurrently.

*CAUTION: Running multiple instances of the same application on your PC is not recommended. Just like running several different applications at the same time, running multiple instances of the same application requires additional memory and other system resources. This may slow your PC's performance, as well as that of PAC Display Runtime.*

**(F) Show Options.** Select how the application's window will appear on-screen: Normal, Minimized, or Maximized.

**(G) Trigger.** Click Trigger to select the PAC Control tag used to trigger the application launch. The trigger is edge-sensitive and activates only from a non-triggered state. See "[Selecting a Trigger to Launch an Application](#)" on page 235 for more information.

**(H) Notification.** Click Notification to assign a value to a tag when an application is successfully launched. See "[Notification When an Application Has Been Launched](#)" on page 236 for more information. A check mark in the Notification enabled box indicates a notification tag is configured.

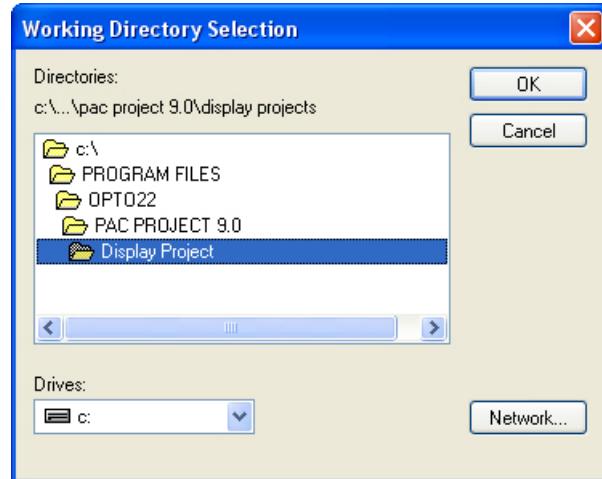
**(I) OK.** Click OK to save your settings and close the dialog box.

Now we'll look at the additional steps needed to complete the settings in the Application Manager dialog box.

#### Selecting a Working Directory for a Launched Application

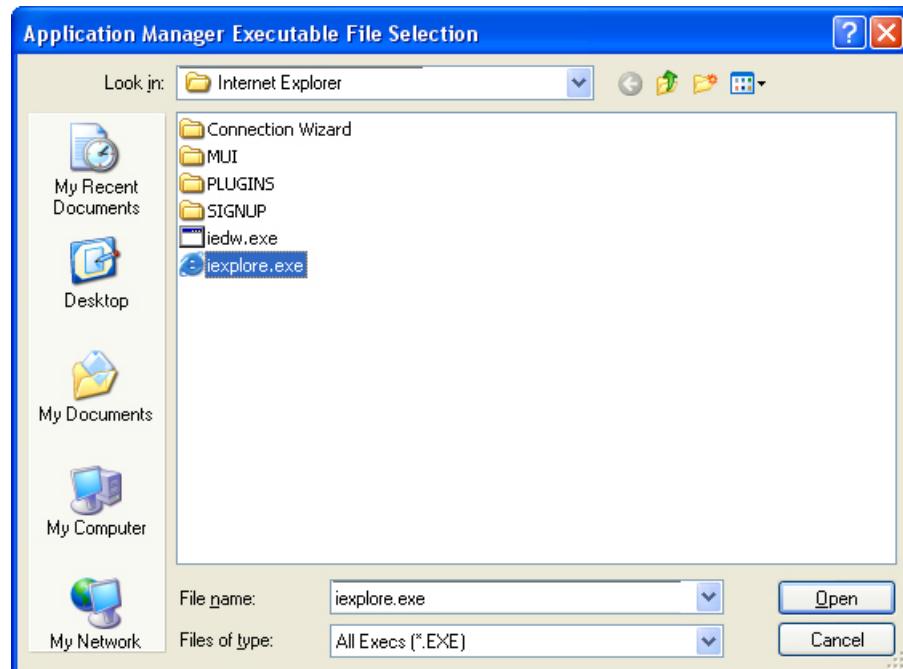
- To set up the working directory the launched application should use, click Browse in the Application Manager dialog box.

2. In the Working Directory Selection dialog box that appears, navigate to the working directory path and click OK. (Click Network to select a network drive.)



#### Selecting the Application File to Run

1. To choose the application you want to run, in the Application Manager dialog box click the Browse button next to the Command Line field.
2. In the Application Manager Executable File Selection dialog box that appears, navigate to the application you'd like to run, highlight it, and click OK.

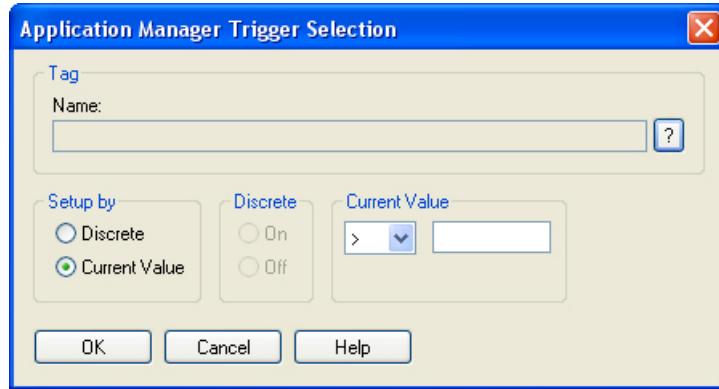


#### Selecting a Trigger to Launch an Application

1. To select the trigger that will launch an application, click Trigger in the Application Manager dialog box.

## SOUNDS

The Application Manager Trigger Selection dialog box appears.

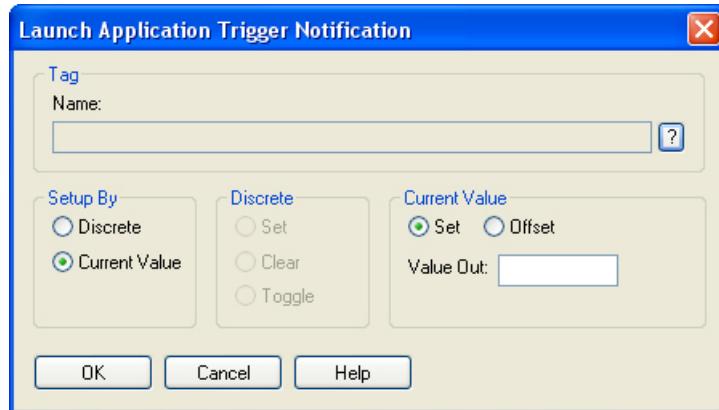


2. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to choose a tag to trigger the application launch.
3. Select Discrete or Current value in the Setup by group.  
Discrete makes the tag's on or off state trigger the application. Current Value sets the tag value that will trigger the application. To enter a value in the Current Value field, select an operator in the drop-down menu, and then enter a value to compare the tag to.

### Notification When an Application Has Been Launched

You can set a tag to a given state or value when an application has been successfully launched by a trigger.

1. In the Application Manager dialog box, click Notification to open the Launch Application Trigger Notification dialog box.



2. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag as the flag to indicate the application was launched successfully.
3. Select Set or Offset, and then enter the value that will be sent to the tag in the Value Out field. Choose Set to replace the tag's current value with the number in the Value Out field. Choose Offset to add that number to the tag's current value.

## SOUNDS

Sounds can provide important feedback, such as alerts or warnings, for the operator using your PAC Display project. You can add sounds to your PAC Display project by configuring triggers to start and stop standard

Windows sound files. To use this capability, the PC running the project must have a properly configured sound card and corresponding system software, as well as a set of speakers. You can use both digitized sound (.WAV) and MIDI music (.MID) files in your project.

Sounds can also be used with project alarms. See [page 287](#) for more information.

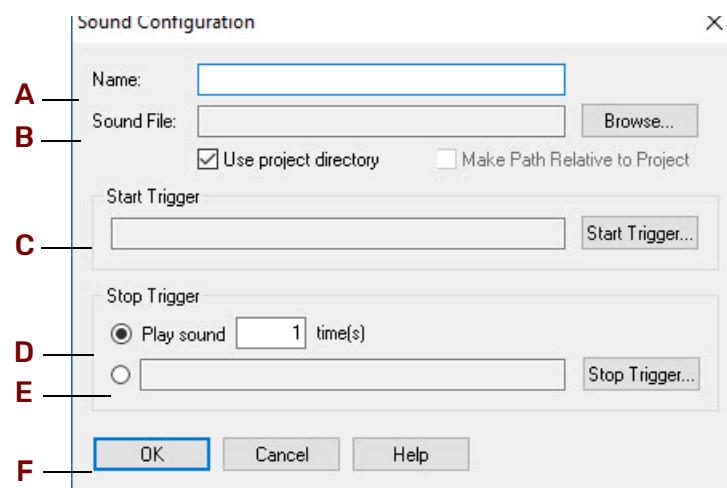
## Configuring a Sound

To configure a sound, choose **Configure > Sounds**. The Sounds dialog box that appears lists all of the sound events that are configured for the current PAC Display project.

- Click **Add** to add a new sound event. You can configure up to 1,000 sound events per project.
- Highlight an existing sound event and click **Modify** to change it.
- Highlight an existing sound event and click **Delete** to remove it.

*NOTE: If there are no sound events in the project, the Modify and Delete buttons cannot be selected.*

If you are creating or changing a sound event, the Sound Configuration dialog box will appear.



**(A) Name.** Enter a name for the sound event. No two sound events in a project may have the same name.

**(B) Sound File.** Click **Browse** and select the sound file you want to play in the standard Windows file selection dialog box that appears. If the **Use project directory** option is checked, you can choose only those sound files located in your project directory.

To use a sound file in a folder *relative* to the folder that the project is in, select **Make Path Relative to Project**. If you then save the project to a different folder (or even to a different computer), PAC Display looks for files in the relative path.

For example, if the project is saved in `C:\proj\` and you configure the file to be in `C:\proj\sounds\`, then the relative path would be this: `.\sounds\`

If you then saved the project to `C:\temp\newproj\`, PAC Display would look for the file in the new location's relative path: `C:\temp\newproj\sounds\`

**(C) Start Trigger.** Click **Start Trigger** to configure a trigger to start playing the sound. See ["Configuring Start and Stop Triggers for Sounds"](#) below to learn how to configure this trigger.

**(D) Play Sound.** Select the Play sound option if you want the sound to play a specific number of times before stopping. Enter the number of times the sound will play in the field next to the option. The default value is one.

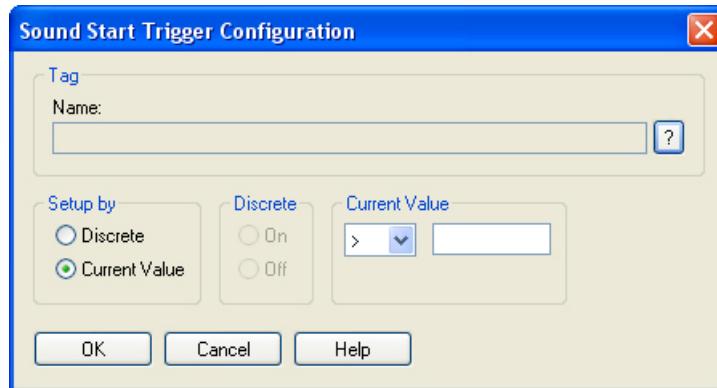
**(E) Stop Trigger.** Click Stop Trigger to configure a trigger to stop the sound that is playing. See “[Configuring Start and Stop Triggers for Sounds](#)” below to learn how to configure this trigger.

**(F) OK.** Click OK to save your settings and close the dialog box.

### Configuring Start and Stop Triggers for Sounds

1. To configure the tag and value that will start or stop a sound, click Start Trigger or Stop Trigger in the Sound Configuration dialog box.

The Sound Trigger Configuration dialog box for either Start Triggers or Stop Triggers appears. These dialog boxes are identical. (The Sound Start Trigger Configuration dialog box is shown below.)



2. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to choose a tag from the Tag Selection dialog box.
3. Select Discrete or Current Value in the Setup by group. Current value sets the tag value that will trigger the sound. Select an operator in the drop-down menu, and then enter a value to compare the tag to. Discrete makes the tag's on or off state trigger the sound.

## CONFIGURING TRIGGER-BASED WINDOW STATES

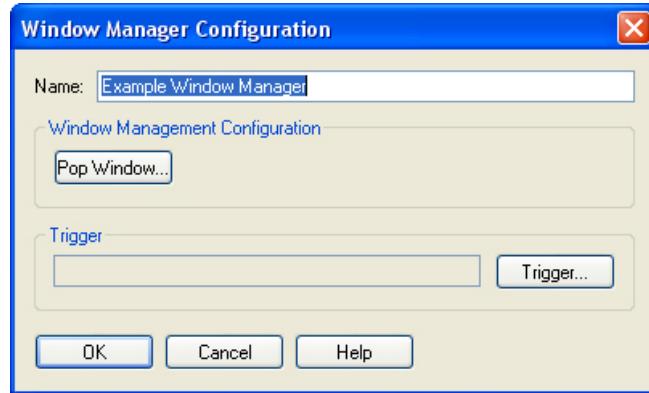
You can use a trigger to modify the appearance of windows that appear in Runtime. Changing the appearance of windows can be effective when you want to immediately attract an operator’s attention, or to prompt operators to take the next action.

To configure a window state, choose Configure > Window State, and in the Window Managers dialog box that appears.

- Click **Add** to add a new window manager. You can configure up to 1,000 window managers per project.
- Highlight an existing window manager and click **Modify** to change it.
- Highlight an existing window manager and click **Delete** to remove it.

If you are creating or changing a window manager, the Window Manager Configuration dialog box will appear.

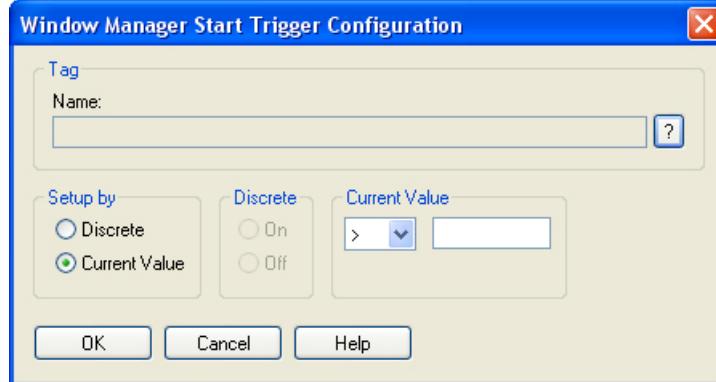
*NOTE: If there are no window manager events in the project, the Modify and Delete buttons cannot be selected.*



To set up a window manager, do the following:

1. Enter the name of the window manager in the Name field.
2. Click Pop Window to configure window states for one or more windows. See "Windows" on page 163 for more information about changing window states.
3. Click Trigger to configure the trigger that will change the window state.

The Window Manager Start Trigger Configuration dialog box appears.



4. Use the Tag Selection button to quickly choose a tag from the Tag Selection dialog box.
5. Select Discrete or Current Value in the Setup By group. Current Value sets the tag value that will trigger the change in window state. Select an operator in the drop-down menu, and then enter a value to compare the tag to. Discrete makes the tag's on or off state trigger the change in window state.

## CONFIGURING RECIPES

Recipes are a way of exchanging data between a control engine and a PC running PAC Display: recipe *download* files send process data and chart control instructions to a control engine; recipe *upload* files create a record of the values currently being used in a strategy table. For example, you can use recipe upload files to save a controller's critical process settings; recipe download files can be used to restore a system's data after a failure, or to make changes to program variables without the need for manual intervention. Recipes are also handy for batch processes when system variables are predetermined and vary between runs or product types. For important information about using a database table as the source for a recipe download, see [page 240](#).

Recipes can be configured to perform their specified actions by:

- **Animated Graphic**—The recipe action happens when an operator selects a graphic object.
- **Trigger**—The recipe action occurs when a tag value meets a defined value.

In PAC Display Basic, recipes are ASCII text files. In PAC Display Professional, recipes can be ASCII text files or they can be a configured database table and columns. (To configure a database for use with PAC Display Professional, see ["Configuring an ODBC Data Source" on page 55](#).)

The basic steps to using recipes are:

1. Configure a recipe file that identifies the PAC Control strategy, control engine, and data you want to send or receive.
  - To configure a recipe download file that copies data down to a controller, see ["Creating a Recipe Download File" on page 241](#).
  - To configure a recipe upload file that sends data to an ASCII recipe file or **(Pro only)** to a database, see ["Creating a Recipe Upload Template" on page 243](#).
2. Activate the recipe so that the controller can send or receive data.
  - To activate the recipe by using an animated graphic object, see ["Download Recipe" on page 142](#) and ["Upload Recipe" on page 158](#).
  - To activate the recipe by using a trigger, see ["Configuring a Recipe Upload" on page 252](#) and ["Configuring a Recipe Download" on page 255](#).

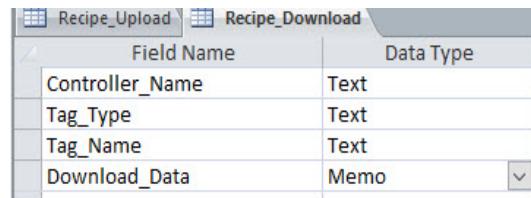
## Using a Database Table as the Source for a Recipe Download

If you're going to use a database to store data for recipe downloads, you'll need a database table with the following columns in the order specified below. PAC Display doesn't accept spaces or reserved words in column names. (In database languages such as SQL, reserved words are programming commands; examples include Alter, Delete, Rename, Update, and Stop.) Otherwise, the column name doesn't matter; what's important is that the columns contain the data in the order shown.

Column Position	Data Type	Contains
1	String	Controller name or IP address
2	String	Tag type
3	String	Tag name
4	String	Indexes and values for each element to be downloaded <b>IMPORTANT:</b> A space character must precede the first index bracket.

This table structure ensures that PAC Display gets the data it needs to successfully process the downloaded recipe.

### Example: Microsoft Access table structure



Recipe_Upload		Recipe_Download	
Field Name	Data Type	Field Name	Data Type
Controller_Name	Text		
Tag_Type	Text		
Tag_Name	Text		
Download_Data	Memo		

### Example: Space characters must precede download data

A space must precede the *first* bracket in each set of download recipe data.

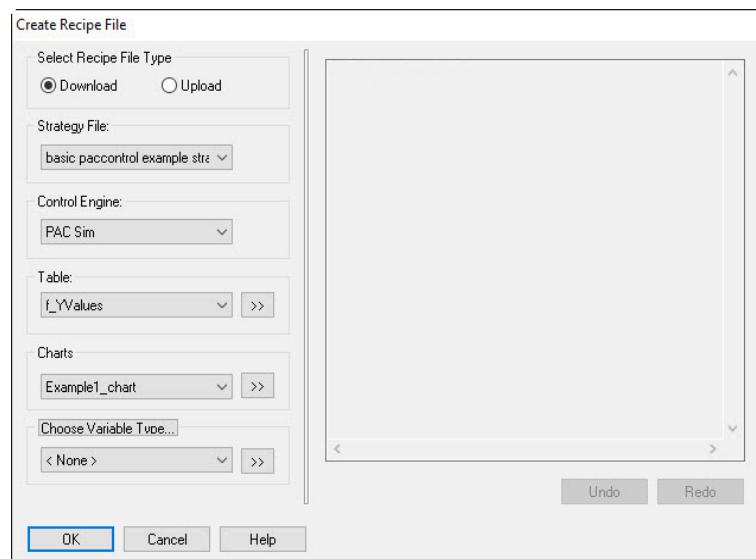
Controller_Name	Tag_Type	Tag_Name	Download_Data
10.192.54.68	Integer Table	Int_5_Elements	[0]12345[1]23456[2]34567[3]45678[4]56789
10.192.54.68	Integer Table	SuperLongX	[0]12345[1]0[2]0[3]0[4]0[5]0[6]0[7]0[8]0[9]0[10]0
*			

### Creating a Recipe Download File

To create a recipe download file to send data from a recipe to a control engine:

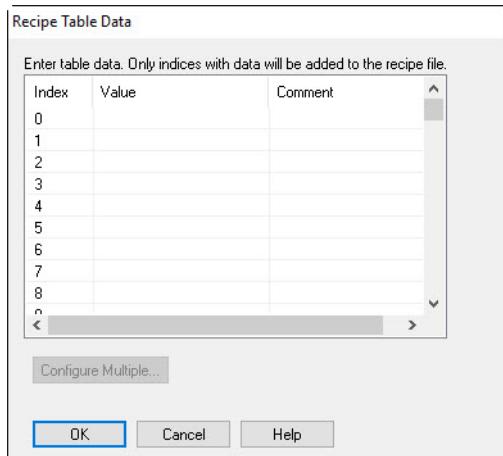
- From PAC Display Configurator's menu bar, click Tools > Create Recipe File.

The Create Recipe File dialog box appears. By default, the recipe file type is Download, and the strategy file is from the current PAC Display project.



- Select the PAC Control strategy and control engine for this recipe file.
- In the Table area, select a table, and then click Add [>>].

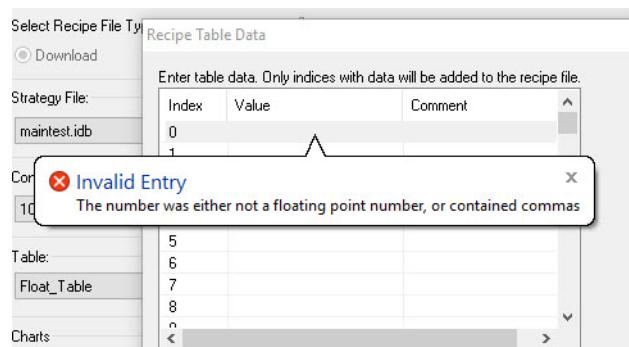
The Recipe Table Data dialog box appears. The Index column lists all the available indexes for the currently selected table.



*NOTE: Using the Create Recipe Dialog, you can enter only one set of indexes for each table in a recipe file. To enter another set of indexes for the table later in the recipe, you must use a text editor to edit the recipe. For details, see "Basic Recipe File Format" on page 246.*

4. Enter values using the following guidelines. PAC Display automatically limits the index value to the maximum configurable index for the selected table.
  - Float Table: Use numeric data only. Spaces, commas or other non-numeric characters are not accepted. A decimal point is not required.
  - Integer Table: Decimal points are not accepted. Spaces, commas or other non-numeric characters are not accepted.
  - String Table: You may use any character except square brackets ([ and ]) which are reserved for marking table indexes and cannot be included in strings. To enter a single string for one index, click in the Value field next to the index number and enter the string.
  - (Integer and Float Tables only) To enter the same value for more than one index, select multiple items using the either the Shift key or the Ctrl key, and then click Configure Multiple. In the dialog box that opens, enter the value and a comment (if any), and click OK.

*NOTE: PAC Display validates your entries and automatically clears invalid data. For example, if you type a string in a float table, your entry is deleted and a message like this is displayed:*



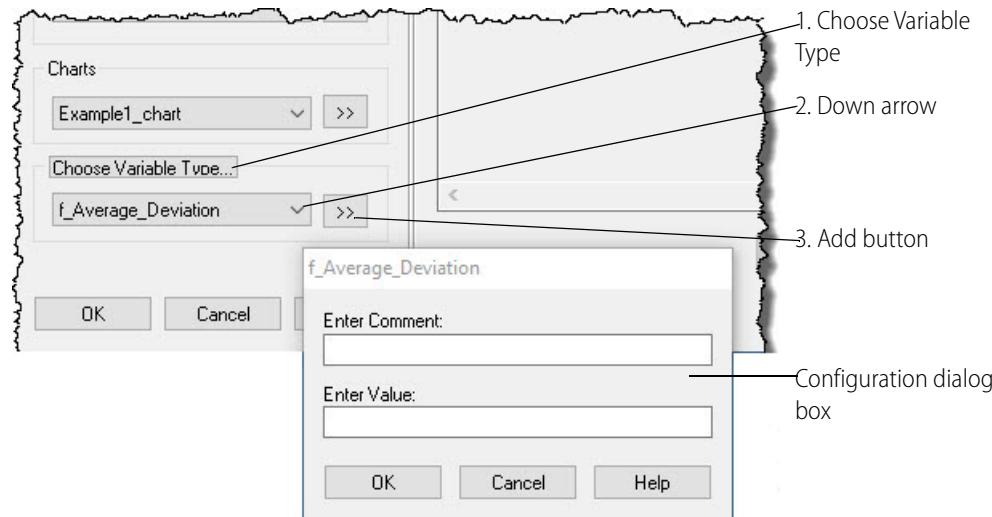
5. In the Charts area, select a chart, and then click the Add button [>>]. The Recipe Chart Action dialog box appears.

- In the Recipe Chart Action dialog box, select a chart action (Start, Stop, Suspend, or Continue) and then click OK.

The action is added to the recipe file, and the dialog box closes.

#### To add an individual integer, float, or string tag:

- Click Choose Variable Type, and then select a type from the pop-up menu.
- Click the down-arrow below Choose Variable Type, and then select a variable.
- Click the Add button  to open a configuration dialog box.



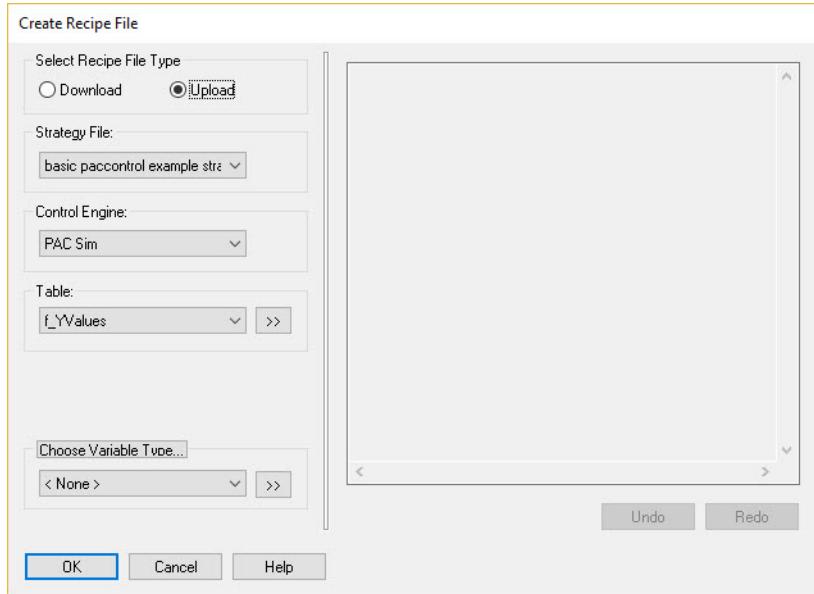
- Enter a value and a comment (if desired), and then click OK.
- If you need to remove the last entry, click Undo. Clicking Undo again removes the next to last entries, and so on. The Redo button restores entries in the same order they were removed.
- Click OK to close the Create Recipe File dialog box and confirm the configuration.  
The Save Recipe File As dialog box opens.
- Type a filename for the file.  
If you want to use an extension other than .RCP or .TXT, place quotation marks around the filename (for example, "My Recipe File.myExt").
- Click Save to save the recipe file and close the dialog box.

#### Creating a Recipe Upload Template

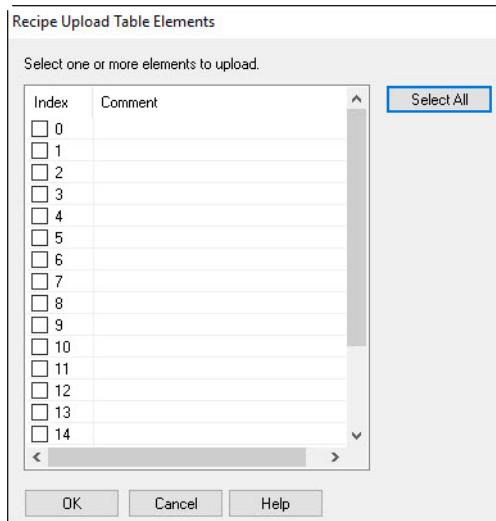
Create a recipe upload template to send data from a strategy table to a recipe file or **(Pro only)** to a database:

- From PAC Display Configurator's menu bar, click Tools > Create Recipe File.  
The Create Recipe File dialog box appears.

2. Select Upload as the file type.

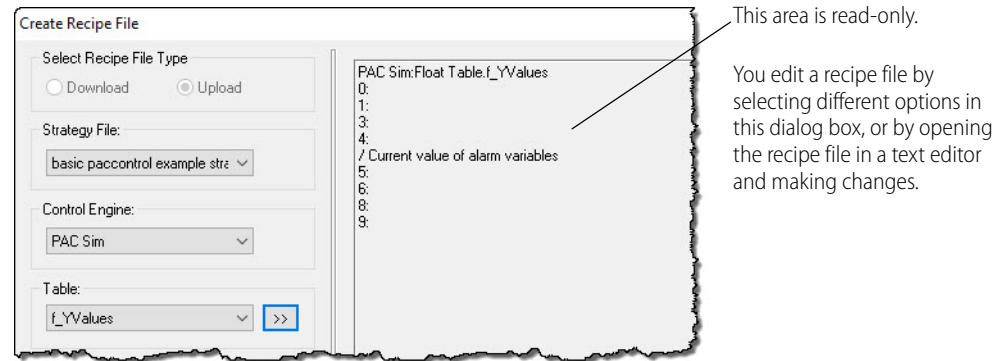


3. Select the PAC Control strategy and control engine for this recipe file.
  4. In the Table area, select a table, and then click the Add button >> .
- The Recipe Upload Table Elements dialog box opens.



- To select or deselect an individual index, click the square next to the Index number. The Select All button selects all table indexes. The Clear All button deselects them.
  - To add a comment, select an index, click in the comment field, and type the comment.
5. Click OK to close the dialog box.

The selected indexes are listed. Comments are displayed above the index number.

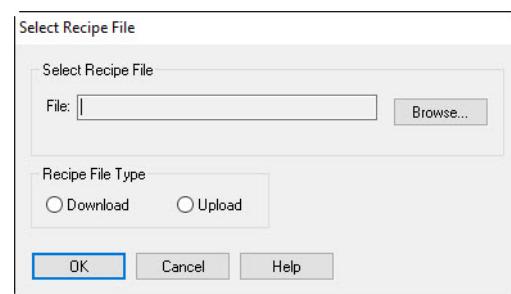


6. If you need to remove the last entries, click Undo. Clicking Undo again removes the next to last entries, and so on. The Redo button restores entries in the same order they were removed.
  7. To add an individual integer, float, or string tag, click Choose Variable Type, and then select a type from the pop-up menu.
    - a. Click the down-arrow, and then select a variable.
    - b. Click the Add button **>>** next to the variable you just selected to add a comment about the variable.
- The Enter Value field is disabled for uploads because the value is obtained from the control engine.
8. Click OK to close the Create Recipe File dialog box and confirm the configuration.
- The Save As dialog box opens.
9. Select the filename and extension for the file.  
If you want to use an extension other than .RCP or .TXT, place quotation marks around the filename (for example, "My Recipe File.myExt").
  10. Click OK, and then click OK again.

## Editing a Recipe Download File

To edit a recipe file:

1. Choose Tools > Edit Recipe File to open the Select Recipe File dialog box.



2. Browse to the file, select the file type, and then click OK.  
The Edit Recipe File dialog box appears.
3. To edit the file, you select different options in the Edit Recipe File dialog box. (For details, see either ["Creating a Recipe Download File" on page 241](#) or ["Creating a Recipe Upload Template" on page 243](#).)  
Note that you cannot edit the file by typing in the Edit Recipe File view pane—the data in the pane is read-only.

Another alternative is to edit the recipe file in a text editor. For details, see “[Basic Recipe File Format](#)” on page 246.

## Basic Recipe File Format

*NOTE: To create a new recipe file, see “[Creating a Recipe Download File](#)” on page 241 or “[Creating a Recipe Upload Template](#)” on page 243.*

When you use the Create or Edit Recipe File dialog box, you can enter only one set of indexes for each table in a recipe file. If you want to enter another set of indexes or make other changes that you can't do using the Create or Edit Recipe File dialog box, you can use a text editor to edit the recipe. PAC Display expects the recipe file to follow a predefined format (syntax) according to the format described in this section. Note that the text editor must be able to save files in ASCII format.

After you edit the file, use the Validate Recipe File utility to check for formatting errors. For details, see “[Validating a Recipe File](#)” on page 251.

As shown in the example below, each recipe file contains at least one PAC Control table tag followed by data values and blank lines. Recipes may also contain comments, and a download recipe might include chart control instructions as well.

```

Comment      /Recipe file for Peanut Butter Cookies
/
PAC Control   Cookie_Controller:Float Table.Temps
table tag
Table element
values
        1:300.0
        2:350.0
        4:200.0
        7:150.0
Blank lines   /End of recipe file
(two carriage
returns)
  
```

```

Comment      /Recipe file for Peanut Butter Cookies
/
PAC Control   Cookie_Controller:Float Table.Temps
table tag
Table element
values
        1:300.0
        2:350.0
        4:200.0
        7:150.0
Blank lines   /End of recipe file
(two carriage
returns)
  
```

**Comment Line**—Any line that starts with a / (forward slash) is a comment, and is ignored by PAC Display. Use comments to explain the recipe and to make notes.

**PAC Control Tag**—Identifies the table tag in the PAC Control strategy that the recipe uses. Only integer, float, and string tags are valid tag types. The tag is in the following format:

<Control Engine Name>:<Type>.<Name>

- <**Control Engine Name**> is the Opto 22 control engine name.

- **<Type>** includes one of the following keywords: Integer Table, Integer 64 Table, Integer, Float Table, Float, String, or String Table. They identify the variable type and are separated from <Control Engine Name> by a colon (:).
- **<Name>** is the PAC Control table tag name. It must be of the type specified by <Type>. A period (.) separates it from <Table Type>.

**Element values**—These are the values downloaded to the control engine or uploaded to the PC.

**Blank line**—This is a required element of a recipe file. Make sure to create a blank line at the end of a data list and at the end of the file by entering *two* carriage returns.

### Example: Recipe Download File

This example has four table elements, one chart control instruction, and one single variable:

Table elements	<pre>/Recipe file for Chocolate Chip Cookies / /My_table is a table with 10 elements /This recipe will download values to 4 elements / Cookie_Controller:Float Table.My_table A--- 34.0 B--- 3:98.6 C--- 35 D--- 9:2.5</pre>
Single variable	<pre>Cookie_Controller:INTEGER.My_counter 4</pre>
Chart control instruction	<pre>Cookie_Controller:Chart.My_Chart RUN</pre>
	<pre>/End of recipe file</pre>

Table elements	<pre>/Recipe file for Chocolate Chip Cookies / /My_table is a table with 10 elements /This recipe will download values to 4 elements / Cookie_Controller:Float Table.My_table A--- 34.0 B--- 3:98.6 C--- 35 D--- 9:2.5</pre>
Single variable	<pre>Cookie_Controller:INTEGER.My_counter 4</pre>
Chart control instruction	<pre>Cookie_Controller:Chart.My_Chart RUN</pre>
	<pre>/End of recipe file</pre>

The **table elements** in the example are used as follows:

**A—**No index reference is indicated for the first data value, 34.0. Therefore, by default it is assigned to zero or My\_table[0].

**B—**The next line, 3:98.6, has an index reference of 3. This means the value 98.6 would be sent to My\_table[3], the fourth element of the table.

**C**—The next value, 35, would be sent to My\_table[4].

**D**—The last data line, 9:2.5, would send 2.5 to the tenth element, My\_table[9]. Make sure to leave the next line blank by entering two carriage returns after the last data line. The blank line indicates that all the data for that particular table has been specified. Do not put blank lines between lines that contain data for the table.

**Single variable.** The example, Cookie\_Controller:INTEGER.My\_counter, would set the value of the integer tag "My\_counter" to 4.

**Chart control instructions** such as STOP, SUSPEND, START, and CONTINUE control the execution state of one or more PAC Control charts when a recipe file is downloaded. You can use a chart control instruction to start a chart that can then move downloaded table values to other program variables.

Chart control instructions have the following format:

```
<Control Engine Name>:Chart.<Chart Name>  
<Chart State>
```

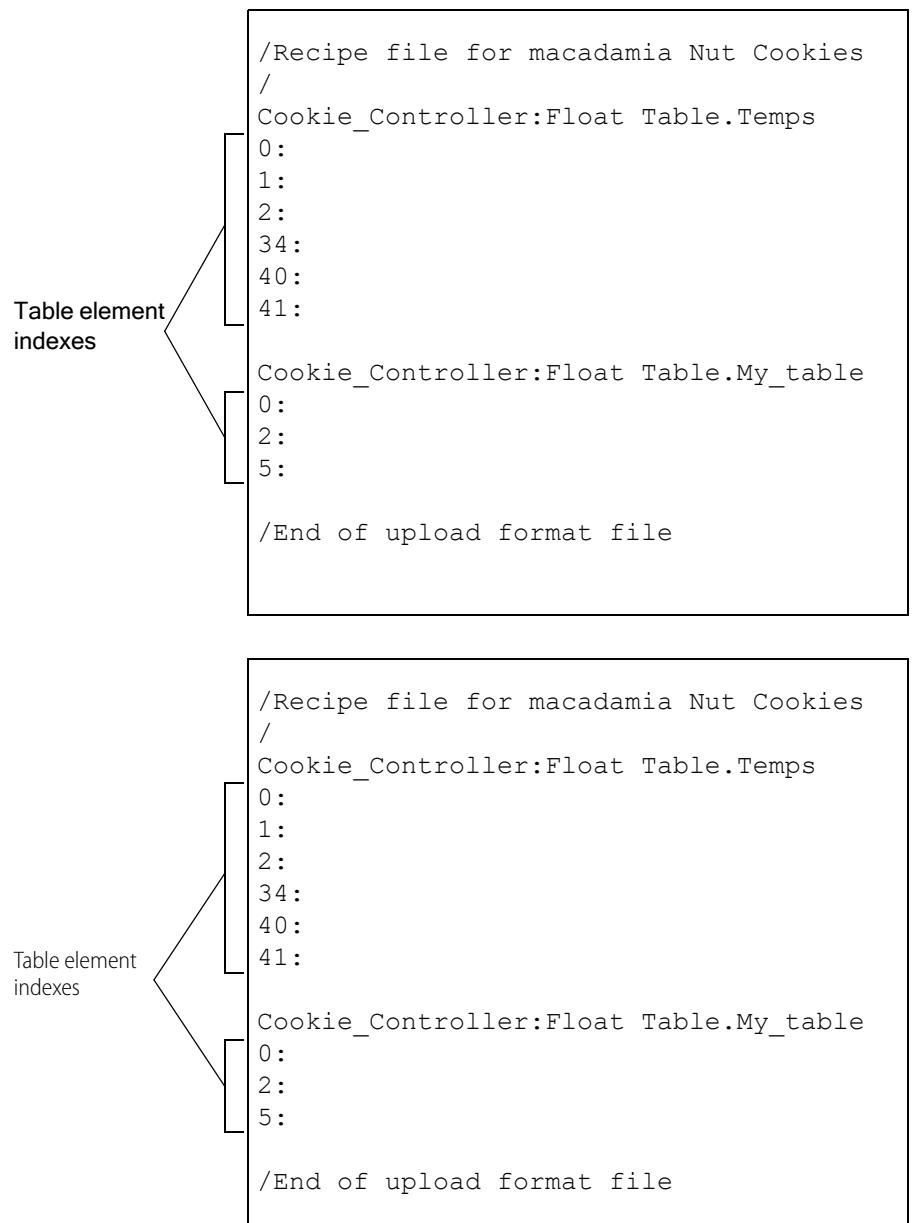
- **<Control Engine Name>** is the name of the Opto 22 control engine.
- **Chart** identifies the keyword identifying this line as a chart instruction. "Chart" is separated from <Control Engine Name> by a colon (:).
- **<Chart Name>** is the PAC Control strategy chart name, and is separated from Chart by a period (.).
- **<Chart State>** is the chart instruction, and must include one of the following keywords: STOP, SUSPEND, START, and CONTINUE. This instruction must be on the line following the <Chart Name>. The last line in a chart control instruction must be a blank line and contain only a carriage return.

### Example: Recipe Upload File

A recipe upload file tells PAC Display which table elements to upload to a *destination file* on the PC or (**Pro only**) a database table. A recipe upload file uses the basic recipe file format (see [page 246](#)), but does not usually contain data.

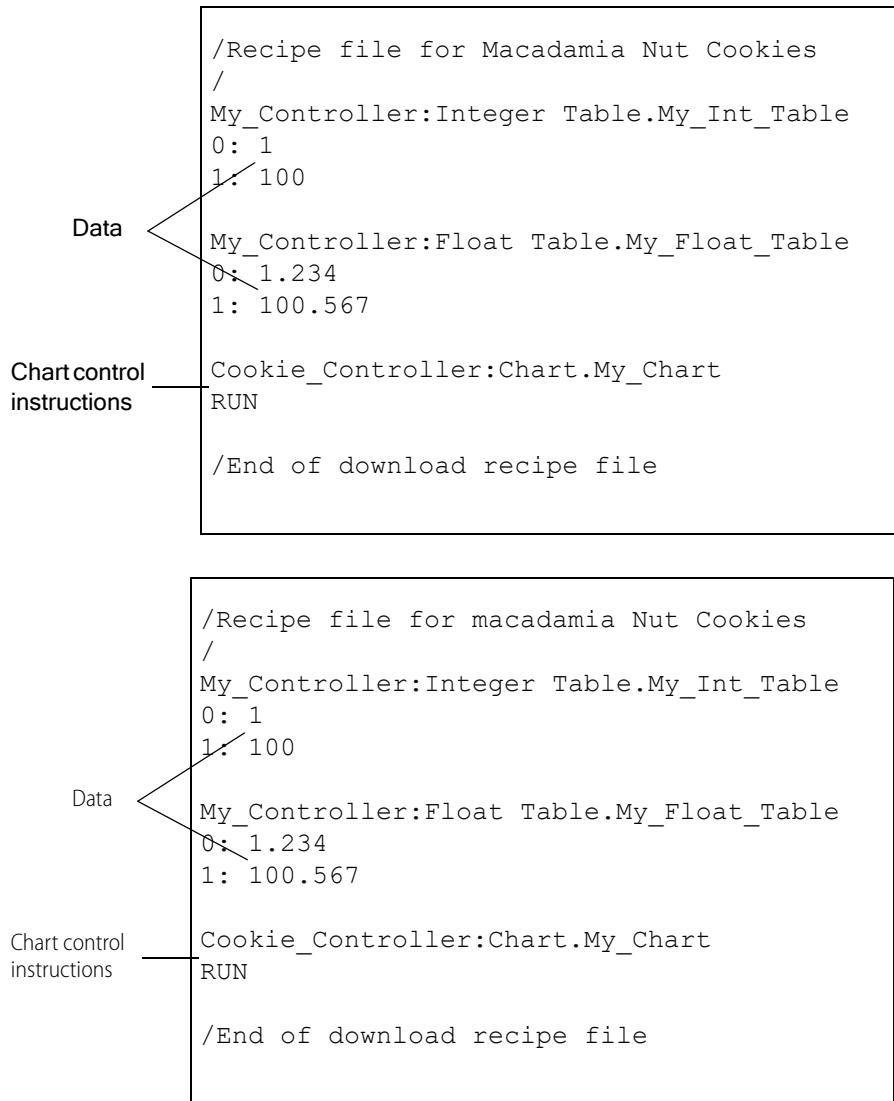
A recipe upload file must have at least one table element index and an index for every table element to be uploaded. The example below shows that you can include table element indexes for multiple tables, as long

as you put a blank line before each new section of data and at the end of the file.  
You create a blank line by pressing the Enter key twice at the end of a line.



## Reusing a Destination File

After an upload, the destination file contains data, and it may contain chart control instructions. To save time, you can reuse a destination file as a recipe download file, because the control engine ignores the data and any control instructions.



## Validating a Recipe File

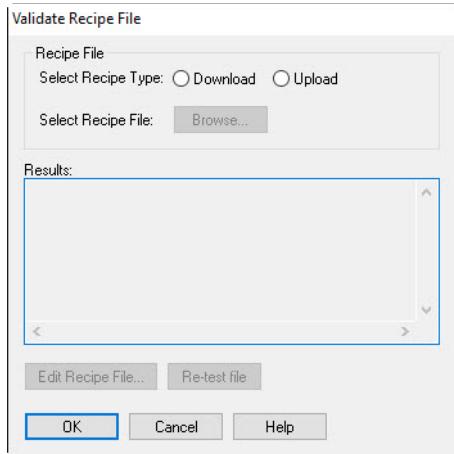
If you manually edit a recipe file, use the Validate Recipe File utility to make sure you haven't made any formatting errors. The utility validates the format of a recipe file, including the structure, tags, and index values by checking the following:

- Are the lines correctly formatted?
  - Are values specified in a download file?
  - Are colons present in an upload template file?
- Is the referenced control engine part of the current PAC Display project?
- Can the strategy file referenced by the controller be opened?

- Are the available types correctly spelled (for example, "Integer Table", "Integer 64 Table", "Float Table", "String Table" or "Chart")?
- Are the table and/or chart names valid?
- If a table is referenced, is an index out of range?
- Are carriage return / line feed pairs properly placed?
- Are there blank lines between table / chart entries?

*NOTE: The utility does not test whether the values for a table in a download file match the table type.*

1. Choose Tools > Validate Recipe File to open the Validation dialog box.

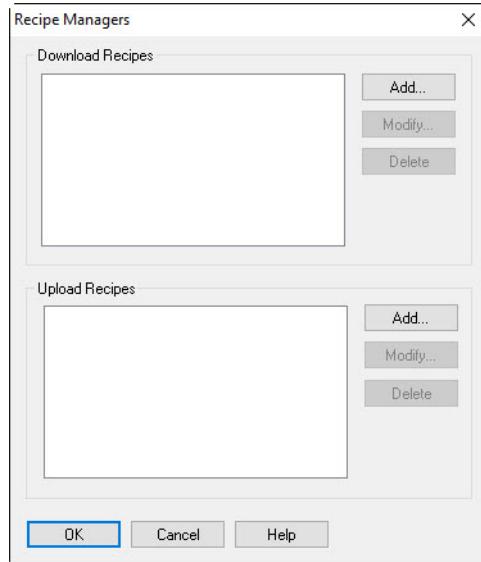


2. Select the type of file to be validated, either Upload or Download.
3. Click Browse.  
The Open Recipe File dialog box opens.
4. Locate the recipe file, and then click Open.  
The utility validates the file and displays the results.
5. If there are any errors, click Edit Recipe File to open a text editor and make the corrections. Save the file, and then use the Re-test button to check the file again.
6. Click OK to close the dialog box.

### Configuring a Recipe Upload

To configure a recipe to upload using a trigger:

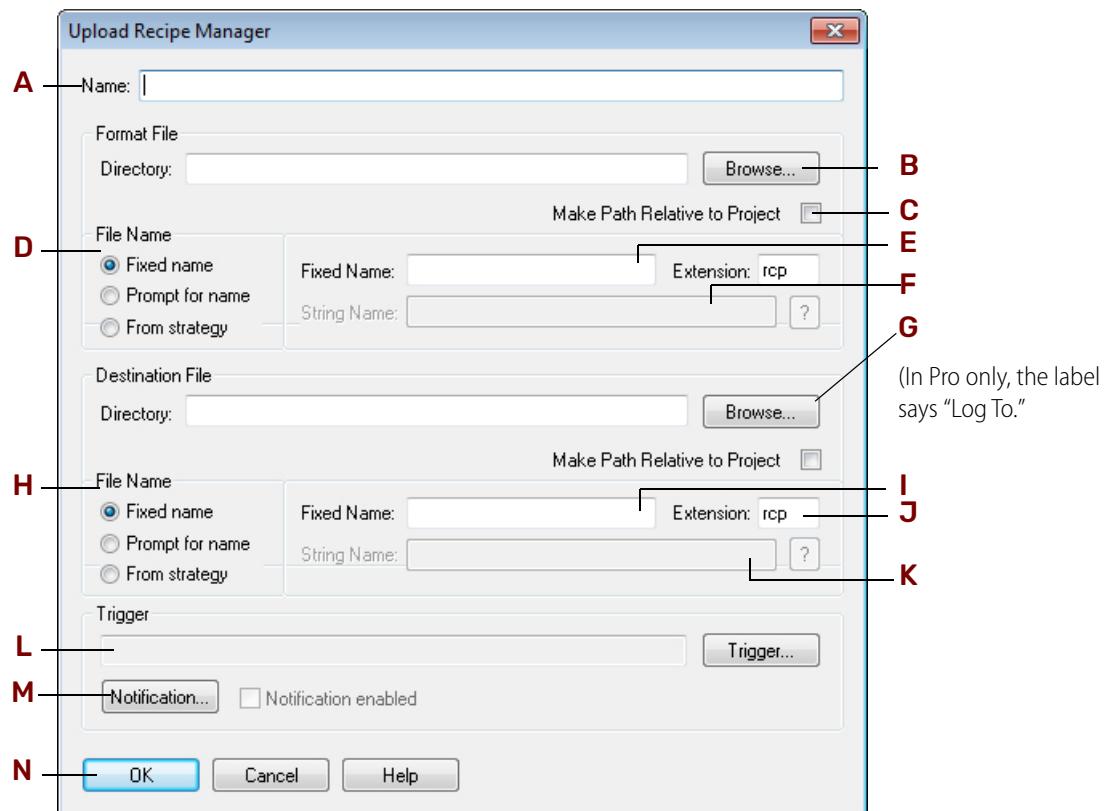
1. From PAC Display Configurator's menu bar, click Configure > Recipes to open the Recipe Managers dialog box.



2. In the Upload Recipes section of the Recipe Managers dialog box:
  - To create a new upload recipe manager, click Add.
  - To change an existing upload recipe manager, highlight it and click Modify.
  - To remove an existing upload recipe manager, highlight it and click Delete.

If you are creating or changing an upload recipe manager, the Upload Recipe Manager dialog box appears.

Upload Recipe Manager Dialog Box



**(A) Name.** Enter the name of the upload recipe manager. This name is used to refer to the recipe group you're configuring in the Configurator. The name in this field must be different from all recipe managers in this project.

**(B) Format File Directory.** Choose the directory the recipe file resides in. You can type the directory in the edit box or click Browse to quickly find and enter the path.

**(C) Make Path Relative to Project.** When selected, if you copy the project and recipe manager files to a different computer, PAC Display will look in the same relative location to find the recipe manager files in Configurator and Runtime.

For example, if the project is saved in C:\proj\ and you configure recipe manager files to be in C:\proj\recipes\, then the relative path would be this: ./recipes\

If you then saved the project to C:\temp\newproj\, PAC Display would look for recipe manager files in the new location's relative path: C:\temp\newproj\recipes\

**(D) File Name.** Choose the source of the recipe file name.

- If you choose Fixed name, **E** is highlighted.
- If you choose Prompt for name, the operator will be asked for the name of the recipe file to be uploaded.
- If you choose From strategy, **F** is highlighted.

**(E) Fixed Name.** If Fixed name was selected in **C**, enter the name of the recipe file located in directory **B**. Notice the file extension is .rcp.

**(F) String Name.** If From strategy was selected in **C**, click the Tag Selection button  to enter a tagname of type string that contains the recipe file name. See “[Configuring Tags](#)” on page 74 for more information about using tags.

**(G) File Directory.** Click Browse and choose the directory location of the recipe file that will (uploads only) receive the data or (downloads only) be the source of the data.

**Pro**

**(Pro only)** In PAC Display Professional, Browse is replaced by a “Log To” button. (For a recipe download file, the button is “Log From.”)

Click Log To (or Log From) to select whether to log the data to (or from) an ASCII file or a database table. For details on logging to or from a database table, see [page 257](#).

**(H) File Name.** Choose the source of the recipe file name.

- If you choose Fixed name, **I** is highlighted.
- If you choose Prompt for name, the operator will be asked for the name of the recipe file to be uploaded to.
- If From strategy string is selected, **K** is highlighted.

**(I) Fixed Name.** If Fixed name was selected in **D**, enter the name of the recipe file located in directory **B**.

**(J) Extension.** Specify the file extension for the recipe files available to this dynamic attribute by entering the extension in the File Extension field. The extension must be one to three characters long and must not contain a period or DOS wild card characters.

If Fixed Name is checked, this extension will append to the File Name entry to create the name for the recipe file. If Prompt For Name is checked, this extension will be used as a filter to select the files for display in a file selection dialog box when Runtime executes this dynamic attribute. However, you may override this filter if you wish to select a file with a different extension.

**(K) String Name.** If From strategy was selected in **C**, click the Tag Selection button  to enter a tagname of type string that contains the recipe file name. See “[Configuring Tags](#)” on page 74 for more information about using tags.

**(L) Trigger (Trigger-based recipe upload).** Click Trigger to select a PAC Control tagname that will trigger the upload recipe action. The trigger can be activated only from a non-triggered state. See “[Selecting a Trigger to Start the Recipe Upload/Download](#)” on page 256 to learn how to configure this trigger. Pressing the Trigger button displays the Recipe Trigger Configuration dialog box.

**(M) Notification (Trigger-based recipe upload).** Click Notification to assign a value to a tag when a recipe has successfully uploaded. Pressing this button displays the Recipe Upload Completed Notification dialog box. Check the Enabled box to make notification active. See “[Notification When Recipe Has Been Downloaded/Uploaded](#)” on page 257 for more information.

**(N) OK.** Click OK to save your settings and close the dialog box.

## Configuring a Recipe Download

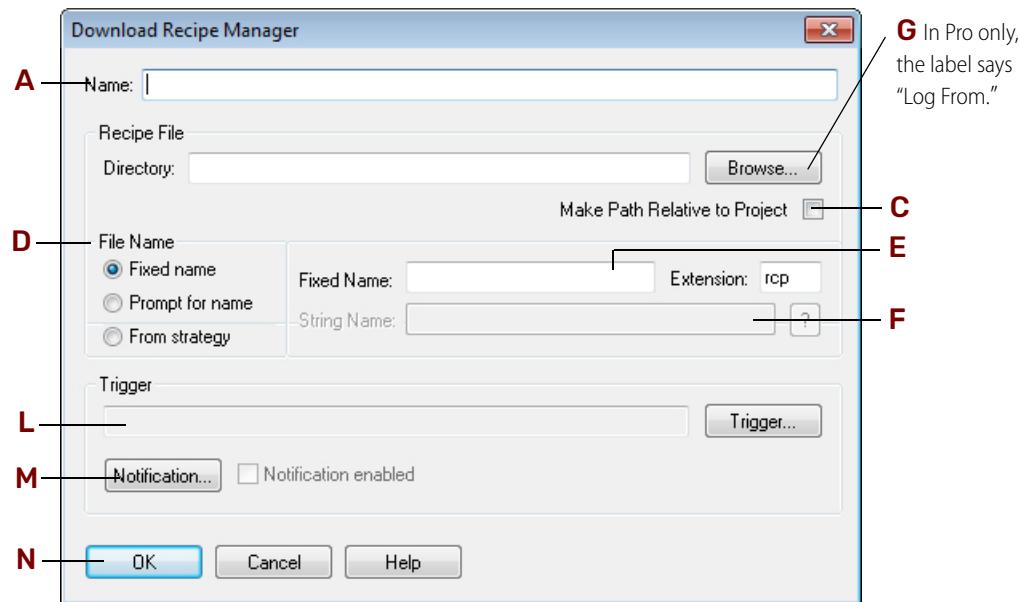
Use the Recipe Manager dialog box to configure conditions that trigger a recipe download or upload.

In either the Download Recipes or Upload Recipes section of the dialog box:

- Click Add to create a new recipe manager.
- To change an existing recipe manager, highlight it and click Modify.
- To remove an existing recipe manager, highlight it and click Delete.

When you click Add or Modify, the Recipe Manager dialog box appears.

#### Download Recipe Manager Dialog Box

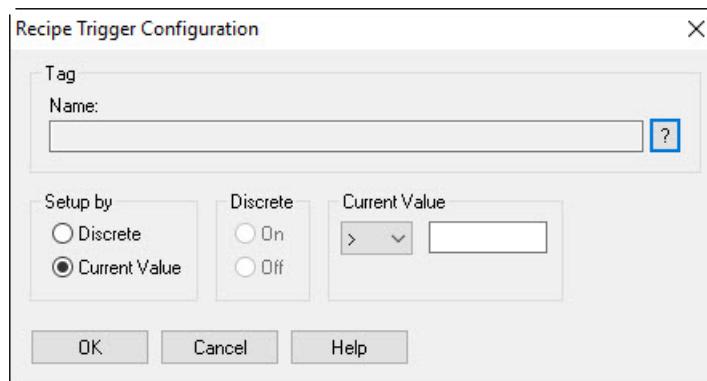


For descriptions of the items on this dialog box, please see ["Upload Recipe Manager Dialog Box" on page 254](#).

#### Selecting a Trigger to Start the Recipe Upload/Download

- To select the trigger that will start a recipe upload or download, click Trigger in the Download/Upload Recipe Manager dialog box.

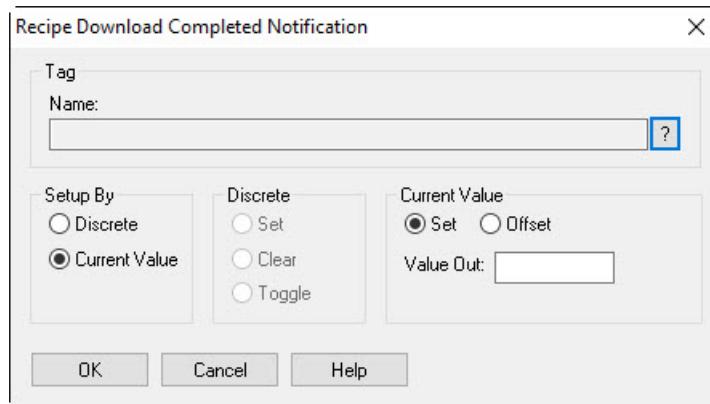
The Recipe Trigger Configuration dialog box appears.



- Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to choose a tag to trigger the recipe upload/download.
- Select Discrete or Current value in the Setup by group. Current value sets the tag value that will trigger the recipe download/upload. Select an operator in the drop-down menu, and then enter a value to compare the tag to. Discrete makes the tag's on or off state trigger the application.

## Notification When Recipe Has Been Downloaded/Uploaded

- In the Download/Upload Recipe Manager dialog box, click Notification to open the Recipe Download Completed Notification dialog box.



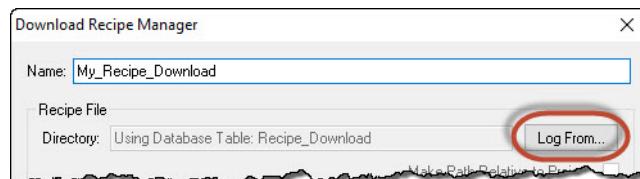
- Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag as the flag to indicate the recipe upload or download was successful.
- Select Discrete or Current Value in the Setup By group.  
Discrete sets, clears, or toggles the tag's on or off state. Current Value sets the tag value. To set a Current Value, select Set or Offset in the Current Values group and then enter a tag value.

## Logging a Recipe File to or from a Database

**Pro**

**(Pro only)** The Directory fields in the Recipe Manager and Dynamic Attribute - Recipe dialog boxes have a "Log To" (or "Log From") button. (In PAC Display Basic, the label says "Browse.") When you click the button, you can choose to load the recipe file to (or from) a database.

This image shows the Directory field configured for a recipe download:



Recipe file downloads can be used to collect snapshots of your variable data at specific points in time; uploads are useful for copying data from a database table to variables in a strategy, and for restoring data to a strategy. To create or configure a recipe file, see:

- ["Creating a Recipe Download File" on page 241](#) and ["Configuring a Recipe Upload" on page 252](#).
- ["Creating a Recipe Upload Template" on page 243](#) and ["Configuring a Recipe Upload" on page 252](#).

To log a recipe to or from a database:

- Make sure you have configured the ODBC data source to be used with PAC Display. For details, see [page 55](#).
- To open the Open either:
  - The Recipe Manager dialog box (Configure > Recipes > Add or Modify); or
  - The Dynamic Attribute dialog box (Edit > Edit Dynamic Attribute, and then, in the Operator Drive Attributes area, double-click either Download Recipe or Upload Recipe).

## CONFIGURING ALARM POINTS

3. Click Log To (or Log From), and then select Database in the pop-up menu.
4. In the Download (or Upload) Recipe Manager dialog box, click Log to, and then select Log to Database from the pop-up menu. The Database Table dialog box opens, displaying a default table and columns.
5. In the Table Name field, you can type the name of a different database table, but the database table must contain the columns listed in the Table Columns pane. You cannot change the column names or column types.

## CONFIGURING ALARM POINTS

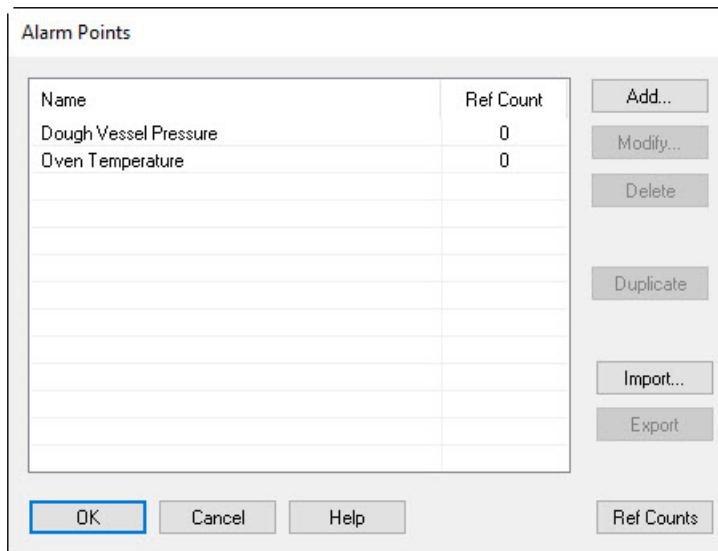
You can incorporate alarm features into your operator interface by adding a PAC Display alarm graphic (see also ["Adding Alarm Graphics" on page 273](#)). In a project, alarm graphics monitor alarm points associated with PAC Control tags, and alert the operator when predefined alarm conditions are reached. Alarm information can be logged to a file or sent to a printer.

Like a historical log point, an alarm point is linked to a PAC Control tag. When an alarm point matches a defined alarm state, it is displayed on all alarm graphics that include that alarm point. If configured to do so, an alarm point can also be sent to any configured file or printer log.

Once it is set up, an alarm point can be included in any number of alarm graphics in a PAC Display project. (Data for an alarm point can still be collected if the alarm point has not been included in a graphic.) You can easily generate a report that lists all the alarm points for a project; see ["Viewing Tags and Dynamic Attributes" on page 180](#) for more information.

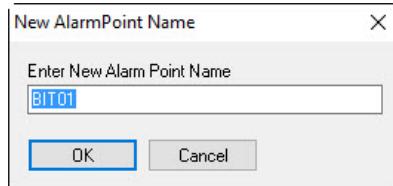
1. To configure an alarm point, choose Configure > Alarm Points.

The Alarm Points dialog box lists configured alarm points. The "Ref Count" column shows the number of alarm windows in which each alarm point is used.



2. Do one of the following:
  - Click Add to create a new alarm point.
  - Highlight an existing alarm point and click Modify to change it.
  - Highlight one or more alarm points and click Delete to remove them. To select multiple alarm points, hold down either the Shift key (for selecting contiguous items) or the Ctrl key (for selecting non-contiguous items) and click an alarm point name.

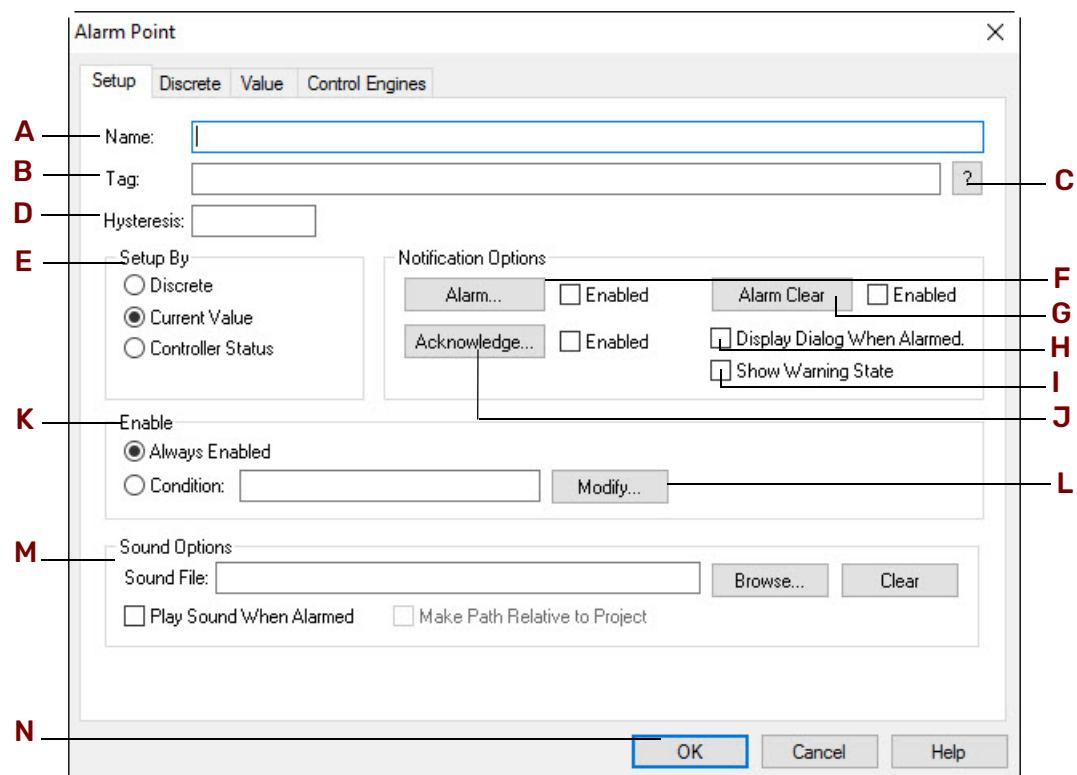
- Highlight one or more alarm points and click Duplicate. In the dialog box that appears for each alarm point, enter a new name, and then click OK to add each duplicate to the list.



- Click Import to import alarm points from a comma-delimited file. Or, click Export to export alarm points to a comma-delimited file. See, “[Importing Alarm Points](#)” on page 262.
- Click Ref Counts to update the values in the Reference Count column.

If you are creating or changing an alarm point, the Alarm Point dialog box appears.

**Alarm Point Dialog Box**



**(A) Name.** Enter a name for the alarm point here. The name of each alarm point in a project must be unique and must be less than 128 characters. The PAC Control tag name appears by default.

**(B) Tag.** Displays the name of the PAC Control tag that you select with the Tag Selection button.

**(C) Tag Selection Button.** Click the Tag Selection button to select a PAC Control tag for the alarm point. Note that the choice of tags available is determined by the type of tag you select in Setup By (E).

**(D) Hysteresis.** Enter a hysteresis value that is applied to the tag value of a triggered alarm point as it moves toward the Normal alarm value. The alarm point will remain in the triggered state until it reaches its threshold.

value plus the hysteresis value (if the alarm point is below Normal) or minus the hysteresis value (if the alarm point is above Normal).

For example, for a triggered HiHi alarm point, suppose the threshold value is 50, the hysteresis value is 5, and the current triggered alarm point value is 53. If the next tag read has a value of 49 (that is, it has descended past the configured threshold of 50), the alarm point will still remain in the triggered HiHi state until the tag reading is less than 45.

**(E) Setup By.** Select the type of tag to be linked to the alarm point.

- Choose Discrete for discrete tags, such as a digital input. Selecting this option enables the Discrete page in the Alarm Point dialog box. See ["Entering Discrete Alarm Conditions" on page 270](#) for configuration information.
- Choose Value for analog points, floats, or similar values. Selecting this option enables the Value page in the Alarm Point dialog box. See ["Entering Alarm Values" on page 271](#) for configuration information.
- Choose Control Engine Status to link the status of a control engine to the alarm point. The alarm will be triggered whenever the linked control engine is not in Attached state. See ["Setting Control Engine Status Alarm Points" on page 272](#) for configuration information.

**(F) Alarm.** Click here to display the Alarm Notification dialog box, where you can have a specified value written to a selected tag when the alarm point enters an alarm condition. See ["Alarm, Acknowledge, and Alarm Clear Notifications"](#) below for information on setting up alarm notification.

Select Enabled to make Alarm Notification active. (You can't select Enabled until Alarm Notification is configured.)

**(G) Alarm Clear.** Click here to display the Alarm Clear Notification dialog box. Use this dialog box to have a tag value be set or cleared when the current alarm returns to Normal from an alarmed state. See ["Alarm, Acknowledge, and Alarm Clear Notifications"](#) below for information on setting up alarm notification.

Select Enabled to make Alarm Clear Notification active. (You can't select Enabled until Alarm Clear is configured.)

**(H) Display Dialog When Alarmed.** Check this box to display the alarm dialog when the alarm point goes into an alarmed state in Runtime. This check box defaults to the current Display Message Box for New Alarm Points setting in the Alarming Setup dialog. See ["Alarm Runtime and User Options" on page 277](#) to adjust this setting globally.

*NOTE: Setting or clearing the Display Message Box for New Alarm Points setting in the Alarming Setup dialog will set or clear this option for all alarm points. Therefore, it is highly recommended to set this global default first, and then adjust the setting on a per-alarm point basis.*

**(I) Show Warning State.** Check this option to enable this alarm point to display in the alarm graphic when this point enters the warning state.

An alarm point is considered to be in a warning state when in one or both of the following conditions:

- A persistence time has been configured for the alarm point (see ["Entering Discrete Alarm Conditions" on page 270](#) and ["Entering Alarm Values" on page 271](#) and the alarm has been triggered, but is waiting for the persistence time to expire).
- An alarm point has the Re-Alarm Time option configured and is still in the triggered state after being acknowledged. To see the Re-Alarm option, select Configure > Alarm Points. Then click the Add or Modify button, click the Discrete or Value tab (depending on the alarm type), and click one of the More buttons.

See also ["Alarm Runtime and User Options" on page 277](#).

**(J) Acknowledge.** Click here to display the Acknowledge Notification dialog box, where you can have a specified value written to a selected tag when the alarm point is acknowledged by the operator. See “[Alarm, Acknowledge, and Alarm Clear Notifications](#)” below for information on setting up acknowledge notification.

Select Enabled to make Acknowledge Notification active. (You can't select Enabled until Acknowledge Notification is configured.)

**(K) Enable.** Choose Condition to make the alarm point dependent on the value of another tag. Click the Modify button (J) to select the tag and define the conditions it needs to meet.

Select Always Enabled for the alarm point **not** to be dependent on the value of another PAC Control tag.

**(L) Modify.** If you've selected Condition under Enable (I) to make the alarm point dependent on the value of another tag, click Modify and configure the tag and conditions in the Alarm Point Conditional Enabling Setup dialog box that appears. See “[Setting Conditional Alarm Points](#)” on page 269 for configuration information.

**(M) Sound Options.** Click the Browse button to select a sound file in a specific folder. Make sure Play Sound When Alarmed is selected. Otherwise, the sound will not play when the point is in an alarmed state.

Click the Clear button to remove the sound file.

See also, “[Configuring a Sound](#)” on page 237.

*NOTES: If no sound file is configured, and the Play Sound When Alarmed check box is selected (the default), then the global sound file will be used. If no global sound file has been configured a message appears warning you that no sound will play when this alarm point is in an alarmed state unless you select a sound file either for the alarm point or for the global sound. The global sound file is configured in the Configure > Alarming Setup dialog on the Sound tab.*

*If you do not select a sound file for this alarm point and no global sound file is specified on the Sound tab of the Configure > Alarming Setup dialog box, you cannot enable this option and an error message will appear if you try.*

*If an alarm point has been configured to play the global sound file, but then the global sound file is cleared in the Sound tab of the Configure > Alarming Setup dialog box, a message will warn you that no sound will play when an alarm point is in an alarmed state unless you configure a default sound or change the sound options for the alarm points.*

**(N) OK.** Click OK to save your settings and close the dialog box.

Now we'll look at the additional steps needed to complete the settings in the Setup, Discrete, and Value pages of the Alarm Point dialog box.

## Exporting Alarm Points to a Binary or Comma-Delimited File

Alarm Points may be exported from a project to either a binary file or a comma-delimited file, and then imported from the file into another project. Both projects must refer to the same tag database(s) for the alarm points that are to be imported. The database may be a PAC Control, ioControl (**Pro only**), or OptoControl tag database file.

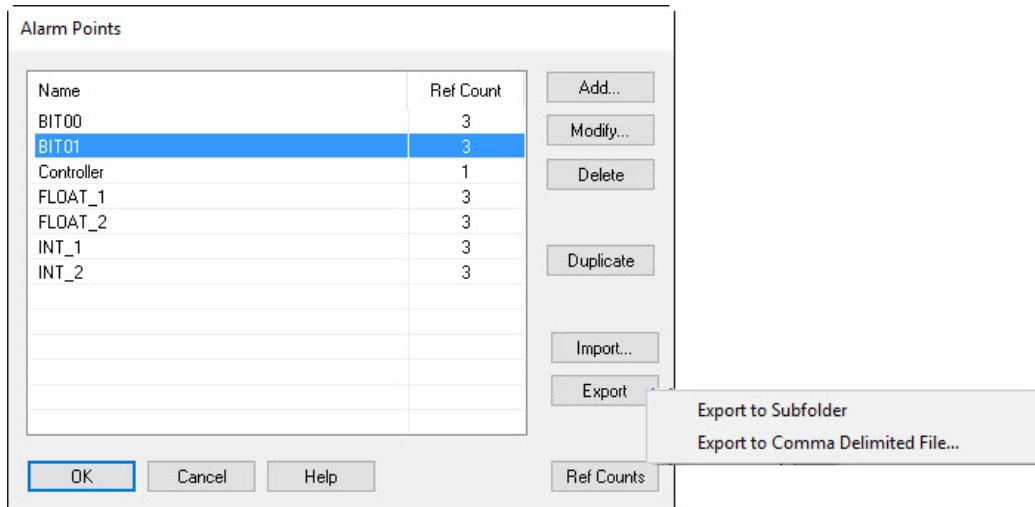
If you want to export and import alarm points quickly, use a binary file (the Export to Subfolder command) to export and import alarm points. However, if you want to use a spreadsheet program (such as Excel) to view, edit, or create the attributes of the alarm points before importing them into another project, use a comma-delimited file.

To export one or more alarm points to a file:

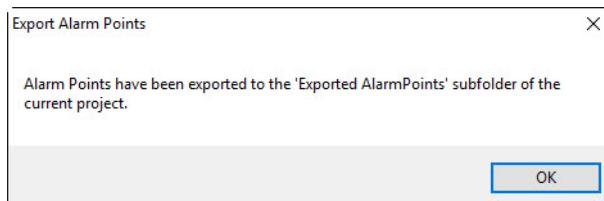
1. In Configurator, choose Configure > Alarm Points to display the Alarm Points dialog box.
2. Select one or more alarm points from the list.

## CONFIGURING ALARM POINTS

3. Click Export, and then choose from the pop-up menu either Export to Subfolder (for a binary file) or Export to Comma-Delimited File.



If you select **Export to Subfolder (for a binary file)**, a message confirms success.



Each alarm point is automatically exported in a separate file to the Exported Alarm Points subfolder of the current project. These binary files have the format:

<Name of Alarm Point>.ape

Readable text files are also created that provide details for each exported alarm point.

If you select **Export to Comma-Delimited File**, the Export Alarm Points dialog box opens. Select the target directory, name the file, and click Save. These files have the format:

<Name you assign>.adl

*NOTE: If you select the same file again later, you will have the option of overwriting the existing file. If you select No, the alarm points are appended to the selected file.*

If there are errors, the message displays up to 10 alarm points in an error list.

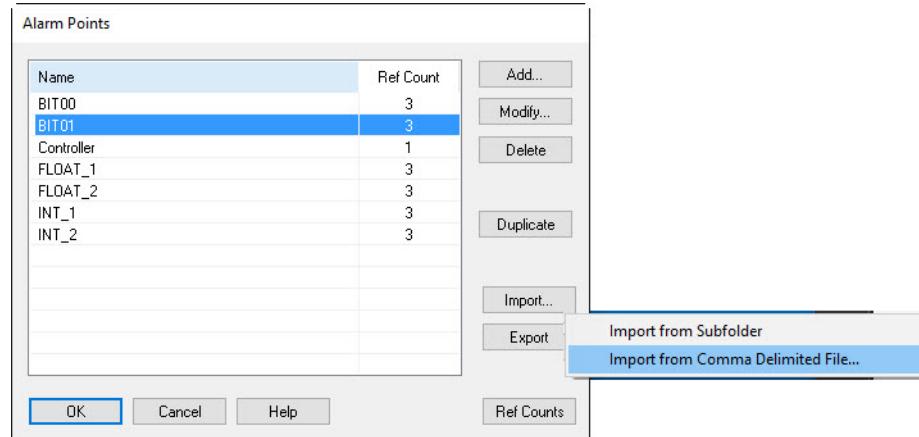
To import the alarm points into another project, see the next section, "[Importing Alarm Points](#)".

## Importing Alarm Points

Alarm Points may be imported from one project into another project that both refer to the same tag database. Before importing, you must export the alarm points to a file as described in "[Exporting Alarm Points to a Binary or Comma-Delimited File](#)" on page 261.

1. In Configurator, choose Configure > Alarm Points to open the Alarm Points dialog box.
2. Click the Import button.

- Select either Import from Subfolder (for a binary file) or Import from Comma-Delimited File from the pop-up menu.



For a binary file, an Import Alarm Point dialog opens showing exported alarm point files in the Exported Alarm Points subfolder under the current project.

For a comma-delimited file, navigate to the folder containing the file.

- For a binary file, select one or more alarm point files (.ape) to import. Or, for a comma-delimited file, select the single file (.adl) to import.
- Click Open. The alarm points are imported and added to the list.
- Click OK to confirm.

*NOTE: If there are errors during the import, PAC Display displays a message indicating the error. The import fails at the first error. PAC Display makes no attempt to guess what the intended field should contain nor does it try to correct the error or present possible solutions. If an error is encountered, check the contents of each field with the table in "Tag Definition Format." The table details the possible values for the 160 fields of each alarm point.*

## Structure of Alarm Point Comma-Delimited File

The structure of the comma-delimited file for alarm points is described below. There are a total of 165 fields.

**Tag Definition Format.** The following table describes a single Tag definition in the comma-delimited file. There are ten fields, all of which are required for tags that are configured.

If tags are *not* configured (i.e., no alarm point notifications, conditional tag, HiHi tag, etc.), *only the first three* fields may be blank. The remaining fields (4-10) *must* have the default values indicated.

Field	Description	Values
1	Control Engine Name	The <i>case-sensitive</i> name of the control engine.
2	Item Name	The <i>case-sensitive</i> name of the item. <i>NOTE: If Configuring a Controller Status alarm point, this value must be the same as the Control Engine Name.</i>
3	Field Type	The <i>case-sensitive</i> name of field (Value, Gain, Counts, etc.). <i>NOTE: If Configuring a Controller Status alarm point, this value must be "# Of Errors".</i>
4	Element Index	Element index or -1 if not used.
5	Bit Index	Bit index or 255 if not used.
6	Start Index	Start Index or -1 if not used.
7	Number of Elements	Number of elements or -1 if not used.

Field	Description	Values
8	Refresh Group	0-based index of refresh group (0 – 13) or 0 if not used.
9	Reserved1	If file has been exported, <i>do not modify</i> this value. For a new alarm point, must be –1.
10	Reserved2	If file has been exported, <i>do not modify</i> this value. For a new alarm point, must be 0.

**Notification Definition Format.** This table describes the definition for the notifications (Alarm, Acknowledge, and Clear) used in describing an alarm point. There are a total of 13 fields per notification.

*NOTE: If notifications are not configured for an alarm point, the seven required tag fields (fields 4-10 in the previous table) are still required.*

Field	Description	Values
1–10	Tag Description	See “ <a href="#">Tag Definition Format</a> ” on page 263
11	Send Type	Must be one of the following: Set (the default if not configured) Discrete Set Clear Toggle Offset
12	Send Value	The value or offset if configured, blank if not needed
13	Enabled Flag	Must be ENABLED or NOT_ENABLED (the default if not configured)

**Alarm Point Definition Format.** The entire alarm point definition file is described below.

Field	Description	Values	Required
1	Alarm Point Name	The name of the alarm point	Yes
2–11	Alarm Point Tag	See “ <a href="#">Tag Definition Format</a> ” on page 263	Yes
12	Deadband	Deadband Value or 0 if not used	Yes
13	Setup Type	Must be one of the following: Current Value Discrete Controller	Yes
14–26	Acknowledge Notification	See “ <a href="#">Notification Definition Format</a> ” on page 264	No*
27–39	Alarm Notification	See “ <a href="#">Notification Definition Format</a> ” on page 264	No*
40–52	Clear Notification	See “ <a href="#">Notification Definition Format</a> ” on page 264	No*
53	Display Dialog When Alarmed?	0 if No, 1 if Yes	Yes
54	Include Warning State	0 if No, 1 if Yes	Yes
55	Always Enabled?	0 if No, 1 if Yes	Yes
56–65	Conditional Tag	See “ <a href="#">Tag Definition Format</a> ” on page 263	No**

Field	Description	Values	Required
66	Conditional Tag Comparison Condition	Must be one of the following numbers: 0 - Not Used or Greater Than (>) 1 – Equal To (=) 2 – Less Than (<) 3 – Greater or Equal (>=) 4 – Less or Equal (<=) 5 – ON (Discrete) 6 – OFF (Discrete)	Yes
67	Conditional Value Compare	0 or value used	No
68	Alarm Point Specific Sound File	Full path to sound file or blank if not used	No
69	Play Sound when Alarmed?	0 = No (or N/A) ; 1 = Yes	Yes
70	Discrete – Alarm When:	0 = Off/False (or Not Used); 1 = On/True	Yes, even if not a discrete alarm point
71	Discrete Alarm Priority	Priority or 0 if Not Used	Yes, even if not a discrete alarm point
72	Discrete Alarm Comment	Comment or blank if Not Used***	No
73	Discrete Normal Enabled	0 = False (or Not Used) 1 = True	Yes, even if not a discrete alarm point
74	Discrete Normal Priority	Priority or 0 if Not Used	Yes, even if not a discrete alarm point
75	Discrete Normal Comment	Comment or blank if Not Used***	No
76	Discrete Persistence Time (msec)	Persistence time, in milliseconds, or 0 if not used	Yes, even if not a discrete alarm point
77	RESERVED	MUST BE 0	Yes, even if not a discrete alarm point
78	Discrete Re-Alarm time (msec)	Re-alarm time, in milliseconds, or 0 if not used	Yes, even if not a discrete alarm point
79	RESERVED	MUST BE 0	Yes, even if not a discrete alarm point
80	HiHi Enabled?	0 = No (default); 1 = Yes	Yes, even if not a Value alarm point
81	HiHi Value	HiHi value or 0 if Not Used	Yes, even if not a Value alarm point
82	HiHi Priority	Priority or 0 if Not Used	Yes, even if not a Value alarm point
83	HiHi - Use Tag?	0 if FALSE 1 if TRUE	Yes
84-93	HiHi Tag	See “ <a href="#">Tag Definition Format</a> ” on page 263	No**
94	HiHi Comment	Comment or Blank if Not Used***	No
95	HiHi Runtime Adjustable?	0 = No or if Not Used; 1 = True	Yes, even if not a Value alarm point
96	HiHi Persistence Time (msec)	Persistence time, in milliseconds, or 0 if not used	Yes, even if not a Value alarm point
97	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
98	HiHi Re-Alarm Time (msec)	Re-alarm time, in milliseconds, or 0 if Not Used	Yes, even if not a Value alarm point

## CONFIGURING ALARM POINTS

Field	Description	Values	Required
99	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
100	Hi Enabled?	0 = No (default); 1 = Yes	Yes, even if not a Value alarm point
101	Hi Value	Hi value or 0 if Not Used	Yes, even if not a Value alarm point
102	Hi Priority	Priority or 0 if Not Used	Yes, even if not a Value alarm point
103	Hi - Use Tag?	0 if FALSE 1 if TRUE	Yes
104-113	Hi Tag	See "Tag Definition Format" on page 263	No**
114	Hi Comment	Comment or Blank if Not Used***	No
115	Hi Runtime Adjustable?	0 = No or if Not Used; 1 = True	Yes, even if not a Value alarm point
116	Hi Persistence Time (msec)	Persistence time, in milliseconds, or 0 if not used	Yes, even if not a Value alarm point
117	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
118	Hi Re-Alarm Time (msec)	Re-alarm time, in milliseconds, or 0 if Not Used	Yes, even if not a Value alarm point
119	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
120	Normal Enabled?	0 = No or if Not Used; 1 = Yes	Yes, even if not a Value alarm point
121	Normal Priority	Priority or 0 if Not Used	Yes, even if not a Value alarm point
122	Normal Comment	Comment or Blank if Not Used***	No
123	Lo Enabled?	0 = No (default); 1 = Yes	Yes, even if not a Value alarm point
124	Lo Value	Lo value or 0 if Not Used	Yes, even if not a Value alarm point
125	Lo Priority	Priority or 0 if Not Used	Yes, even if not a Value alarm point
126	Lo Use Tag?	0 if FALSE 1 if TRUE	Yes
127-136	Lo Tag	See Tag Description	No**
137	Lo Comment	Comment or Blank if Not Used***	No
138	Lo Runtime Adjustable?	0 = No or if Not Used; 1 = True	Yes, even if not a Value alarm point
139	Lo Persistence Time (msec)	Persistence time, in milliseconds, or 0 if not used	Yes, even if not a Value alarm point
140	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
141	Lo Re-Alarm Time (msec)	Re-alarm time, in milliseconds, or 0 if Not Used	Yes, even if not a Value alarm point
142	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
143	LoLo Enabled?	0 = No (default); 1 = Yes	Yes, even if not a Value alarm point

Field	Description	Values	Required
144	LoLo Value	LoLo value or 0 if Not Used	Yes, even if not a Value alarm point
145	LoLo Priority	Priority or 0 if Not Used	Yes, even if not a Value alarm point
146	LoLo - Use Tag	0 if FALSE 1 if TRUE	Yes
147-156	LoLo Tag	See “ <a href="#">Tag Definition Format</a> ” on page 263	No**
157	LoLo Comment	Comment or Blank if Not Used***	No
158	LoLo Runtime Adjustable?	0 = No or if Not Used; 1 = True	Yes, even if not a Value alarm point
159	LoLo Persistence Time (msec)	Persistence time, in milliseconds, or 0 if not used	Yes, even if not a Value alarm point
160	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
161	LoLo Re-Alarm Time (msec)	Re-alarm time, in milliseconds, or 0 if Not Used	Yes, even if not a Value alarm point
162	RESERVED	MUST BE 0	Yes, even if not a Value alarm point
163	Control Engine Name for Controller Status Alarm Point	Control Engine Name or blank if Not Used	No
164	Last Known Value Priority	Priority or 99998 if Not Used	Yes
165	Comm Failure Priority	Priority or 99999 if Not Used	Yes
* Even if no notifications are configured, there are required fields. See “ <a href="#">Notification Definition Format</a> ” on page 264.			
** Even if the tag is not configured, there are required fields. See “ <a href="#">Tag Definition Format</a> ” on page 263.			
*** Alarm Point Comments may not contain commas.			

### Sample alarm point entries:

```
Controller Status,10.192.54.68,10.192.54.68,# Of
Errors,-1,255,-1,-1,0,-1,37,0.000000,Controller,,,,-1,255,-1,-1,0,-1,0,Se
t,,NOT_ENABLED,,,,-1,255,-1,-1,0,-1,0,Set,,NOT_ENABLED,,,,-1,255,-1,-1,0,
-1,0,Set,,NOT_ENABLED,0,0,1,,,,-1,255,-1,-1,0,-1,0,0,0.000000,C:\Projects
\GLASS.WAV,0,0,0,,1,0,,0,0,0,22,1,0.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,
0,31588528,0,0,1,0.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,0,0,0,17,1,0,,1,0
.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,0,22,0,31588528,1,0.000000,0,0,0,0,
1,255,-1,-1,0,-1,0,,0,0,433212520,0,0,10.192.54.68,99998,99999
```

```
10.192.54.68:MyTable[1].BIT01,10.192.54.68,MyTable,,1,1,-1,0,0,5,0.000
000,Discrete,,,,-1,255,-1,-1,0,-1,0,Set,,NOT_ENABLED,,,,-1,255,-1,-1,0,-1
,0,Set,,NOT_ENABLED,,,,-1,255,-1,-1,0,-1,0,Set,,NOT_ENABLED,0,0,1,,,,-1,2
55,-1,-1,0,-1,0,0,0.000000,C:\Projects\DRUMROLL.WAV,1,1,0,,1,0,,0,0,0,0,1
,0.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,0,0,0,1,0.000000,0,0,,,,-1,255,
-1,-1,0,-1,0,,0,0,0,0,1,0,,1,0.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,0,0
,0,0,1,0.000000,0,0,,,,-1,255,-1,-1,0,-1,0,,0,0,0,0,,99998,99999
```

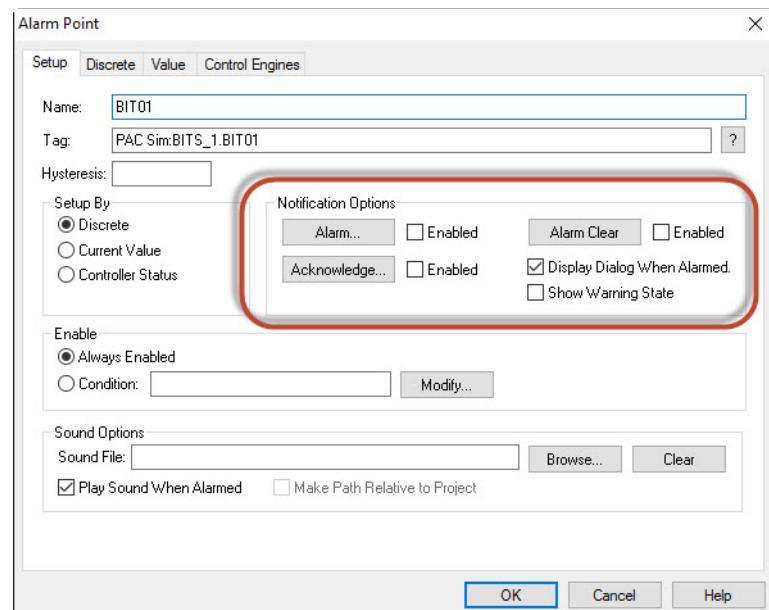
### Alarm, Acknowledge, and Alarm Clear Notifications

You can have a value sent to a tag when any of the following alarm events occur:

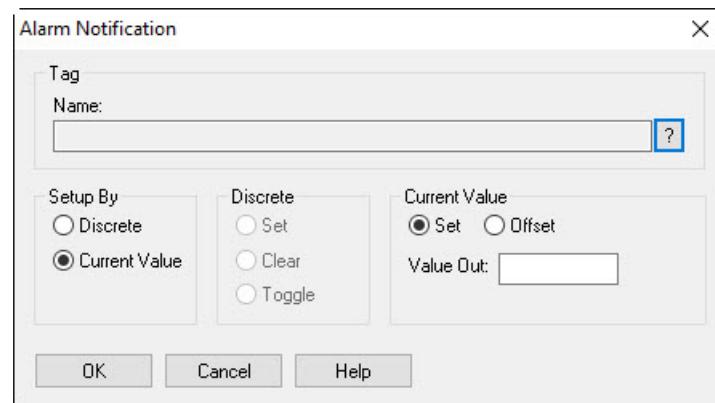
## CONFIGURING ALARM POINTS

- An alarm occurs
- An active alarm is acknowledged
- An active alarm returns to Normal from an alarmed state.

To configure an alarm point for these events, click Alarm, Alarm Clear, or Acknowledge in the Alarm Point dialog box (Configure > Alarm Points > Add or Modify button > Set up tab).



The Alarm Notification, Alarm Clear, or Acknowledge Notification dialog box appears. These dialog boxes are identical. (The Alarm Notification dialog box is shown below.)



1. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.
2. In the Setup By group, select Discrete or Value.  
**Discrete** specifies an on/off trigger state for the selected tag. After you select Discrete, define the trigger value by choosing one of the following options:
  - Set—Switches the trigger state to On.
  - Clear—Switches the trigger state to Off.

- Toggle—Switches the trigger state from its current condition to the opposite (for example, On is switched to Off).

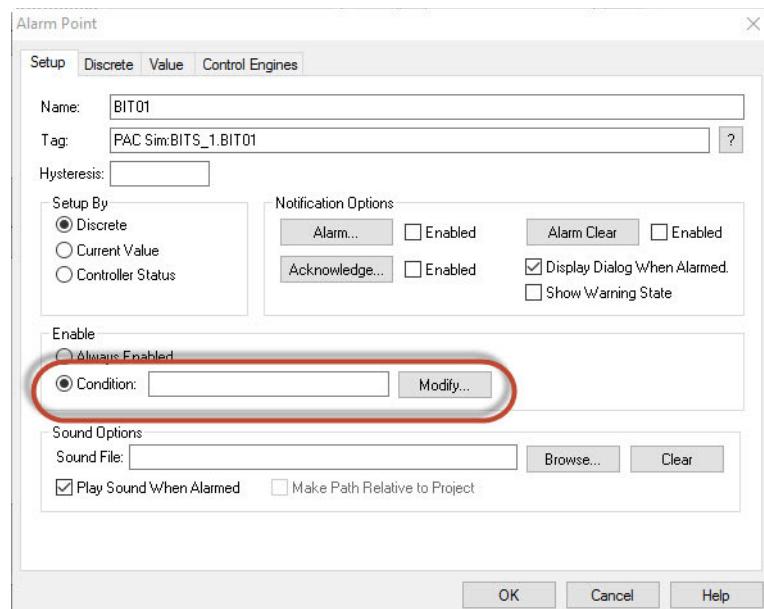
**Value** defines the floating point or integer value that is written to the tag. After you select Value, define the value by choosing one of the following options, then entering a value in the Value Out field:

- Set—Replaces the tag's current value with the value you enter in the Value Out field.
- Offset—Adds the value you enter in the Value Out field to the tag's current value.

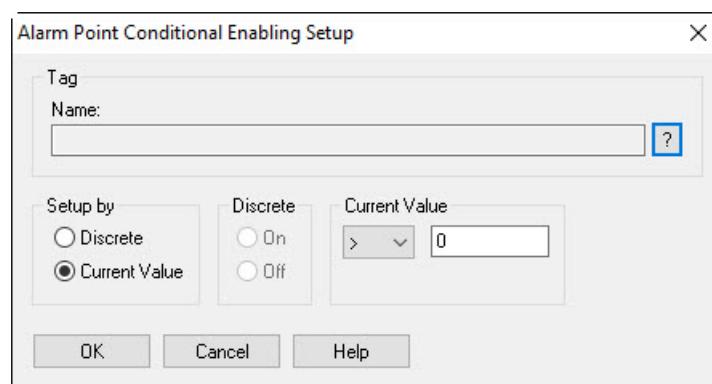
3. Click OK to save your settings and close the dialog box.

### Setting Conditional Alarm Points

1. To make the alarm point dependent on the value of another tag, select Condition in the Alarm Point > Setup tab, then click Modify.



The Alarm Point Conditional Enabling Setup dialog box opens.



2. Configure the tag and conditions.
3. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag. This tag's value will be compared to a value you define.

## CONFIGURING ALARM POINTS

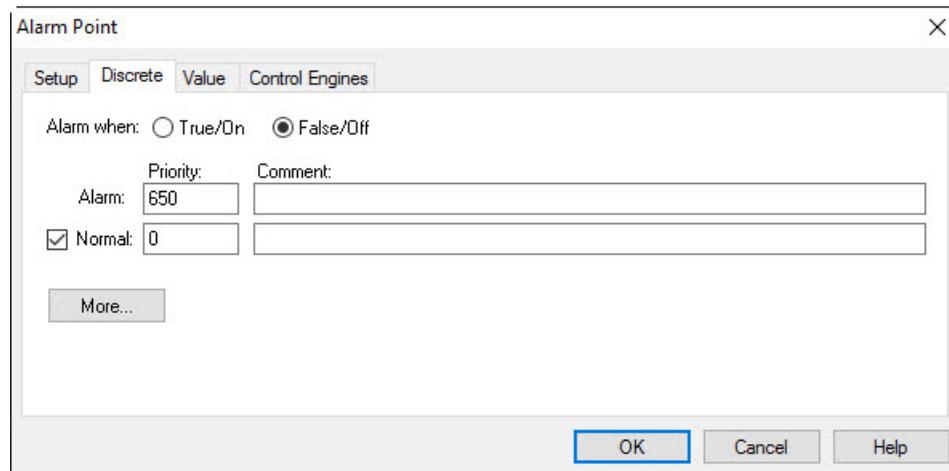
4. Select Discrete or Current value in the Setup by group. Current Value sets the tag value that will trigger the alarm point. Select an operator in the drop-down menu, and then enter a value to compare the tag to. Discrete makes the tag's on or off state trigger the alarm point.

*NOTE: Triggers are edge sensitive, and activate only on a positive transition from a non-triggered state.*

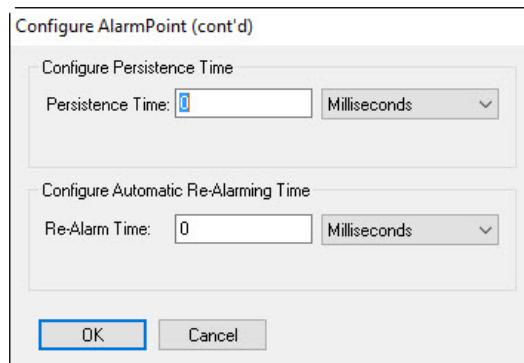
5. Click OK to save your settings and close the dialog box.

### Entering Discrete Alarm Conditions

If you selected Discrete in the Setup by field on the Alarm Point Setup page, complete the alarm point setup by configuring the alarm's state in the Discrete page.



1. To select the state of the alarm condition tag, select True/On to have the alarm point be in the alarm state when the associated tag is "on" for Discretes, or "true" for integer bits. Select False/Off to have the alarm point be in the alarm state when the associated tag is "off" for Discretes or "false" for integer bits.
2. Select the check box next to Normal to have the normal state displayed in history windows and logs. The normal state is the opposite of the alarm state.
3. When an alarm point state occurs, you can define how long it must be in that state (the *persistence time*) before the alarm point is triggered. Click More and enter the Persistence Time in milliseconds or seconds.

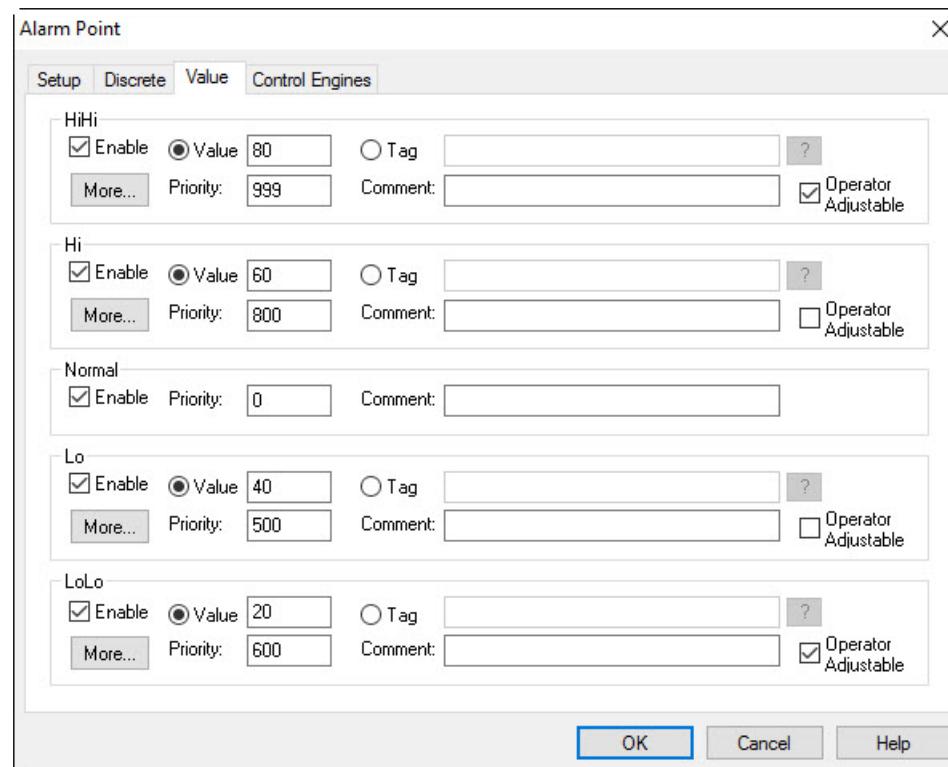


4. When an alarm point state remains *after* the alarm has been triggered and acknowledged, you can define how much time must elapse before the alarm point is re-triggered. Click More and enter the Re-Alarm Time in milliseconds or seconds.

5. Enter an integer value between 0 and 999 in the fields to define an alarm value for each alarm level. The highest priority is represented by 999, and 0 represents the lowest. Priority values can be useful in Runtime for displaying the relative importance of alarm points, and for filtering out alarms with lower priorities.
6. (Optional) In the Comment fields, enter text that will be displayed in alarm graphics for each alarm level. The comment can have a maximum of 256 characters. This comment can display information about the alarm point, for example, or provide instructions to the operator.
7. Click OK to save your settings and close the dialog box.

### Entering Alarm Values

If you selected Current Value in the Setup by field on the Alarm Point Setup page, complete the alarm point setup by configuring the alarm's state in the Value page.



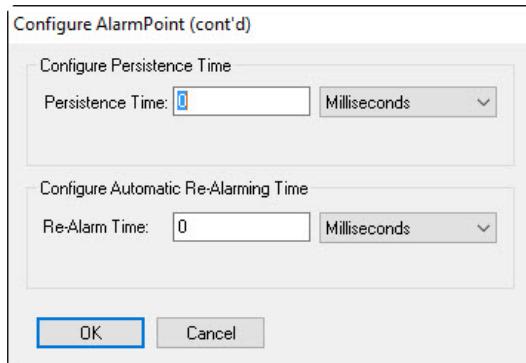
You must define values for each alarm level that will be used with the alarm point. The following alarm levels are available:

- **HiHi** alarms occur when the tag value is greater than or equal to the HiHi value.
- **Hi** alarms occur when the tag value is greater than or equal to the Hi value and less than the HiHi value.
- **Normal** is between the Hi and Lo values.
- **Lo** alarms occur when the tag value is less than or equal to the Lo value and greater than the LoLo value.
- **LoLo** alarms occur when the tag value is less than or equal to the LoLo level.

For each alarm level you want to use with the alarm point:

## CONFIGURING ALARM POINTS

1. To select the state of the alarm condition tag, select True/On to have the alarm point be in the alarm state when the associated tag is “on” for discretes, or “true” for integer bits. Select False/Off to have the alarm point be in the alarm state when the associated tag is “off” for discretes or “false” for integer bits.
2. Select the check box next to Normal to have the normal state displayed in history windows and logs. The normal state is the opposite of the alarm state.
3. When an alarm point state occurs, you can define how long it must be in that state (the *persistence time*) before the alarm point is triggered. Click More and enter the Persistence Time in milliseconds or seconds.

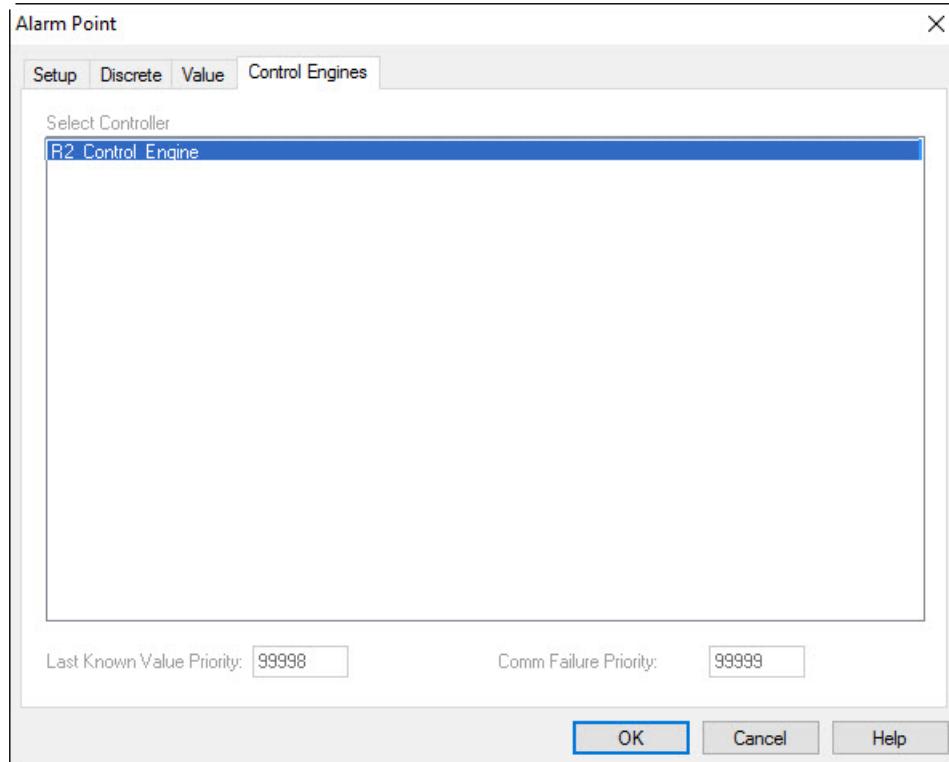


4. When an alarm point state remains *after* the alarm has been triggered and acknowledged, you can define how much time must elapse before the alarm point is re-triggered. Click More and enter the Re-Alarm Time in milliseconds or seconds.
5. Enter an integer value between 0 and 999 in the Priority fields to define an alarm value for each alarm level. The highest priority is represented by 999, and 0 represents the lowest. Priority values can be useful in Runtime for displaying the relative importance of alarm points, and for filtering out alarms with lower priorities.
6. (Optional) In the Comment fields, enter text that will be displayed in alarm graphics for each alarm level. The comment can have a maximum of 256 characters. This comment can display information about the alarm point, for example, or provide instructions to the operator.
7. Click OK to save your settings and close the dialog box.

### Setting Control Engine Status Alarm Points

If you selected Controller Status in the Setup by field on the Alarm Point Setup page, complete the alarm point setup by selecting a control engine from the list on the control engines page. Only control engines that have been added to the PAC Display project are available. See “[Configuring Control Engines](#)” on page 61 for more information on adding primary and backup control engines to a PAC Display project.

*NOTE: When the Control Engine Status option is selected, no other feature in the Alarm Point dialog box is available.*



To configure an alarm point based on control engine status, do the following:

1. Click the Control Engines tab in the Alarm Point dialog box.
2. In the list of available control engines, select the control engine that will be linked to the alarm point.
3. If you want to change the Last Known Value Priority or Comm Failure Priority levels, enter a new value in the corresponding field.  
Using the default settings, these priority levels cannot be filtered out by the user since they are higher than 999. If you want the user to be able to filter out control engine status alarms, set either—or both—values to 999 or less.
4. Click the Setup tab and enter a name for the alarm point in the Name field.
5. Click OK to close the dialog box and save your settings.

## ADDING ALARM GRAPHICS

Alarm graphics monitor alarm points associated with PAC Control tags, and alert the operator when pre-defined alarm conditions are reached.

Alarm graphics can be placed and resized just like a trend or any other graphic object. You can place multiple alarm graphics in any window. See also, ["Configuring Alarm Points" on page 258](#).

To create an alarm graphic:

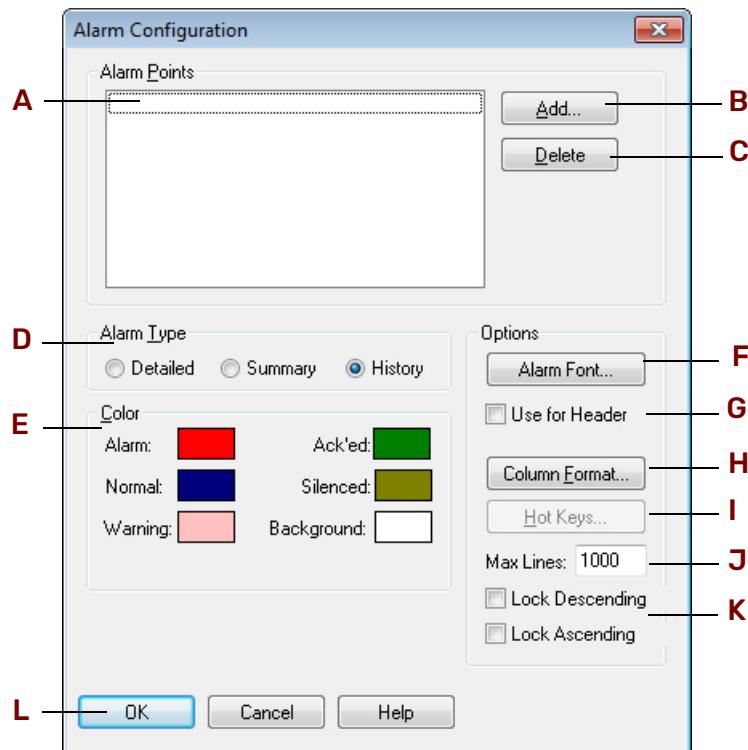
1. Select the Alarm tool  from the Toolbox.
2. Click and drag a large rectangle, and release the mouse.

An alarm graphic similar to the example below appears.

*TIP: Use your mouse pointer to manually adjust columns to the preferred width, or use the Column Format button ([page 215](#)) to set the width in pixels.*

3. To configure alarms for this graphic, choose the Select tool  and double-click the graphic. The Alarm Configuration dialog box opens.

## Alarm Configuration Dialog Box



**(A) Alarm Points.** The Alarm Points list shows configured alarm points that are associated with the alarm graphic. To add an alarm point to the list, click Add (B). To remove an alarm point from the list, click Delete (C).

**(B) Add.** Click Add to add an alarm point to the PAC Display project. In the Alarm Points dialog box that appears, you can select previously configured alarm points or configure new points as needed. To select more

than one alarm point at a time, press and hold the Ctrl key and then click each point you want to add. See “[Configuring Alarm Points](#)” on page 258 for information on adding and configuring alarm points.

**(C) Delete.** Select an alarm point in the list and click Delete to remove it from the alarm graphic. The alarm point is not deleted from the PAC Display project or from any other alarm graphic.

**(D) Alarm Type.** Choose the type of the alarm graphic by selecting Detailed, Summary, or History.

- **Detailed alarms** treat each alarm point state as a separate alarm condition. The operator must acknowledge each alarm point before its name is cleared from the alarm graphic.

For example, if an alarm is in the Lo state and changes to the LoLo state, alarms for both states are listed in the graphic. Alarm points can be selected and acknowledged from a detailed alarm.

- **Summary alarms** display only the state of the current alarm.

For example, if an alarm is in the Lo state and changes to the LoLo state, only the LoLo state alarm is listed in the graphic. Alarm points can be selected and acknowledged from a summary alarm.

- **History alarms** list each change of state for each alarm point. Alarm points cannot be acknowledged from a history alarm.

**(E) Color.** For each of the following items, click a color square and select a color in the Color dialog box that appears.

- Alarm—Alarm points in an alarm condition
- Normal—Alarm points that have returned to their normal state
- Warning—Warning state text
- Ack'd—Alarm points that have been acknowledged
- Silenced—Alarm points that have been silenced
- Background—Background color of an alarm graphic

**(F) Alarm Font.** Click Alarm Font to select the font used in the alarm graphic.

**(G) Use for Header.** Select Use for Header to have the alarm font you selected appear in the alarm graphic’s column headers.

**(H) Column Format.** Click Column Format to set the information that appears on the alarm graphic. In the Alarm Format dialog box that appears, select the information the alarm graphic will display, and the width alarm graphic columns will appear on screen. See “[Setting the Alarm Format](#)” below for configuration information.

**(I) Hot Keys.** Click Hot Keys to configure keys on the keyboard that the operator can use to acknowledge alarms. In the Alarm Hot Keys dialog box that appears, select keys or key combinations the operator can use to acknowledge one or more alarms. Only detailed and summary alarm graphics can have hot keys. See “[Assigning Alarm Hot Keys](#)” on page 276 for more information.

**(J) Max Lines.** Enter a number to set the maximum number of alarm point lines a history alarm graphic can contain. When this number is exceeded, the oldest alarm point is removed to make room for the new point. The History alarm type must be selected for this option to be available.

**(K) Lock Ascending/Descending.** You can lock the history alarm display in either ascending or descending order. By default, the display order is not locked. If locked, no sort arrow appears in the column header and clicking on a column header does not sort by the column.

**(L) OK.** Click OK to save your settings and close the dialog box.

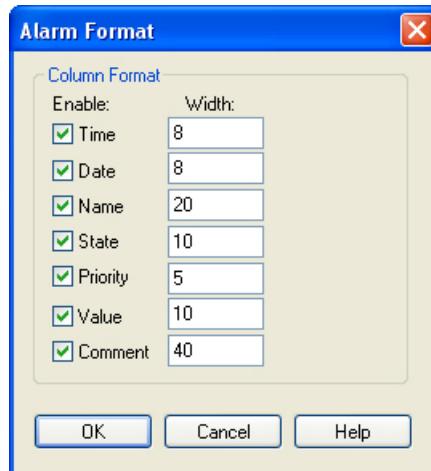
Now we’ll look at the additional steps needed to complete the settings in the Alarm Configuration dialog box.

## Setting the Alarm Format

You can customize the alarm information that appears when an alarm graphic is displayed on screen, or when an alarm log file is sent to a printer.

1. Click the Column Format button on the Alarm Configuration dialog box.

The Alarm Format dialog box appears.



2. Select the check box next to the name of each column that you want to appear in the alarm graphic or printed alarm log.
3. For each column name that you want to use, enter the desired column width (in pixels) in the Width field. For alarm graphics, the widths are an approximate guideline for how wide the columns will appear on screen. For printed alarm logs, the widths are absolute values. If a number or text cannot fit into a printer column, it will be truncated.

## Assigning Alarm Hot Keys

Alarm hot keys are keystrokes or keystroke combinations that the operator can quickly use to respond to alarms. When a hot key is defined for an alarm, pressing a key on the keyboard (along with an optional Ctrl or Shift key) performs the same action as clicking the mouse on an object.

*NOTE: Hot keys can also be defined for dynamic objects in a PAC Display project, but these hot keys are defined separately from alarm hot keys. See "Assigning a Dynamic Attribute to a Graphic Object" on page 165 to learn how to set up hot keys for a dynamic graphic.*

To configure hot keys for an alarm:

1. Click the Hot Keys button on the Alarm Configuration dialog box.



2. Select a key in the drop-down list for the function you want to use:
  - **Acknowledge.** This hot key will have the same effect as pushing the alarm's "Acknowledge" button
  - **Acknowledge All.** This hot key will have the same effect as pushing the alarm's "Acknowledge All" button
  - **Select List.** This highlights the alarm point list on the display. Once the alarm point list is highlighted, cursor keys can be used to select alarm points for acknowledgment.
3. If you want to use the Ctrl and/or Shift keys in combination with the key you've chosen, select Ctrl, Shift, or both.

## CONFIGURING PROJECT ALARMS

To configure alarm features for the whole project, click Configure > Alarming Setup and configure the following settings as needed in the Alarming Setup dialog box described in:

["Alarm Runtime and User Options" on page 277](#)

["Email Options" on page 279](#)

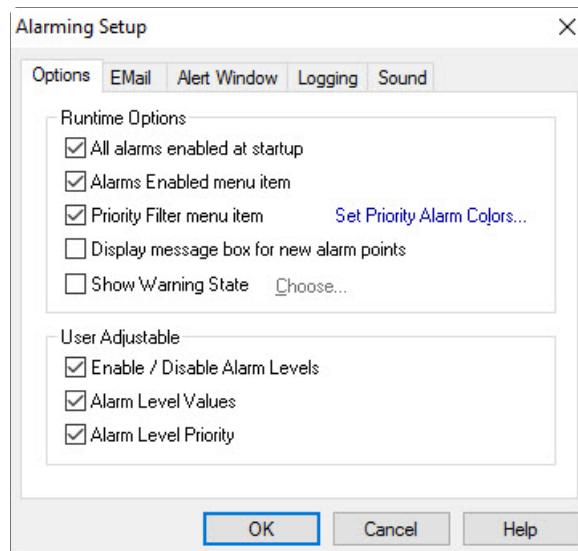
["Alert Window Options" on page 283](#)

["Alarm Logging Options" on page 284](#)

["Alarm Sound Options" on page 287](#)

### Alarm Runtime and User Options

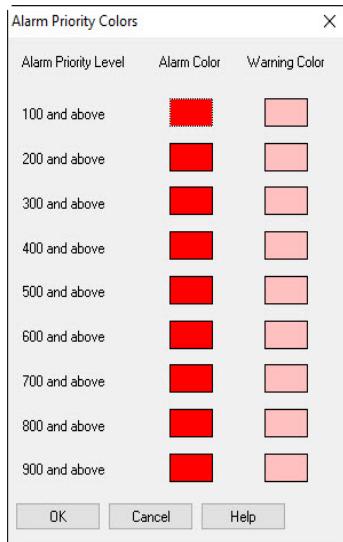
The Options tab allows you to configure how an alarm appears in PAC Display Runtime. It also provides options for how a user can work with alarms in a PAC Display project.



To set how an alarm appears in PAC Display Runtime, select one or more of the following options in the Runtime Options group:

- All alarms enabled at startup—Enables all alarms when the project starts in Runtime.
- Alarms Enabled menu item—Makes the Alarms Enabled menu available for the user to enable and disable all alarms.
- Priority Filter menu item—Makes the Priority Filter menu available for the user to control whether to view all alarms, or only alarms exceeding a specified priority value.

- Set Priority Alarm Colors—Click the link to display the Alarm Priority Colors dialog box where you can customize the color of alarms and warnings based on priority.



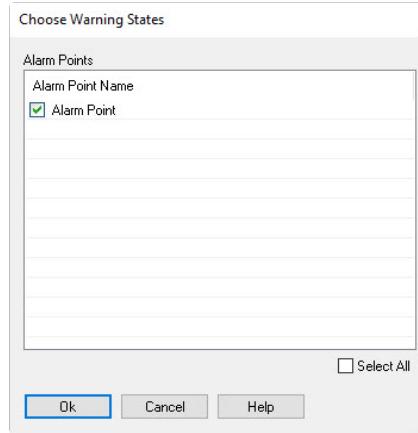
- a. Click a color to display the Color dialog box, where you can select a color or configure a custom color. When you've finished configuring the color, click OK to close the dialog box.
- b. If desired, configure additional alarm and warning colors. When you've finished, click OK to close the Alarm Priority Colors dialog box.  
–Display message box for new alarm points—Makes a dialog box appear containing information about the alarm point. The user can acknowledge the alarm in this dialog box, or close it and acknowledge the alarm at a later time. See also, ["Configuring Alarm Points" on page 258](#) to adjust this setting on a per-alarm basis.

*NOTE: Setting or clearing this setting in the Alarming Setup dialog will set or clear this option for all alarm points. Therefore, you should set this global default first, and then adjust the setting on a per-alarm point basis.*

- c. A persistence time has been configured for the alarm point (see ["Entering Discrete Alarm Conditions" on page 270](#) and ["Entering Alarm Values" on page 271](#)) and the alarm has been triggered, but is waiting for the persistence time to expire.
- d. An alarm point has the Re-Alarm Time option configured and is still in the triggered state after being acknowledged. To see the Re-Alarm option, select Configure > Alarm Points. Then click the Add or Modify button, click the Discrete or Value tab (depending on the alarm type), and click one of the More buttons.

When selected, the Show Warning State option enables all alarm points to be displayed in the alarm graphic when these points enter the warning state. If alarm points have already been configured, you can select specific alarm points to be displayed in the warning state. To do this, first select this option, then click Choose... to open the Choose Warning State dialog box. Select the alarm points you to display in the alarm state, then click OK. Select All to select all of the alarm points. Select Clear All to de-select them.

See also, “Configuring Alarm Points” on page 258.



*NOTE: To override this behavior when configuring new alarm points or modifying existing alarm points, use the Show Warning State option in the Notification Options section of the Alarm Point dialog. See “Configuring Alarm Points” on page 258.*

To define the changes a user can make to an alarm in PAC Display Runtime, select one or more of the following options in the User Adjustable group:

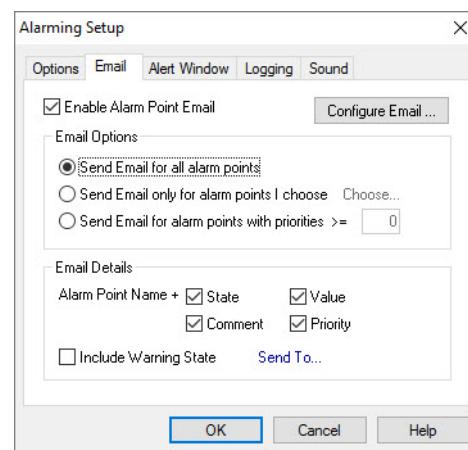
- Enable/Disable Alarm Levels—Allows the user to enable or disable alarm points
- Alarm Level Values—Allows the user to change alarm point values
- Alarm Level Priority—Allows the user to change alarm point priorities

Click OK to save your settings and close the dialog box.

## Email Options

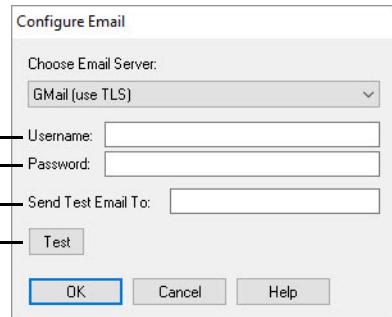
Use the Email tab to configure email to be sent when alarms occur:

1. Select Configure > Alarming Setup, and then click the Email tab.



2. To enable sending emails, make sure Enable Alarm Point Email is selected, and then click Configure Email.

The Configure Email dialog box appears.



- a.** From the drop-down list, select the email server that will send the email:
  - AOL®—uses TLS protocol
  - Custom—allows you to configure an email server that is not in the list
  - Gmail™—uses SSL protocol
  - Gmail™—uses TLS protocol
  - Hotmail®—uses TLS protocol
  - System default—uses Outlook Express®
  - Yahoo®—uses SSL protocol
- b.** If you selected Custom in [step a](#), continue to [step 3](#).  
If you did not select Custom in [step a](#):

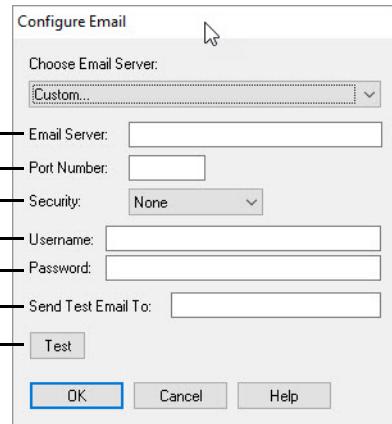
For all options except System Default, in the **A** Username and **B** Password fields, type the email address and password to be used when PAC Display logs on to the email server.

When an email is sent, the email address in the Username field will appear in the email's "From" field.

*NOTE: The Username and Password fields are disabled for the System Default option, because the system uses the default Microsoft Outlook user name and password for the computer where PAC Display is installed.*

- c.** To test the email server configuration, type a recipient's email address in the **C** Send Test Email To field, and then click **D** Test.  
If your configuration is valid, a "Mail sent successfully!" message is displayed, and an email with the subject "Test Email message from PAC Display" is sent to the recipient.  
If the test fails, an error message is displayed.
- d.** Click OK to save the changes and close the dialog box.  
The Alarming Setup dialog box is again displayed.  
Continue to [step 4](#).

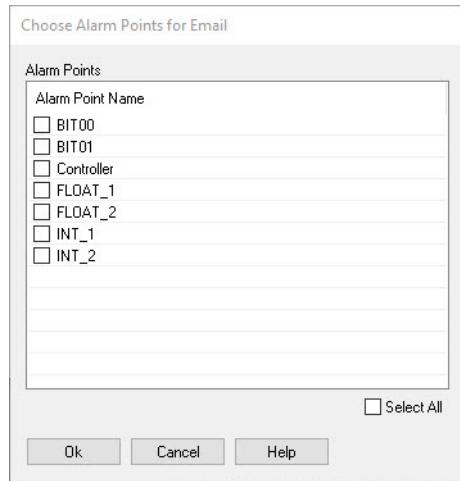
3. If you selected Custom in step 2a, the Configure Email dialog box looks like this:



- a. Complete the fields:
    - A** Email Server—The IP address or domain name of your outgoing email server.
    - B** Port Number—The port number that the Email Server listens on.
    - C** Security—Select the cryptographic Internet protocol that the server uses. Options are None, SSL, or TLS.
  - b. In the **(D)** Username and **(E)** Password fields, type the email address and password to be used when PAC Display logs on to the email server.  
When an email is sent, the email address in the Username field will appear in the email's "From" field.
  - c. To test the email server configuration, type a recipient's email address in the **(F)** Send Test Email To field, and then click **(G)** Test.  
If your configuration is valid, a "Mail sent successfully!" message is displayed, and an email with the subject "Test Email message from PAC Display" is sent to the recipient.  
If the test fails, an error message is displayed.
  - d. Click OK to save the changes and close the dialog box.  
The Alarming Setup dialog box is again displayed.
4. In the Email Options area of the Alarming Setup > Email tab, select one of the following options:
- Send Email for all alarm points—Creates and sends an email to the recipients you enter.

## CONFIGURING PROJECT ALARMS

- Send Email only for alarm points I choose—Click Choose to open a dialog box listing all alarm points currently configured.

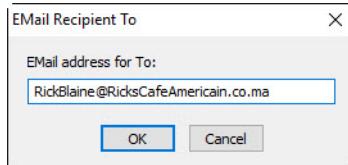


- Check the alarm points for which an email is to be sent. Choose Select All to select all alarm points. Choose Clear All to clear all selected alarm points.
  - Click OK to save your selections and close the dialog box.
- Send Email for alarm points with priorities  $\geq$  —Sends email only for alarm points with a priority greater than or equal to that specified. This is useful for alarm points where only a specific state (such as HiHi or LoLo) warrant an email, or for other critical alarm points.
5. In the Email Details area of the Alarming Setup dialog box, select the level of information that will be sent in the email. By default, all emails will include the name of the alarm point. You can also select State, Value, Comment and Priority to be included.
  6. Select Include Warning State if you want to send an email when the alarm point enters the Warning state.
  7. Click Send To to launch the Email Recipients dialog box:



- a. Click To, Cc, or Bcc to open a dialog to enter the email addresses of the recipients. When you have entered an email address, you can do any of the following things:

- To modify an entry, double-click the entry in the list to open the Email Recipient dialog box:



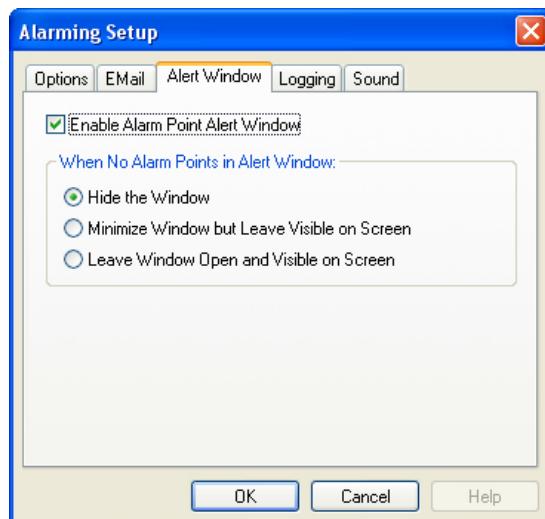
- Enter the change, and then click OK.
  - To delete an entry from any list, click on the entry and press the Delete key. In the confirmation dialog box, click Yes to delete the entry.
- b.** (Optional) To allow users to make changes to the configured email recipients, select Allow Email to be edited before sent.

When enabled, this option displays the email in the default email window, so the user can edit the email before sending it. If this option is not selected, Runtime sends the email with no user interaction.

*NOTE: When an email is sent with no user interaction, a prompt may appear asking whether you want to send the email. Click Yes to send the email. For information on how to set up your mail client to handle this kind of message, see the documentation for your mail client.*

## Alert Window Options

Use the Alert Window tab to enable alarm points that have entered a Warning state to appear in the Alert Window in Runtime.

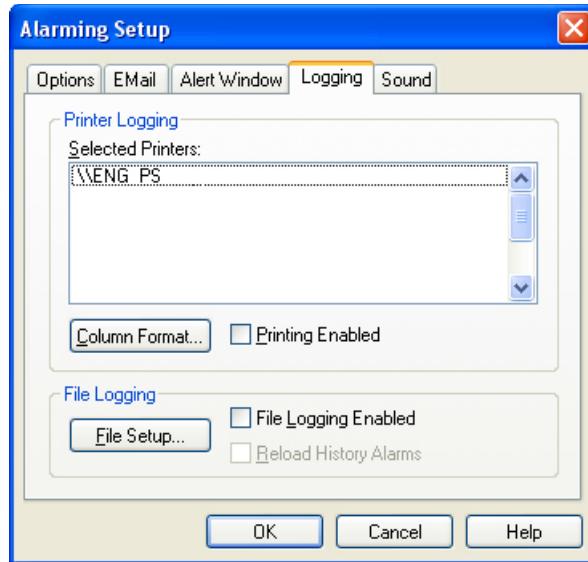


1. Select Enable Alarm Point Alert Window to enable alarm points that have entered a Warning state to appear in the Alert Window in Runtime.
2. Under When No Alarm Points in Alert Window select one of the following options:
  - Hide the Window—Removes the Alert Window from the screen when the last alarm point has been removed from the window.

- Minimize Window but Leave Visible on Screen—Collapses the contents of the window to just the caption bar when the last alarm point has been removed from the window, and leaves the collapsed window on screen.
- Leave Window Open and Visible on Screen—Leaves the window open and visible when the last alarm point has been removed from the window.

### Alarm Logging Options

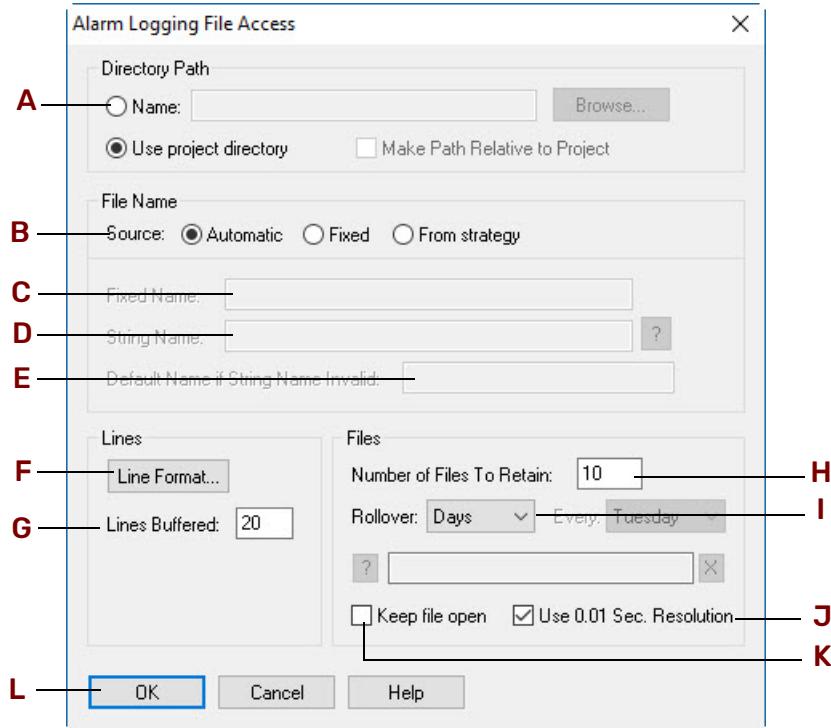
Use the Logging tab to configure how alarm data is sent to a printer or saved in a file.



1. To choose a printer to send alarm data to, select Printing Enabled and then choose a printer from the Selected Printers list. If you want to use a printer that does not appear on the list, you will need to install the printer so that it can be accessed from your PC. If you aren't sure how to do this, refer to documentation from Microsoft and your computer manufacturer.  
Note that if you move the PAC Display project from one Windows operating system to another, you must reselect the printers.
2. To choose the alarm information that appears on the printed alarm log, click the Column Format button. In the Alarm Format dialog box that appears, set the format in which the alarm graphic will appear on screen and the information it will contain. See ["Setting the Alarm Format" on page 276](#) for configuration information.
3. If you want History Alarm windows to be refreshed (have their contents updated) each time they open, select Reload History Alarms. This option is available only when file logging has also been enabled.
4. To save a log file of alarm data to disk, select File Logging Enabled and click File Setup.

In the Alarm Logging File Access dialog box that opens, you can configure the name, location, line format, and other settings for the log file where the alarm data will be saved. By default, PAC Display saves alarm logs as

text files in Unicode (UTF-16) format. To save all logs in ASCII format, select the “Save log files in ASCII format” check box in the Runtime Setup dialog box. For details, see [“Runtime Setup: General Tab” on page 290](#).



**(A) Directory Path.** Choose the directory where the alarm log file will be saved. Click Name and enter the directory path in the field next to it, or click Browse to find a directory path.

Click Use Project Directory to save the alarm log file to the PAC Display project directory. (This occurs by default if you don't specify another location.)

To save alarm log files in a folder relative to the folder that the project is in, select Make Path Relative to Project. If you then save the project to a different folder (or even to a different computer), PAC Display will save and look for files in the relative path.

For example, if the project is saved in C:\proj\ and you configure log files to be in C:\proj\alarms\, then the relative path would be this: .\alarms\

If you then saved the project to C:\temp\newproj\, PAC Display would save and look for log files in the new location's relative path: C:\temp\newproj\alarms\

**(B) File Name.** Select Automatic, Fixed, or From strategy to determine how the alarm log file name will be created, and then fill in additional information as needed for that option.

If the Automatic option is used, log files are named based on the rules described in [“Naming Historical Data Log Files” on page 230](#). If you select this option, files are named using the rollover convention if required; this is described in more detail on [page 230](#). If rollover is not used, the file is named “alarmlog.alm.” The Automatic option is used by default if you do not select another option.

**(C) Fixed Name.** If you selected the Fixed option in **B**, enter a file name here. The file name can be any valid, eight-character DOS file name and doesn't require a three-character file extension. Note that if you don't specify an extension, one is *not* added automatically.

**(D) String Name.** If you selected the From strategy option in **B**, enter a PAC Control string tagname here. Use the Tag Selection button  to quickly enter the tag containing the name of the alarm log file. When the trigger starts the alarm log, the string containing the file name is read, and the new data is appended to the log file if the file already exists. If the file doesn't already exist, it is created. The rollover naming convention doesn't apply to this type of file name.

If the string in **D** is an invalid file name, the default name of the log file is created using the following rules:

- If the string is empty, the project directory is added to Default Name (**E**) and the extension .alm is used.
- If the string is not empty and a project directory is not specified as the directory path, the Name in **A** is added to Default Name (**E**).
- If the project directory is specified as the path, or the previous step failed, the project directory is added to Default Name (**E**) and the extension .alm is used. If the project directory is read-only or there is not enough room left on the drive containing the project directory, an error message indicates that the file could not be created.

**(E) Default Name.** Enter a default file name here in case the file name used in String Name (**D**) is invalid. The file name can be any valid, eight-character DOS file name. The three-character file extension .alm is assigned by PAC Display.

**(F) Line Format.** Click to configure the character, or delimiter, used to separate the data in the log file, to choose the type of quotes used for each data line, and where to insert carriage returns. You configure these parameters in the Line Format dialog box that appears. See [page 230](#) for more information.

**(G) Lines Buffered.** Enter the number of lines of data your PC will save to a memory buffer before writing the information to the alarm log file. When choosing a number, keep in mind that the lower the number of buffered data lines, the more frequently the computer has to write to the file. Alternately, the higher the number of data lines buffered in memory, the more data that will be lost if your PC loses power or has a system failure. A valid entry is any number between 0 and 999; the default is 20 files.

**(H) Number of Files to Retain.** Enter the maximum number of alarm log files that can be created using rollover before the oldest file is overwritten. For example, if you enter 10 and your rollover time period is set to hours, you will have 10 alarm log files created for 10 hours of data before the oldest file is overwritten with new data. See [page 230](#) for more information on rollover settings.

**(I) Rollover.** Choose the rollover time period here. Select None to have all logged data placed in a single data file named ALARMLOG.ALM. If you select Weeks, also select the day of the week to have the files rollover. Logging begins when the PAC Display project is loaded, and data collected will be appended to the existing data file. The size of the file is limited only by available disk space.

To use the Trigger option, see ["Using the Rollover Trigger Option" on page 227](#). Logging begins when the Start Trigger is activated, and data collected is appended to the existing data file.

**(J) Use 0.01 Sec Resolution.** Select this option to log the time in hundredths of a second.

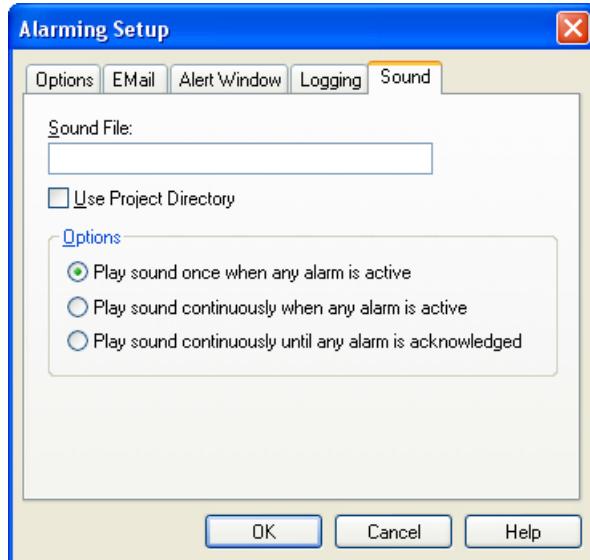
**(K) Keep File Open.** Select Keep File Open to allow buffered data to be appended to the alarm log file more quickly. If you leave this box unchecked (the default setting), the file is closed after each time data is written to it. This provides greater data integrity than leaving the file open.

**(L) OK.** Click OK to save your settings and close the dialog box.

## Alarm Sound Options

*NOTE: To play sound files, the PC running the project must have a properly configured sound card and corresponding system software, as well as a set of speakers. You can use both digitized sound (.wav) and MIDI music (.mid) files in your project.*

The Sound tab allows you to define an alarm sound and the conditions when it is played.



1. To enter the name of the sound you want played, click Browse and locate the sound file.  
If you select Use Project Directory, the sound file must reside in the project directory. This option is useful if the project directory might be moved to a different location.
2. Select an option to determine how many times the sound will play when a new alarm occurs:
  - Play sound once when any alarm is active—The sound plays once, then stops.
  - Play sound continuously when any alarm is active—The sound continues to play until the operator acknowledges all active alarms.
  - Play sound continuously until any alarm is acknowledged—The sound continues to play until the operator acknowledges at least one active alarm.
3. Click OK to save your settings and close the dialog box.

See also ["Configuring Alarm Points" on page 258](#) to assign a sound to a specific alarm point.

*NOTE: If an alarm point has been configured to play the global sound file, but then the global sound file is cleared in this dialog box, a message will ask you to configure a default sound or proceed with this choice for the alarm point.*



# 10: Configuring and Using PAC Display Runtime

This chapter describes the versions of PAC Display Runtime that can be used, and explains how to customize features that are available when your project runs in PAC Display Runtime. It also explains how to use features that an operator sees and works with when using Runtime.

## In This Chapter

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<a href="#">Runtime Setup: General Tab</a> .....	page 290
<a href="#">Runtime Setup: Control Engine Tab</a> .....	page 294
<a href="#">Runtime Setup: Security Tab</a> .....	page 297
<a href="#">Runtime Setup: I/O Unit Tag Tab</a> .....	page 319
<a href="#">Using Runtime</a> .....	page 320

## CONFIGURING RUNTIME

You can configure some of the ways that a PAC Display project appears in Runtime. Using PAC Display Configurator, you can specify which windows are open or closed, whether the menu is displayed, and whether or not the operator can exit the program. You can also customize options for the Event Log Viewer, a window that displays messages about the status and other characteristics of a PAC Display project. And you can control whether a PAC Display project gathers I/O unit information, such as I/O point states and values, from tags on a control engine or directly from an I/O unit itself.

*NOTE: If you want to run your PAC Display project on a computer with multiple monitors, in PAC Display Configurator simply extend the project's main window across the monitors you want to use. When you open the project in Runtime, the main window will appear the way you positioned it over the monitors. For more information on using multiple computer monitors, see the PAC Display User's Guide "System Requirements" on page 4 and "Using Multiple Monitors" on page 34.*

To set up a project for Runtime, click Configure > Runtime from the PAC Display Configurator, then configure the settings in the Runtime Setup dialog box.

["Runtime Setup: General Tab"](#) (below)

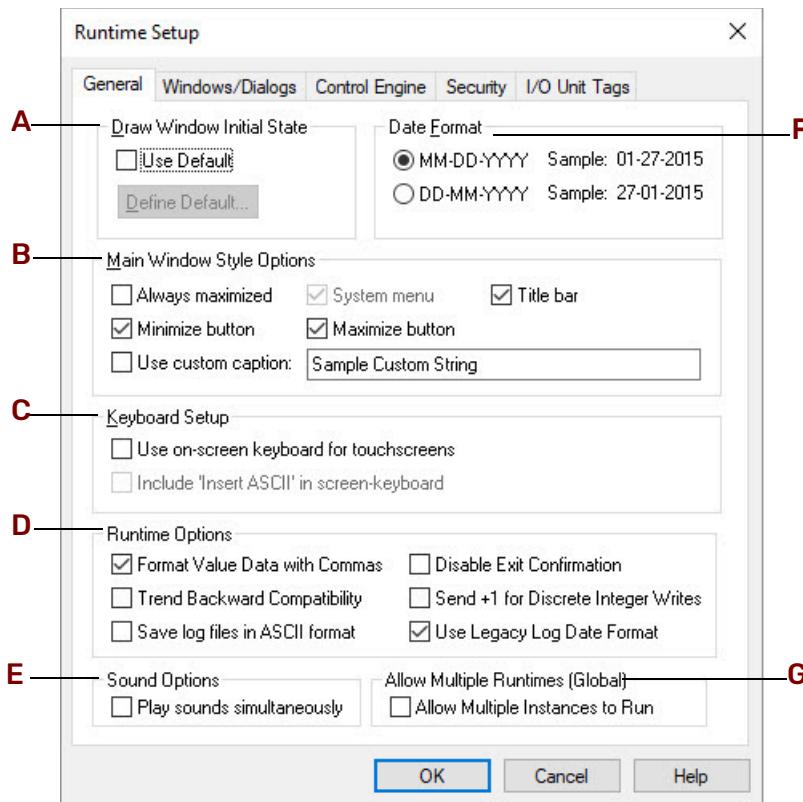
["Runtime Setup: Windows/Dialogs Tab, Multi-Monitor Options: Center Dialogs on"](#) on page 293

["Runtime Setup: Control Engine Tab"](#) on page 294

["Runtime Setup: Security Tab"](#) on page 297

["Runtime Setup: I/O Unit Tag Tab"](#) on page 319

## RUNTIME SETUP: GENERAL TAB



**(A) Draw Window Initial State.** Use these options to configure how the project's windows will look when the project is first opened in Runtime. To set the default options, check the Use Default check box, and then click Define Default to set the default options. In the Pop Window dialog box that opens, select windows and configure whether the window is opened, closed, or iconified. See “[Using Draw Windows and URL Windows](#)” on page 91 for additional options for configuring window states in Runtime.

**(B) Main Window Style Options.** Use these options to customize the PAC Display Runtime application window.

- **Always Maximized** keeps the main window completely open, covering the entire screen. When this option is selected, the Minimize and Maximize button options are not available; deselect Always Maximize if you want to choose the minimize or maximize options.
- **Use Custom Caption** lets you enter a title that will appear in the title bar of the main window. Enter the title in the Custom Caption field. If a customized caption ends with a hyphen (-), the project file name is added to the caption.
- **Title Bar** displays the Windows title bar for the main window. If space is limited on your operator interface, deselect this option to slightly increase the viewable area that's available. If you deselect the Title Bar option, note that all options within the group except for Always Maximized are unavailable.

**(C) Keyboard Setup.** Use these options to set up your PAC Display project to run on a touchscreen terminal.

- **Use On-Screen Keyboard for Touchscreens.** Check this option to enable the use of an on-screen keyboard with the Send String and Send Value Dynamic Attributes. Use this option when PAC Display Runtime is running on a computer without a physical keyboard and has a touchscreen. Selecting this option enables all Send String and Send Value Dynamic Attributes in a project.
- **Include 'Insert ASCII' in Screen-Keyboard.** Select this option to include the 'Insert ASCII' parameter in the On-Screen Send String dialog box. The 'Insert ASCII' feature allows a user to enter any character value between 0-255. This option is available only for the Send String Dynamic Attribute. The Use On-Screen Keyboard for Touch Screens option must be checked in order for this option to be available.

**(D) Runtime Options.** Use these options to configure the following:

- **Format Value Data with Commas.** Displays large numbers using commas. For example, one million displays as 1,000,000. However, if a data field in an existing project is too small to display large numbers with commas, you can deselect this option. Without commas, one million displays as 1000000.
- **Trend Backward Compatibility.** Displays Trend data in the same manner as it is displayed in OptoDisplay. This is the same effect as selecting None as the y-axis Label Position on the Trend Configuration dialog box, except that the labels are displayed. Multiple ranges appear to overlap, and all pens are displayed. As shown in the following example, if pen 1 has a range of 0-100 and pen 2 has a range of 300-400, the y-axis has a range of 0-100 and 300-400 simultaneously and both pens are displayed. By default, this option is disabled.
- **Save log files in ASCII format.** Saves all alarm logs, event logs, historical data logs, and Runtime operator logs in ASCII format.
- **Disable Exit Confirmation.** Keeps PAC Display Runtime from displaying a confirmation message when you close the program.
- **Send +1 for Discrete Integer Writes.** Allows PAC Display Runtime to mimic OptoDisplay Runtime when sending Discrete Writes to integer variables that have no bit index specified (the bit index field is left blank). This is helpful when upgrading projects from FactoryFloor or OptoDisplay, or when there is logic in strategies that tests against *true* rather than *not false*. Note that *false* is defined as zero (0) and *true* is defined as any value that is "*not false*".  
If the bit index field is left blank when configuring a discrete write to an integer, a message says, "No Bit Index specified. All bits will be modified." **If you click Yes, Runtime will send a value of -1 (all bits set) when sending Discrete Writes to integer variables whose bit index field is blank.** By using this option, Runtime sets only the first bit of the integer to a 1, resulting in an actual integer value of +1 (the same as OptoDisplay). This option affects all the discrete write options: Set, Toggle, Direct, and Reverse.
- **Use Legacy Log Date Format.** Ensures that the date/time format for records in historical data logs is YYYY/MM/DD, HH:MM:SS.SSS. This option is selected by default. Deselect this option to log records using the MM/DD/YYYY, HH:MM:SS.SSS date/time format.

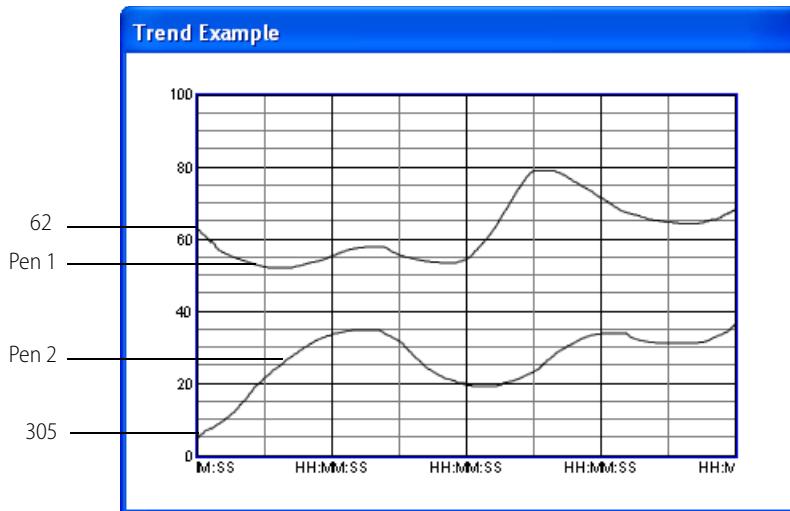
**(E) Sound Options.** If you want all sounds to play as they occur, select "Play sounds simultaneously." This allows each sound that occurs to play at the same time other sounds are playing. If this option is not selected, each sound that occurs will play one at a time in a round-robin fashion.

**(F) Date Format.** Use the Date Format options to change how the date appears in Alarm windows, SuperTrend objects, and historical data log files. When you switch from one date format to another, any SuperTrends placed in a window are immediately updated to reflect the selected date format.

You can select one of two date formats:

- **MM-DD-YYYY** displays the date as month, day, and year.  
For example, October 31, 1999 would be displayed as 10-31-1999.
- **DD-MM-YYYY** displays the date as day, month, and year.

For example, October 31, 1999 would be displayed as 31-10-1999.



If the "Play sounds simultaneously" is checked, sounds start playing immediately, regardless if other sounds are still playing, and will overlap any currently playing sounds.

For examples, see "[Setting Up Sound Options](#)" on page 292

**(G) Allow Multiple Runtimes.** Select this option to allow multiple runtimes to run at the same time.

**CAUTION:** Before using this option, consider the following:

- If each project is logging to files (SuperTrend, Historical, Operator Logging, etc.), are the projects saving data to the same file(s)? If so, system instability or a crash may occur.
- Performance will be reduced for each Runtime project.

See also, "[Running Multiple Runtimes](#)" on page 323

## Setting Up Sound Options

If you want all sounds to play as they occur, select "Play sounds simultaneously." This allows each sound that occurs to play at the same time other sounds are playing. If this option is not selected, each sound that occurs will play one at a time in a round-robin fashion.

If the "Play sounds simultaneously" is checked, sounds start playing immediately, regardless if other sounds are still playing, and will overlap any currently playing sounds

In the following examples, sounds A and B may be configured for alarms, triggers, etc. Sound A is configured to repeat five times. Sound B is configured to repeat three times.

**Scenario 1.** Sound A and sound B are triggered at the same time.

- If the "Play sounds simultaneously" is not checked, sound A will play five times, and then sound B will play three times.  
AAAAAABB  
(time —> )
- If the "Play sounds simultaneously" is checked, sounds A and B will play at the same time with sound A playing five times, and sound B playing three times.  
AAAAAA  
BBB

(time —>)

**Scenario 2.** Sound A is triggered. While it is playing, sound A is triggered again.

- If the “Play sounds simultaneously” is not checked, the initial five instances of sound A will continue to play until all five have played. Then the next five instances of sound A will play.

AAAAAAA  
(time —> )

- If the “Play sounds simultaneously” is checked, when sound A is triggered the second time, it will start immediately, and it may overlap the initial five sounds from the first trigger.

AAAAA  
AAAAA  
(time —> )

**Scenario 3.** Both sounds are triggered at the same time. Sound A is one second long, and sound B is three seconds long.

- If the “Play sounds simultaneously” is not checked, the sounds will play one after the other.

AAAAAB--B--B--  
(time —> )

- If the “Play sounds simultaneously” is checked, the sounds will play at the same time. Sound A will end before sound B.

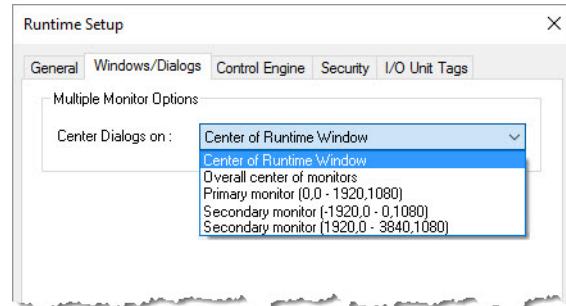
AAAAA  
B--B--B--  
(time —> )

If you deselect the Title Bar option, note that all options within the group except for Always Maximized are unavailable.

## RUNTIME SETUP: WINDOWS/DIALOGS TAB, MULTI-MONITOR OPTIONS: CENTER DIALOGS ON

Select this option to specify where PAC Display Runtime dialog boxes should open when Runtime is running on a computer with more than one monitor.

*NOTE: This option cannot center the following Microsoft Windows common dialog boxes: Color, Font, File Open, File Close, and Print. These dialog boxes open where they were last positioned.*



**Center of Runtime Window.** (Default) Dialog boxes are centered on the main Runtime window. They will keep centering on the main window, even if you move it to a different monitor.

**Overall center of monitors.** (For use with an odd number—3, 5, 7, and so forth—of monitors.) Dialog boxes are centered at the center of all monitors. (The center of all monitors is defined by your computer's graphics card settings or Microsoft Windows display settings.)

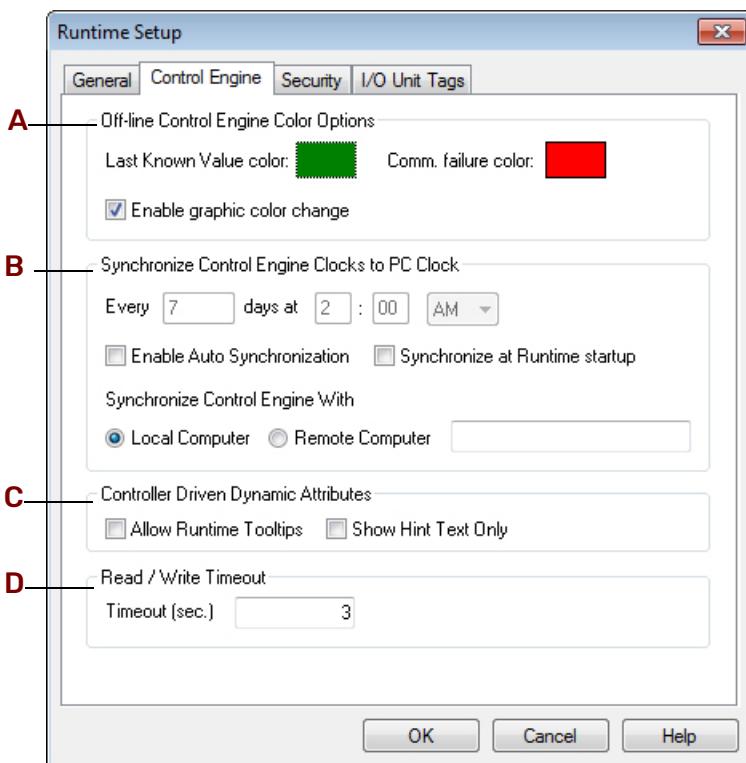
**Primary monitor.** (n,n - nnnn,nnnn) Dialog boxes are centered on the primary monitor, regardless of which monitor displays PAC Display Runtime. (The primary monitor is defined by your computer's graphics card settings or Microsoft Windows display settings.)

The numbers in the parentheses are the top left and bottom right coordinates of the primary monitor. These numbers may differ depending on the monitor's size and position relative to the other monitors being used.

**Secondary monitor.** (nnnn,nnnn - nnnn,nnnn). Dialog boxes are centered on the secondary monitor(s). All monitors other than the primary monitor are displayed in the list as "Secondary" monitors.

The numbers in parentheses are the monitor's top left and bottom right coordinates relative to the primary monitor. For example, a secondary monitor with coordinates of (-1920,0 - 0,1080) would be to the "left" of the primary monitor, and a secondary monitor with (1920,0 - 3840,1080) coordinates would be to the "right" of the primary.

## RUNTIME SETUP: CONTROL ENGINE TAB



**(A) Off-line Control Engine Color Options.** If one or more control engines stops communicating, you can have all graphics with dynamic attributes tied to the control engine(s) change color to indicate the control engine's state.

- **Last Known Value color**—If communication is lost during Runtime, PAC Display Runtime changes the colors configured for the graphic object's dynamic attributes (for example, Text Color, Control Engine Status color, or Text In from Control Engine color) to the color you configure here. Data displayed in the Last Known Value color represents the last value returned before communication was lost.

- **Comm Failure color**—PAC Display Runtime changes the graphic object's normal color to the color you configure if communication cannot be established when Runtime launches.

When your PAC Display project includes data from multiple control engines, configuring colors for both conditions makes it easier to know whether communication for a particular source was lost or was never established.

If any graphic object in the project uses the View Control Engine Status dynamic attribute, the object will still change color based on control engine status. If the color used for this dynamic attribute is different from the "Offline control engine" color, you must confirm which color setting to use.

**(B) Synchronize Control Engine Clocks to PC Clock.** Enable control engine clocks to be synchronized with the PC clock on the PC that is running OptoOPCServer.

- **Enable Auto Synchronization:** When enabled, set the day and time that the control engine clock is automatically synchronized with the PC clock.
- **Synchronize at Runtime startup:** When enabled, the control engines are synchronized with the PC clock every time Runtime is started.
- **Synchronize Control Engine With:** When enabled, choose which PC to use to sync the control engine's clock. If you choose Remote Computer, a dialog box appears to browse to the remote computer. This option is useful if there are several PCs running the same PAC Display project gathering data from the same control engine because clocks may vary considerably from one PC to the next.

**(C) Controller Driven Dynamic Attributes.** If Allow Runtime Tooltips is enabled, when a user places the cursor over a graphic object that has control engine-driven attributes in Runtime, the current values are displayed in a pop-up tooltip. See also, [Using Allow Runtime Tooltips](#).

**(D) Read/Write Timeout.** Enter the read/write timeout in seconds. The default is 3 seconds. This is the timeout setting for Send Value, Send Discrete and Send String (writes) and Discrete Toggles (reads), and other operator-driven actions that require an immediate read of a value. This does not apply to control engine-driven attributes where the values are read (text-in, fill color, etc.) or things like historical data log and SuperTrends. If the tag can't be written to (or read from) in the configured time, a message is put in the event log.

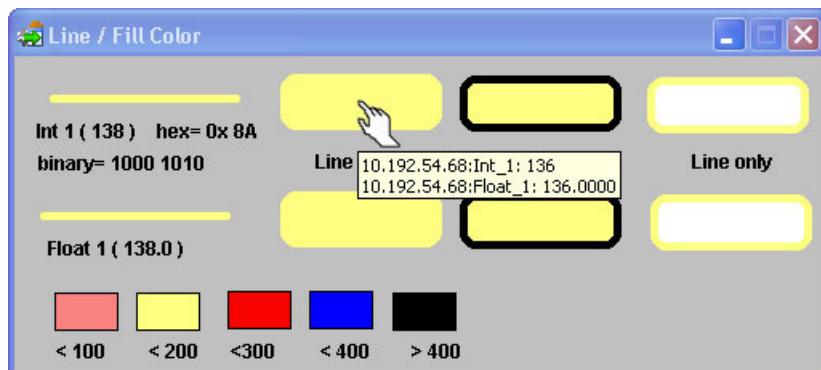
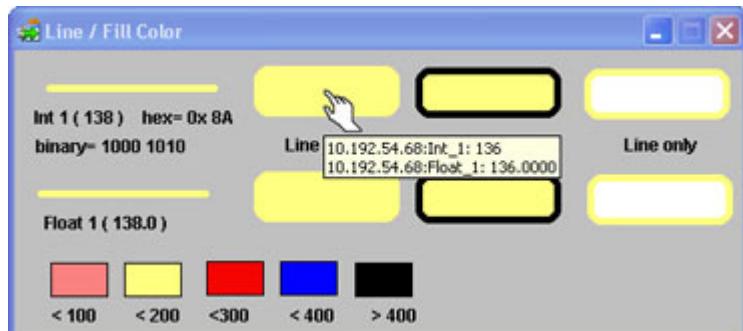
### Using Allow Runtime Tooltips

If Allow Runtime Tooltips is selected on the Control Engine tab of the Runtime Setup dialog box, when a user places the cursor over a graphic object that has Control Engine-driven dynamic attributes in Runtime, the current values are displayed in a pop-up tooltip.

*NOTE: The tooltip will NOT display for Trends, SuperTrends, XY-Plots or Alarm Graphics.*

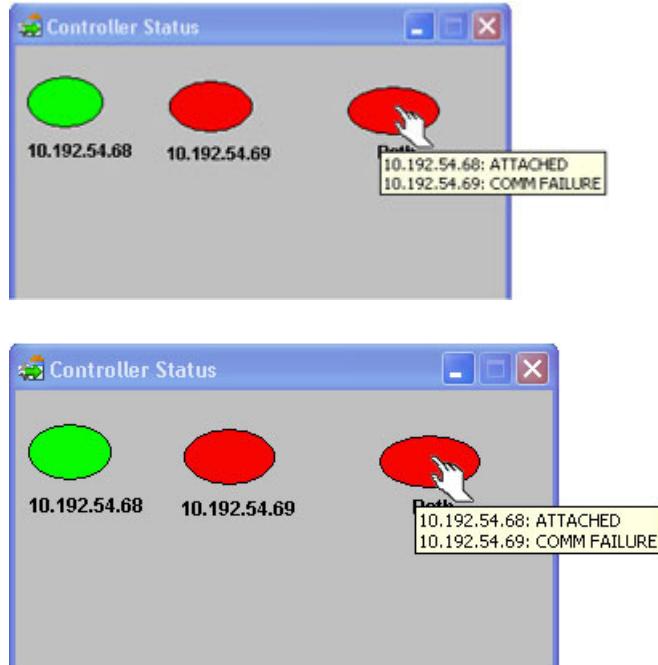
## Examples

This example shows a graphic object with two different dynamic attributes: a line and fill color from two different tags.

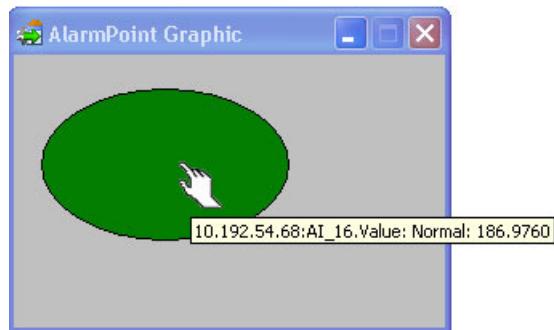


If a graphic object is configured with the Control Engine Status dynamic attribute, the tooltip will display the status of each control engine that is currently being monitored. The next example shows the status of two

control engines. The color is always the color of the worst-case control engine—in this case, the one that has a COMM FAILURE.



If a graphic object is displaying a Control Engine-driven dynamic attribute for an alarm point status, the tooltip shows the state of the alarm point as well as the value of the point as shown here.

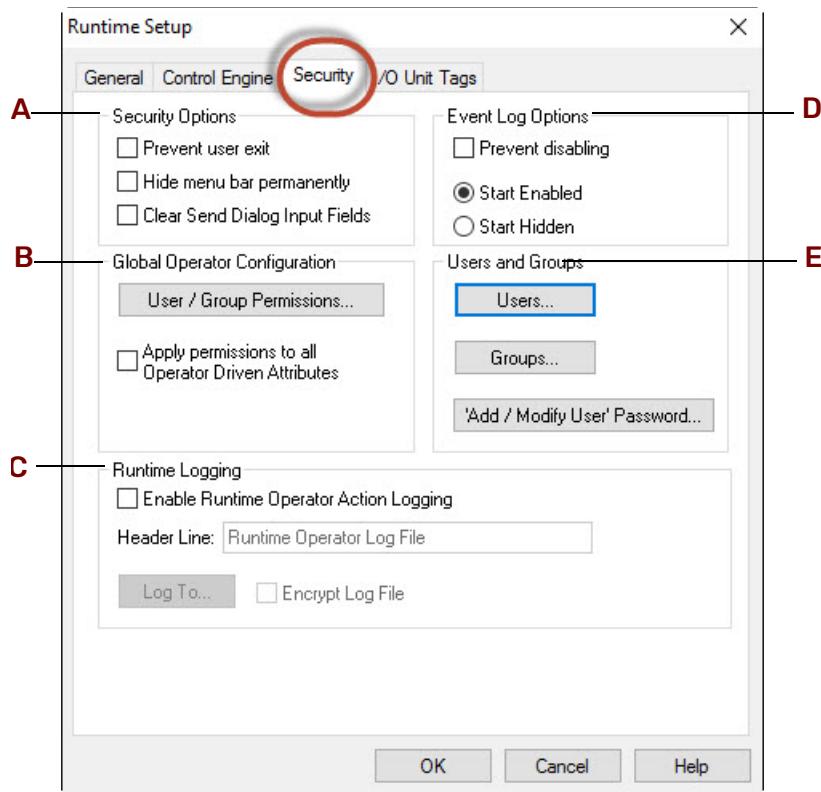


## RUNTIME SETUP: SECURITY TAB

NOTE: For additional security features, see:

- [“Protecting a Project with a Password” on page 46](#) to assign a password to the PAC Display project to prevent unauthorized users from opening it in PAC Display Configurator.
- [“Modifying Draw or URL Windows” on page 94](#) to assign a password to individual windows in a PAC Display project to prevent unauthorized users from opening them.
- [“Security Settings for Graphic Objects and Dynamic Attributes” on page 176](#) to allow or deny operator access to individual graphic objects, based on configured, authorized users and groups.
- [“Viewing Logged-In Users in Runtime” on page 325](#) to view a list of the users currently logged in to PAC Display Runtime.

The options on the Security tab control allow you to control who can log in to Runtime and whether to log their actions during Runtime. The options also control some general PAC Display features available to the operator during Runtime.



#### (A) Security Options

- Select **Prevent user exit** to prevent the Runtime operator from exiting PAC Display Runtime once the project starts in Runtime. This also prevents the operator from changing the project currently open in PAC Display Runtime.
- **Hide menu bar permanently** hides the PAC Display Runtime menu bar from the Runtime operator. This restricts operator interaction with Runtime menu commands to only what you've defined in the project itself. For example, pressing the Esc key will not activate the menu bar, and pressing F1 won't invoke the Runtime online help system. (To offer access to the online help system when the menu bar is hidden, you should configure a graphic object using an Execute Menu Item dynamic attribute that specifies the Help menu item. For details, see ["Execute Menu Item" on page 144](#).)
- **Clear Send Dialog Input Fields.** Normally, Runtime copies the last value sent into the Send Value and Send String dialog boxes. However, you might want to prevent this when the last sent value is, for example, the operator's password. Select Clear Send Dialog Input Fields to clear the last sent value, which prevents it from being visible the next time the Send Value or Send String dialog box is displayed.

#### (B) Global Operator Configuration

- **User / Group Permissions** lets you grant or restrict users and user groups from accessing all of the project's graphics objects that have been configured for security. For details, see ["Configuring Global Operators" on page 309](#).
- **Apply permissions to all Operator Driven Attributes.** Check this option to apply the selected permission (grant or deny access) to *all* graphic objects with operator-driven attributes. (Note that this applies even if no *individual* graphic object security permissions are set up.)

If you don't select this option, permissions for global operators are automatically added only to graphic objects that have been individually configured for security (see [page 177](#)).

#### (C) Runtime Logging

- **Enable Runtime Operator Action Logging.** Check this option to enable the Header Line, Log To, and Encrypt file features for logging Runtime operator actions.
- **Header Line.** Enter text that will appear at the top of the Runtime Operator Action log file. **(Pro only)** If you choose to log actions to a database table:
  - Header Line text will be the table name.
  - PAC Display replaces spaces in the Header Line with underscores ( \_) because table names cannot contain spaces.
- **Log To.** Click this button to specify the name and contents of the Runtime Operator Action log. If you choose to log actions to an ASCII text file:
  - Configure the file name and other parameters in the Event Log Configuration dialog box that appears.
- (Pro only)** If you choose to log actions to a database table:
- **Encrypt Log File.** Check this option to encrypt data that is logged to an Operator Log File. (This option is not available when logging to a database.)

#### (D) Event Log Options

- **Prevent Disabling.** Select this option to prevent a user from disabling the Event Log Viewer during Runtime. You must first select Start enabled to get this option.
- **Start Enabled.** Select this option to enable the Event Log Viewer at startup.
- **Start Hidden.** Select this option to prevent the Event Log Viewer from displaying when Runtime launches; it runs in the background instead. In this mode you can see the Event Log Viewer by choosing View > Event Log in Runtime.

See also, "[Enabling the Event Log Viewer](#)" on page 312.

#### (E) Users and Groups

- **Users.** Choose this option to add, modify, and delete logins for users who are allowed to log in to PAC Display Runtime. You can also copy the permissions of an existing user to create new users with the same permissions. For details, see "[Configuring Runtime Users](#)" on page 301. To prevent authorized users from accessing specific graphic objects, see "[Security Settings for Graphic Objects and Dynamic Attributes](#)" on page 176.
- **Groups.** Choose this option to create, modify, and delete user groups, and to see a list of users in a group. Generally speaking, all users in a group have the same security permissions to the project's graphic objects. However, you can override group permissions on an individual basis. See also "[Configuring Global Operators](#)" on page 309 and "[Security Settings for Graphic Objects and Dynamic Attributes](#)" on page 176.
- **"Add / Modify User" Password.** Choose this option to create a password that Runtime users must enter before they can modify the list of users with permission to log in to Runtime. See also "[Configuring a Password to Modify Runtime Users](#)" on page 305.

### Restricting the Operator

In addition to securing access to graphic objects (see [page 176](#)) and preventing login access to Runtime (see [page 301](#)), there are a few more ways to control an operator's interactions with PAC Display Runtime:

- To prevent the operator from exiting PAC Display Runtime, select Prevent User Exit in the Security Option group. Once the project starts in Runtime, an operator won't be able to exit the PAC Display Runtime application.

- To hide the menu bar from the operator, select Hide Menu Bar Permanently. This restricts operator interaction with Runtime menu commands to only what you've defined in the project itself. The Esc key will not activate the menu bar, and pressing the F1 key won't invoke the Runtime online help system.
- To allow selected users to log in to PAC Display Runtime or to set up global operator-driven permissions, see "[Configuring Runtime Users](#)" below.

You can also configure a graphic object so that Runtime commands execute when the object is clicked. This is done by assigning Runtime menu commands to the graphic object using the Execute Menu Item dynamic attribute; see "[Execute Menu Item](#)" on page 144 for instructions.

## Understanding Runtime Users, User Groups, and Permissions

There are a variety of ways you can create and manage runtime users and user groups, as well as grant or deny them permission to access certain windows and functionality in your PAC Display project. It's important that you understand how the choices you make in granting or denying (or not configuring) permissions to users and user groups affects their ability to access certain windows or perform functions.

**Users and User Groups.** You can create either of the following types of runtime users:

- Microsoft Windows users, which are users you define on the local computer or domain.
- PAC Display Runtime users, which are users you create in PAC Display Runtime.

You can also create groups of these users:

- Microsoft Windows users into Microsoft Windows groups. You add, edit, delete, and manage Microsoft Windows users and groups with tools provided by Microsoft.
- PAC Display Runtime users into PAC Display groups. You manage PAC Display Runtime users and groups within the PAC Display Runtime, as described in this chapter.

**Permissions.** You can grant or deny permissions for:

- An individual graphic object configured with operator-driven attributes.
- For all graphic objects in a project that are configured with operator-driven attributes.

You can also grant or deny permission to PAC Display Runtime.

Not configuring permissions (neither granting nor denying) to an individual graphic object defaults to granting permission, unless other permissions are set. For example:

- If you grant permission to an individual graphic object for UserX,
- but do not configure permission (which means neither granting nor denying) for UserY,

then UserY does not get access to the object because it has been explicitly set for UserX.

As you can see, without careful planning, permissions can become confusing and you may not achieve the results you want. To help clarify these rules, the following table explains what happens when three different PAC Display Runtime users (UserX, UserY, and UserZ) are granted, denied, or not configured with access to an individual graphic object, while at the same time, permissions for all graphic objects in a project are granted, denied, or not configured:

If access for...	is ____ for the graphic object	and is ____ for the entire project,	then the user's access to the object is:
UserX	not configured	not configured	granted
UserY	not configured	not configured	granted
UserZ	not configured	not configured	granted
UserX	not configured	granted	granted
UserY	not configured	not configured	denied <sup>a</sup>
UserZ	not configured	not configured	denied <sup>a</sup>

If access for...	is ____ for the graphic object	and is ____ for the entire project,	then the user's access to the object is:
UserX	not configured	denied	denied
UserY	not configured	not configured	denied <sup>a</sup>
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	granted	granted	granted
UserY	not configured	not configured	denied <sup>a</sup>
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	denied	not configured	denied
UserY	not configured	not configured	denied <sup>a</sup>
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	granted	not configured	granted
UserY	not configured	granted	granted
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	granted	not configured	granted
UserY	not configured	denied	denied
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	denied	not configured	denied
UserY	not configured	granted	granted
UserZ	not configured	not configured	denied <sup>a</sup>
UserX	denied	granted	granted
UserY	granted	denied	granted
UserZ	not configured	not configured	denied <sup>a</sup>

<sup>a</sup>These users are denied access to the graphic object because another user has their access specifically set (either as granted or denied) to that same graphic object.

### Combining Users, User Groups, and Permissions

Generally speaking, all users in a group have the same security permissions to the project's graphic objects. However, for greater flexibility, you can override permissions to graphic objects on an individual basis. This means that an individual PAC Display Runtime user's permissions can differ from the group (or groups) he or she is assigned to. For example, you can create a Supervisors group and set very liberal permissions for anyone assigned to the group. But if there is a certain supervisor who shouldn't have access to one certain graphic object, you can deny access at the user level, and display an error message if the operator tries to access the graphic object.

Such flexibility can be very helpful, but because you can assign a Runtime user to multiple user groups, it can also be confusing. Simply stated, "Deny Access" security permissions have priority over "Grant Access" permissions. This means that if a user has been granted access, but is a member of a group that has been denied access, the user will not be able to use the on-screen object.

### Configuring Runtime Users

*NOTE: If no Runtime users are configured, anyone with access to PAC Display can open and use Runtime.*

To control access to PAC Display Runtime, graphic objects, and operator-driven dynamic attributes, you configure users and (optionally) user groups. When a PAC Display project is launched in Runtime, Runtime prompts the operator for a username and password. (To prevent operators from accessing specific Runtime graphic objects, see "["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#).)

## RUNTIME SETUP: SECURITY TAB

You can add, modify, delete, and copy Runtime users in:

- PAC Display Configurator > Configure > Runtime > Security tab > Users
- PAC Display Runtime > Security > Add / Modify User

*NOTE: To configure Runtime users in Runtime, you must first configure an "Add / Modify User" password. For details, see [page 305](#).*

When considering security for your Runtime environment, keep the following points in mind:

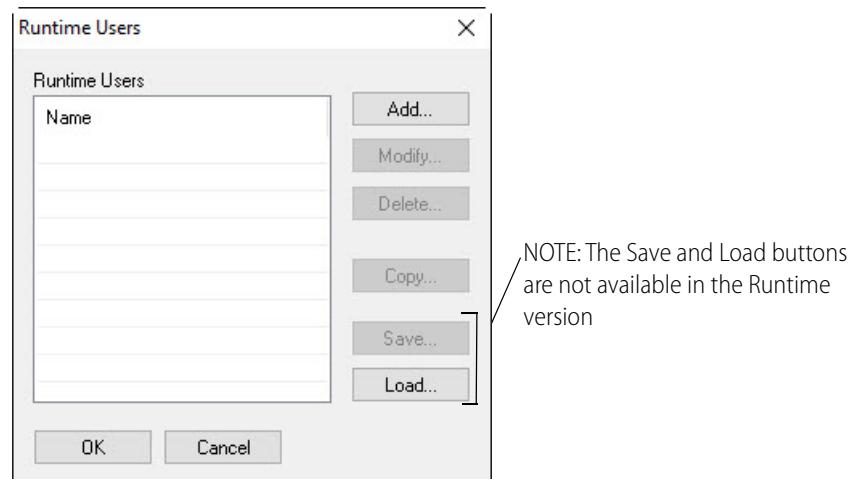
- If no Runtime users are configured, anyone with access to PAC Display can open and user Runtime.
- Runtime user logins are a special kind of login that you create in PAC Display Configurator; they are not the same as Windows logins that allow users to login to a particular computer or network.
- Logging in and out of Runtime does *not* change the user currently logged in to the PC in Windows. The user who initially logged in to Windows remains the Windows user.
- If no Runtime users are configured, the option to log out of Runtime is disabled in Runtime.

### Open the Runtime Users Dialog Box

In Configurator, click Configure > Runtime > Security tab > Users.

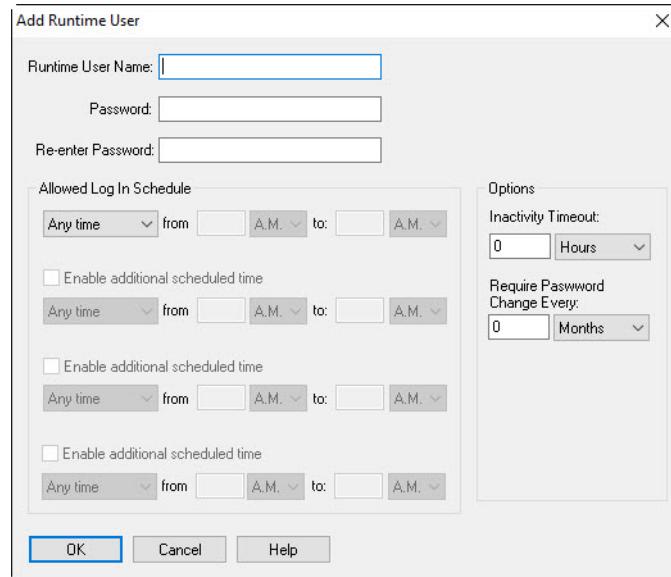
Or, in Runtime, click Security > Add / Modify User.

The Runtime Users dialog box opens.



### Add a Runtime User Login

- In the Runtime Users dialog box, click Add to open the Add Runtime User dialog box.



- In the Add Runtime User dialog box:

a. In the Runtime User Name field, type a username.

b. In the Password field and in the Re-enter Password field, type a password.

This is the username and password that the operator will use to log in to Runtime, and also when prompted for access to a security-restricted graphic object.

*NOTE: The Runtime username and password are case-sensitive.*

c. (Optional) In the Allowed Log In Schedule area, configure the days and times that the operator is allowed to log in to Runtime. You can choose a specific day of the week, weekdays, weekends, never, or any time.

For each additional login period, select "Enable additional scheduled time," and then select the login time. To disable a schedule, deselect "Enable additional scheduled time" for that time period.

d. To automatically log an operator out of Runtime after a specified period of inactivity, in the Inactivity Timeout fields, type an amount and select the time unit (Minutes, Hours, Days, or Weeks). To disable the automatic log out feature, type a 0 (zero) in the text box.

A PAC Display Runtime project is considered "inactive" if (within the configured time period):

- The mouse has not moved; or
- A menu command has not been performed; or
- An operator-driven attribute is not been clicked.

*NOTE: Trigger-based commands are not included in the above list. For example, if a window opens or closes, a recipe uploads or downloads, or an alarm point state changes, these are not considered to be operator interactions in PAC Display.*

- To require an operator to change his or her password after a specified amount of time, under Require Password Change Every, enter the amount of time. The units can be set in Days, Weeks, and Months. Beginning 14 days prior to the expiration of a password, the operator will be notified when logging in that the password will expire, and be given the option to change it.

To disable this feature, enter a 0 in the text entry field.

4. To map an operator's Runtime login user name to his or her global operator-driven user name, select Has Global Operator Driven Access, and then enter the global operator-driven user name. This option must be configured in order for the operator logged in to PAC Display Runtime to modify operator-driven attributes without having to log in for each attribute. See also, "[Configuring Global Operators](#)" on [page 309](#).
5. Click OK. The new username is added to the list of Runtime users.

#### **Modify a Runtime User**

1. In the Runtime Users dialog box, highlight the username, and then click Modify (Configure > Runtime > Security tab > Users).
2. Make the desired changes, and then click OK to close the dialog box and save the changes.

#### **Delete a Runtime User**

When you delete a Runtime user, PAC Display also removes the user from any groups he or she may belong to. For information on user groups, see [page 307](#).

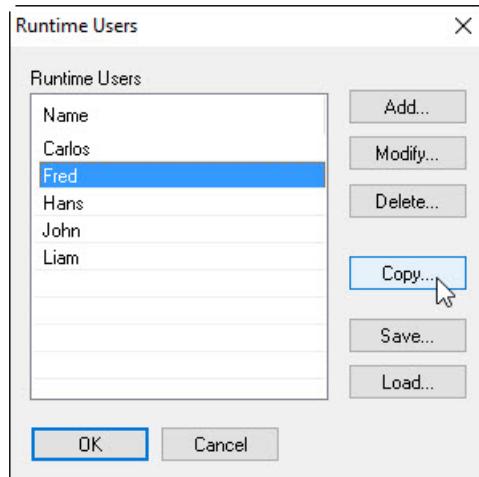
1. In the Runtime Users dialog box, highlight the username, and then click Delete (Configure > Runtime > Security tab > Users).
2. Click OK to confirm the deletion and save the change.

#### **Copy a Runtime User**

To save time when configuring Runtime users, you can copy an existing user's permissions and group memberships, and then assign them to a new Runtime user. (The Copy feature does not copy the selected user's password.)

*NOTE: The user you copy must belong to at least one User Group.*

1. In the Runtime Users dialog box, highlight a Runtime user whose permissions and group memberships you want to duplicate.



2. Click Copy. A new Runtime user is added to the list.



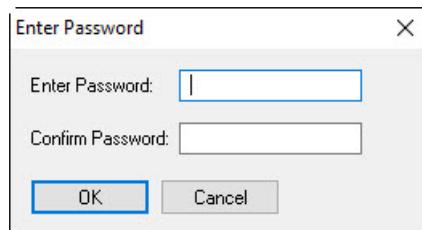
3. To change the new user's name and create a password, highlight the name, and then click Modify.
4. In the Modify Runtime User dialog box, make the desired changes, and then:
  - a. Click OK to close the Modify Runtime User dialog box.
  - b. Click OK to save the new user and close the Runtime Users dialog box.

The new Runtime user has the same permissions and group memberships as the user you copied. You can also modify the new user's permissions for individual graphic objects. For details, see ["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#).

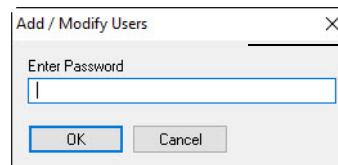
### Configuring a Password to Modify Runtime Users

The "Add / Modify Password" function lets you configure a password that operators can enter in Runtime to modify the list of Runtime users.

1. In Configurator, choose Configure > Runtime > Security tab, and in the Users and Groups area, click "Add / Modify User" Password. The Enter Password dialog box opens.



2. Type the new password in both fields, and then click OK to close the dialog box and save the changes. In Runtime, the operator is prompted to enter the password when Security > Add / Modify User is clicked.



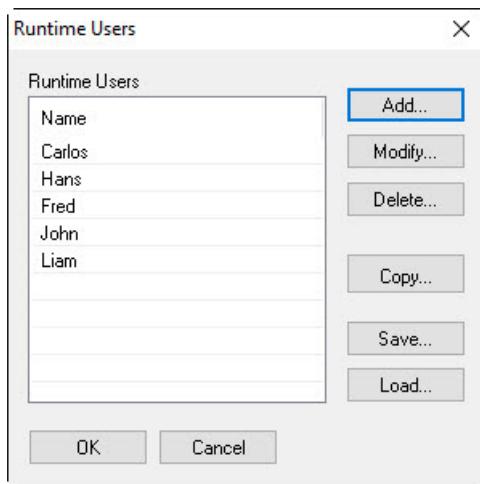
In Runtime, an operator types the configured password in this dialog box after he clicks Security > Add / Modify User.

## Saving User Configuration Information to an External File

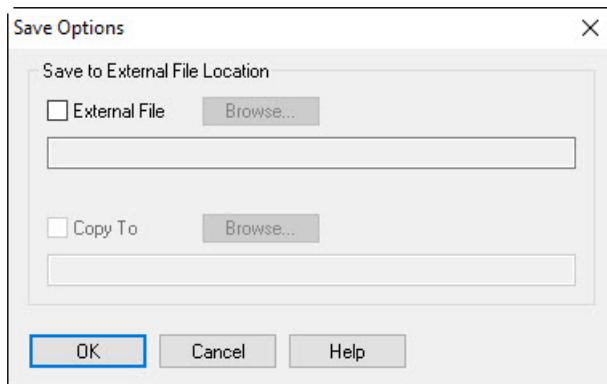
Once users have been configured, you can save the user information to an encrypted file external to the project file. By saving user permissions information to an external file, you can simply load the user information file to a new project (instead of having to reconfigure users for the new project).

A login configuration file has the extension .pdlin.

1. Make sure you have one or more users configured for this project. See “Configuring Runtime Users” on page 301.
2. In Configurator, choose Configure > Runtime > Security tab, and then, in the Users and Groups area, click Users. The Runtime Users dialog box opens.



3. In the Runtime Users dialog box, click Save to open the Save Options dialog box.



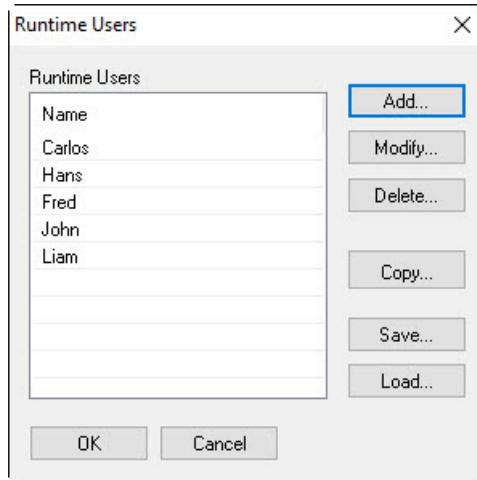
4. For each of the following options, click Browse to locate the target directory, then enter a filename and click OK.
  - a. Click **External File** to specify the primary location for the user login configuration file.
  - b. Click **Copy To** to specify the backup location for the user login configuration file. This option is enabled when you select External File. The backup copy is used if the primary file becomes corrupted or is otherwise unavailable.
5. Click OK to close the Save Options dialog box.

## Loading User Configuration Information from an External File

Once the user login configuration information has been saved to an external file, you can load that user information into another PAC Display project. The user names in the external file will replace any user names currently in the target project.

1. In the Runtime Users dialog box, click Load, browse to the external file, and then click Open.

The users in the file appear in the list of Runtime users.



2. Click OK to close the dialog box.

*NOTE: Once a file is loaded via the Load button, the file's location is automatically set to be the primary external file location.*

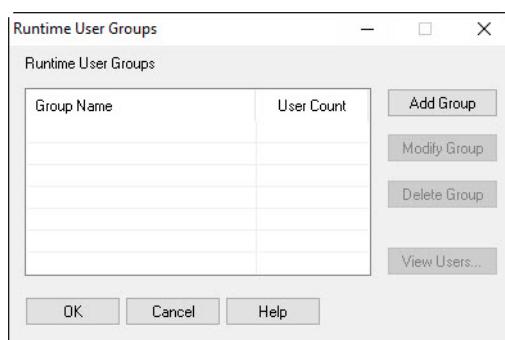
## Configuring User Groups

To reduce the amount of configuration needed to restrict access to PAC Display Runtime and graphic objects, you can assign individual Runtime users to *user groups*. A user group is a set of users who typically perform the same job function. For example, you can configure a "Supervisors" group, and then assign all the individual supervisors to the group.

Note: You must configure at least one Runtime User before you can configure a user group.

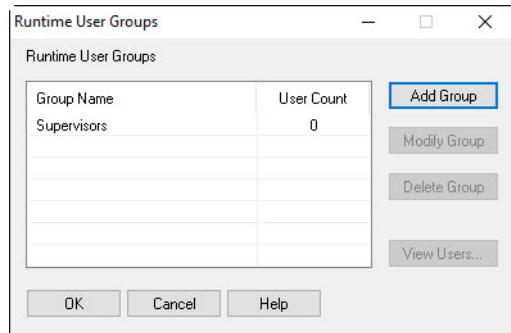
### Add a User Group

1. In Configurator, click Configure > Runtime > Security tab, and in the Users and Groups area, click Groups to open the Runtime User Groups dialog box.



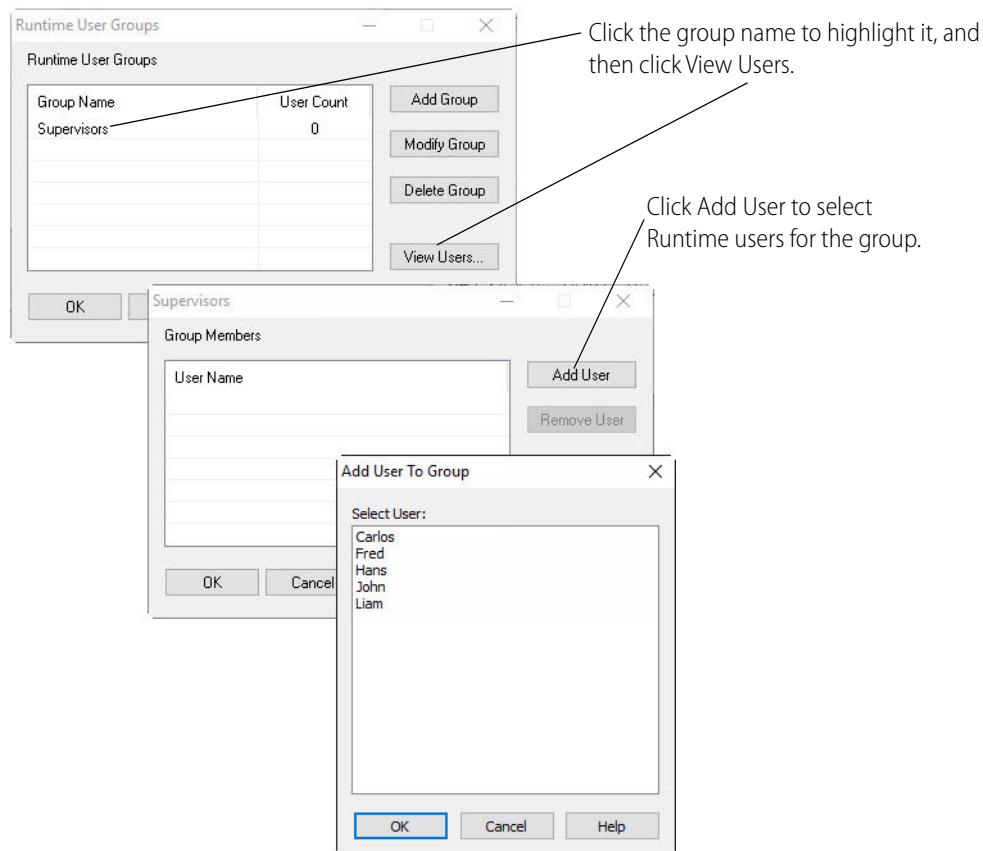
## RUNTIME SETUP: SECURITY TAB

2. Click Add Group. In the Add Group dialog box, type the group name, and then click OK to save the change and close the dialog box. The User Count is 0 (zero) because the group has no members.



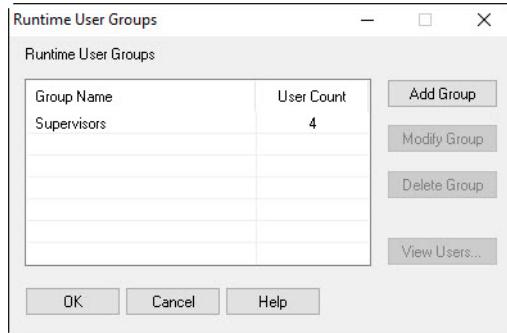
### Add Members to a User Group

1. In the Runtime User Groups dialog box, click the group name to highlight it, and then click View Users. The Group Member dialog box opens.
2. In the Group Member dialog box, click Add User to open the Add User to Group dialog box.



3. Click the names to add to the group, and then click OK.  
The member names appear in the Group Members dialog box.

- Click OK to save the changes. The Runtime User Group dialog box opens, and the number of members is displayed in the User Count column.



#### Remove Members from a User Group

- In the Runtime User Groups dialog box, click the group name to highlight it, and then click View Users. The Group Member dialog box opens.
- In the Group Member dialog box, click the user to delete. To delete more than one user, hold down the Ctrl key and click the users to delete.
- Click Remove User, and at the prompt, click Yes. Then click OK to save the changes and close the dialog box.

#### Modify a User Group.

- In the Runtime User Groups dialog box, click the group name to highlight it, and then click Modify Group.
- Type the new name, and then click OK to save the change and close the dialog box.

If you modify a user group and then decide to add more members, you must first save the changes by clicking OK to close the Runtime User Groups dialog box. When you click Groups to reopen the Runtime User Groups dialog box, the View Users button is enabled so you can click it and add new members to the group.

#### Delete a User Group

- In the Runtime User Groups dialog box, click the group name to highlight it, and then click Delete Group.
- At the prompt, click Yes to delete the group and close the dialog box.

## Configuring Global Operators

Configuring global operators is an easy way to grant or deny access to all operator-driven attributes in a PAC Display project. Users (or user groups) configured as global operators are automatically added to graphic objects that have been individually configured for security (see [page 177](#)). In addition, when a global operator logs in using the special Global Operator Access login, he or she can execute any operator-driven dynamic attribute without having to enter a username and password each time (PAC Display Runtime menu bar > Security > Global Operator Access > Log in). Simply stated, global operator security is similar to graphic object security, with the added benefit that the global operator can execute security-configured operator-driven attributes without having to enter login credentials each time.

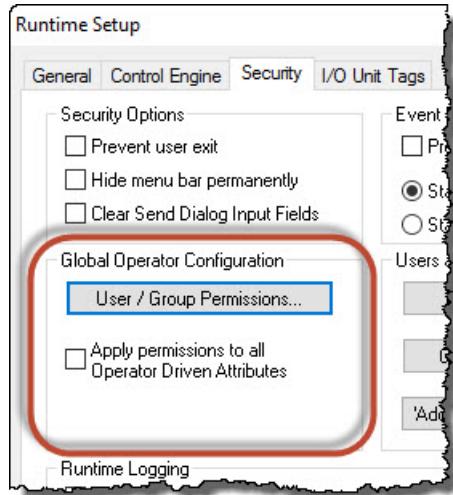
Note that a global operator is different from a Runtime user (see [page 301](#)). Typically, you configure Runtime user logins for people who use PAC Display Runtime as part of their day-to-day work, and you configure global operators for people who occasionally need temporary access to a project's graphic objects (for example, to approve an override). However, you *can* configure a Runtime user as a global operator; when that's the case, the Runtime is automatically logged in with global operator permissions when he or she user logs in to PAC Display Runtime.

## RUNTIME SETUP: SECURITY TAB

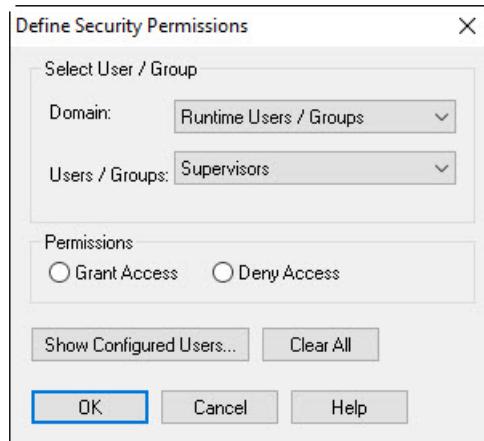
You also have the option to allow or restrict access to *all* graphic objects with operator-driven attributes—even if security has not been configured for an individual object.

### Configure global operators

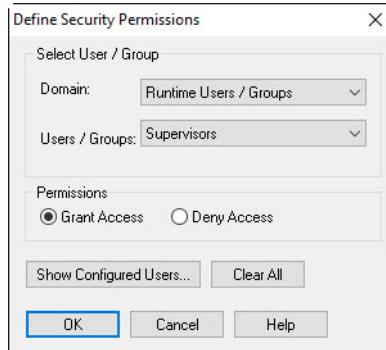
1. In Configurator, click Configure > Runtime to open the Runtime Setup dialog box, and then click the Security tab.



2. In Global Operator Configuration area, click User / Group Permissions to open the Define Security Permissions dialog box.



3. Select the Domain, and then select the user or group from the Users/Groups drop-down list. Then, select either Grant Access or Deny Access.



Click Show Configured Users to see the list of users and user groups that have been granted and denied global permissions.

Click Clear All to remove all global permissions from all users and user groups.

4. Click OK to close the dialog box and save the changes.
5. (Optional) When a graphic object is configured for security (see [page 176](#)), operators must log in every time they try to modify an operator-driven attribute. To prevent the system from requiring a login for every secure graphic object, select the Apply permissions to all Operator Driven Attributes check box.
6. Select the Apply permissions to all Operator Driven Attributes check box to apply the global permissions (from [step 3](#)) to all graphic objects configured with operator-driven attributes. (This way, you don't have to individually configure security permissions for each graphic that needs security.)
7. On the Runtime Setup > Security tab, click OK to close the dialog box and save the changes.

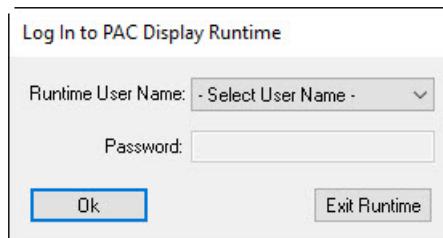
### Logging In to and Out of Operator Driven Attribute Access in Runtime

If global users are configured (see “[Configuring Global Operators](#)” on page 309), a configured user can log in and access any security-configured operator-driven dynamic attribute.

See also, “[Logging In to and Out of Runtime](#)” on page 322.

*NOTE: The Operator Driven Attribute Access submenu is not available in the Read Only version of Runtime.*

1. In Runtime, choose Security > Operator Driven Attribute Access > Log In (or Log Out).



2. Select the user name from the drop-down list, type the password in the Password field, and then click OK.

*CAUTION: As long as a globally configured user is logged in, anyone can access the security-configured operator-driven dynamic attributes. To prevent unauthorized access, it is the responsibility of the configured user to log out when finished.*

## Enabling the Event Log Viewer

Use the Event Log Options on the Security tab of the Runtime Setup dialog box to configure the Event Log Viewer. The Event Log Viewer displays messages in PAC Display Runtime about system events and a project's communication transactions. By default, the Event Log Viewer is enabled when Runtime starts.

**Prevent disabling.** Select this option to prevent a user from disabling the Event Log Viewer during Runtime. You must first select Start enabled to get this option.

**Start enabled.** Select this option to enable the Event Log Viewer at startup. Uncheck this option to keep the Event Log Viewer running in the background rather than on top.

**Start hidden.** Select this option to prevent the Event Log Viewer from displaying when Runtime launches. In this mode you can see the Event Log Viewer by choosing View > Event Log in Runtime.

See ["Using the Event Log Viewer" on page 325](#) for information on using the Event Log Viewer in Runtime, and ["Configuring the Event Log File" on page 316](#) to learn about enabling saving the event log to a file and setting the format in which event log files are saved. By default, the event log is not saved to a file.

## Logging Runtime Operator Actions

When an operator uses a PAC Display project in Runtime, general information about how and when the project is used can be recorded in the Runtime operator log file. Detailed information such as which on-screen controls were used and which values or states were changed can also be recorded in this log file. For security, the log file can be optionally encrypted.

By default, PAC Display saves Runtime operator logs as text files in Unicode (UTF-16) format. To save all logs in ASCII format, select the Save log files in ASCII format check box in the Runtime Setup dialog box. For details, see ["Runtime Setup: General Tab" on page 290](#).

*NOTE: You can also configure security settings for an object to restrict its use to authenticated users and groups. See ["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#) to learn how to configure user and group authentication for a graphic object.*

### Data Recorded in the Runtime Logging File

When the PAC Display project runs in PAC Display Runtime, the following information about operator actions is recorded:

- *Date*—Date of action (month/day/year)
- *Time*—Time of action (24-hour)
- *Action Taken*—Description of action and PAC Display project file used
- *Control Engine*—Control engine running the PAC Control strategy that the PAC Display project is accessing
- *Tag*—Complete name of tag being modified
- *Old Value*—tag value before being modified
- *New Value*—tag value after being modified
- *User*—Name of user logged into computer running PAC Display project
- *Computer*—Computer running the PAC Display project

Discrete controller variables display Off values as 0, and On/Set values as 1. Discrete I/O points are logged as 0 (Off) and -1 (minus 1) - for On/Set.

In this example, the log shows that the operator “edgar” opened and closed the PAC Display project “factory.UUI” using the computer “MFG-00”.

PAC Display Runtime Operator Log File				
Line Formats:				
12/11/2010	10:22:28.230	Open project: cfactory.UUI executed	edgar	MFG-00
12/11/2010	10:59:57.442	Close project: cfactory.UUI executed	edgar	MFG-00

The next example shows that the same operator “edgar” changed the setpoint value of “fTemperatureSetpoint” from 200 to 150 on the same project.

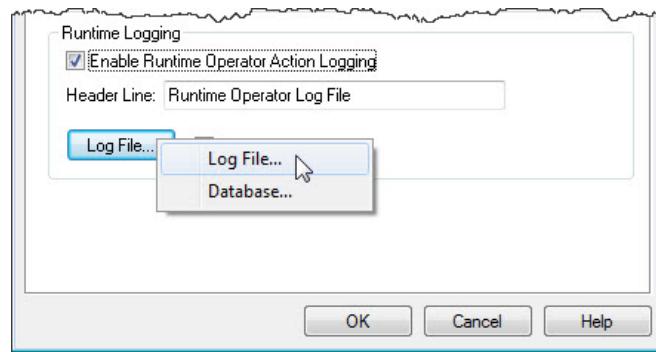
PAC Display Runtime Operator Log File						
Line Formats:						
12/11/2010	10:56:06.852	Cookie Controller	Cookie Controller:fTemperatureSetpoint	200.0000	150.0000	edgar MFG-00

## Configuring a Runtime Operator Log File

Also see “[Configuring a Runtime Operator Log Database](#)” on page 314.

To record operator actions in a log file:

1. In Configurator, select Configure > Runtime to open the Runtime Setup dialog box.
2. Click the Security tab, and select Enable Runtime Operator Action Logging.
3. If necessary, change the header line to meet your application’s requirements.
4. Click Log To, and then choose Log File from the popup menu.



The Runtime Logging File Setup dialog box appears. Configuring a Runtime operator log file is identical to configuring an event log file; follow the instructions in “[Configuring the Event Log File](#)” on page 316 and then go to the next step.

**NOTE:** To create a single networked file that logs the operator actions of all the networked PCs running PAC Display, make sure each PC writes to the same networked file. This allows you to view all the operator actions of the networked PCs from a central location. In order for the date and time stamps to be useful, make sure that the time on each PC is synchronized with the standard network server time.

5. Select Encrypt Log File if you want the log file saved as an encrypted document. See “Encrypting and Decrypting the Runtime Operator Log File” on page 315 for information on using encrypted files.

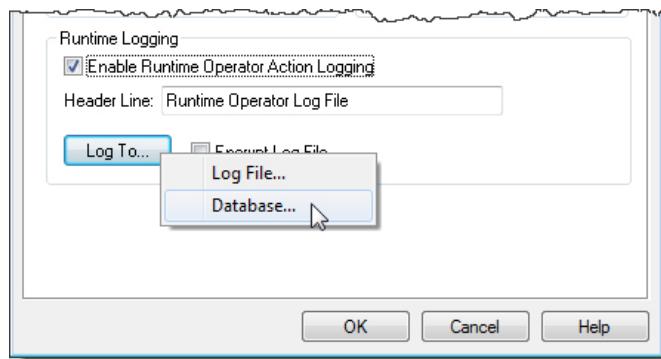


## Configuring a Runtime Operator Log Database

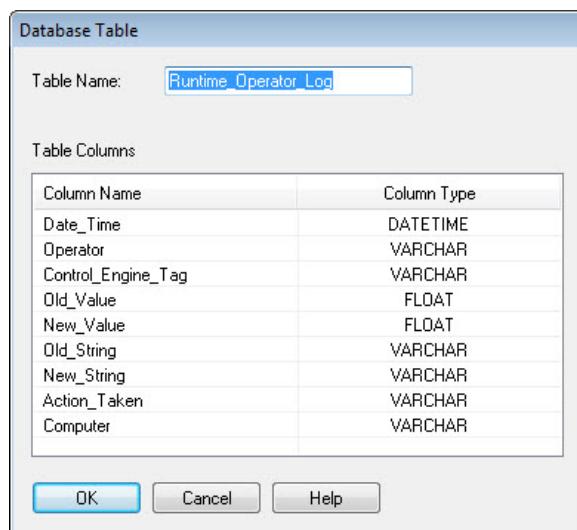
**(Pro only)** If you have configured an ODBC-compliant database (such as Microsoft SQL Server, MySQL, or Microsoft Access), you can also Runtime operator log action log data to a database. For information about configuring ODBC data sources, see page 55. Also, see “Configuring a Runtime Operator Log File” on page 313.

To log operator actions to a database:

1. In Configurator, select Configure > Runtime to open the Runtime Setup dialog box.
2. Click the Security tab, and select Enable Runtime Operator Action Logging.
3. If necessary, change the header line to meet your application’s requirements.
4. Click Log To, and choose Database from the popup menu.



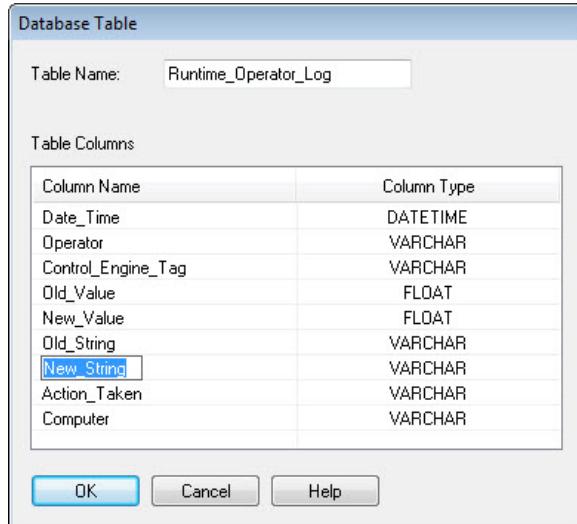
If a database is configured, a dialog box shows the default settings for the table that will be created and logged to.



5. If desired, modify the table name or the column names.

Modify a column name as follows:

- a. Click the name to highlight the row.
- b. Click the name once again to make it editable.



- c. Type a new name, and then press Enter.
- d. Click OK to confirm your changes and close the dialog box.

#### NOTES

- *Table and column names may not contain the following characters: (space) [] :*
- *Column names cannot begin with a SQL reserved word for that database type.*  
*Examples: INTEGER, VALUE, BACKUP, CURRENT\_DATE*

#### Changing the Database Table Name

When you create or modify a table for logging operator actions in a database, you can change the database table name. However, after Runtime logs data to the database, if you then try to change the database table name in Configurator, a message is displayed, that says the table already exists.

When the message appears, do one of the following:

- Click Yes to create a new table and start logging to that table.
- Click No to rename the existing table and continue logging to that table.

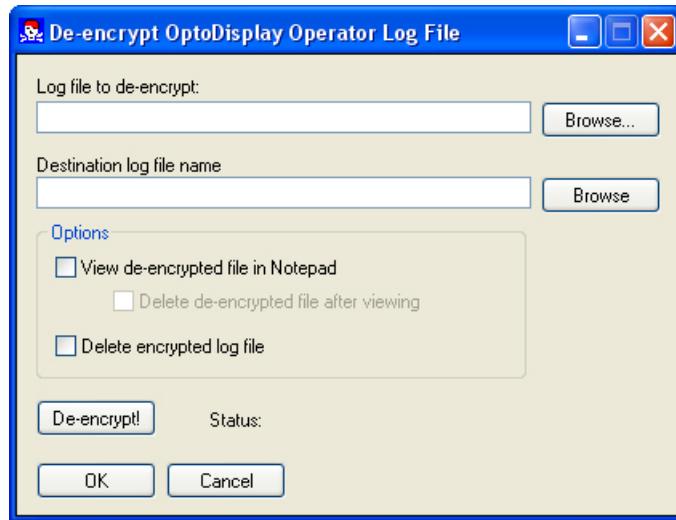
#### Encrypting and Decrypting the Runtime Operator Log File

To save a Runtime operator log file in an encrypted format, select Encrypt Log File in the Security tab of the Runtime Setup dialog box.

To decrypt the log file, do the following:

1. In PAC Display Configurator, select View > Decrypt Operator Log File.

The log file decryption window opens.



2. Click Browse next to the "Log file to decrypt" field and locate the encrypted operator action log file.
3. Click Browse next to the "Destination log file name" field and select a filename and location where the decrypted file will be saved.  
Skip this step if the default name and destination for the decrypted file is acceptable.
4. Select "View decrypted file in Notepad" to automatically open the file in Windows Notepad after it is decrypted.  
When this option is selected, you can also select "Delete decrypted file after viewing" to have the file deleted automatically when Notepad closes.
5. Select "Delete encrypted log file" to have the encrypted log file deleted automatically after it is decrypted.
6. Click Decrypt to decrypt the file.
7. Click OK to close the log file decryption window.

## Configuring the Event Log File

As events occur in a project in Runtime, messages with a date and time stamp are posted to the Event Log Viewer. These messages can be saved to an event log file and archived to provide an operations record for a PAC Display project.

NOTE: A project can have only one event log file active (open) at a time.

By default, PAC Display saves event logs as text files in Unicode (UTF-16) format. To save all logs in ASCII format, select the Save log files in ASCII format check box in the Runtime Setup dialog box. For details, see ["Runtime Setup: General Tab" on page 290](#).



**(Pro only)** If you have configured an ODBC-compliant database (such as Microsoft SQL Server, MySQL, or Microsoft Access), you can also send event log messages to a database. For information about configuring ODBC data sources, see [page 55](#).

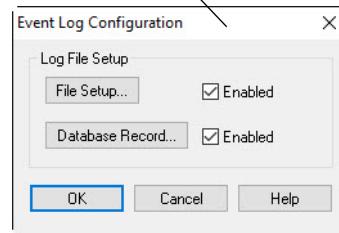
- To configure an event log, select Configure > Event Log.

#### Event Log Configuration Dialog Box

PAC Display Basic



PAC Display Professional



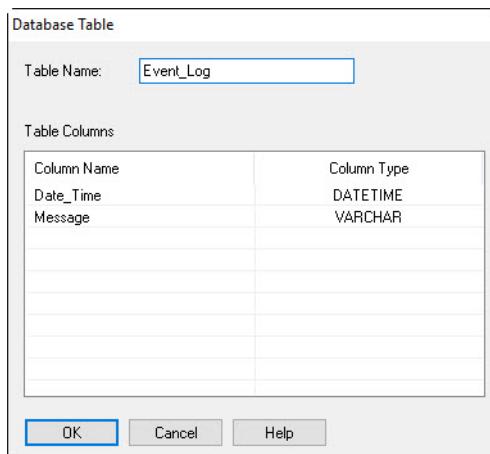
- To create an event log file when you start the project in Runtime, select Enabled (next to the File Setup button), and then click File Setup.

The Event Log File Configuration dialog box appears. In the Event Log File Configuration dialog box, you configure where the event log data will be stored, how the data lines will appear, and the log's rollover parameters. For details, see ["Event Log File Configuration Dialog Box" on page 318](#).

- (Pro only)** To send event log messages to a database:

- Select Enabled (next to the Database Record button). Note that you can select the Enabled check box only if an ODBC data source has already been configured. For details, see [page 55](#).
- Click the Database Record button.

The Database Table dialog box appears, showing the default database table and columns that the event messages will be logged to.

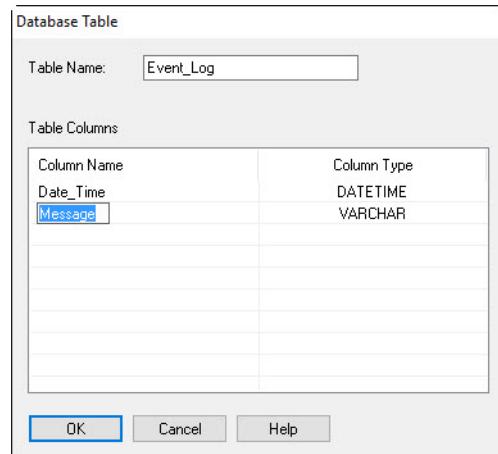


**To change the Table Name**, highlight the name and then type a new name. Note that the name cannot contain a space.

If Runtime logs data to the database, a message appears, saying that the table already exists.

- Click Yes to create a new table and start logging to that table.
- Click No to rename the existing table and continue logging to that table.

**To change a column name**, click the name to highlight the row. (You cannot change a column type.) Click the name once again to make it editable.

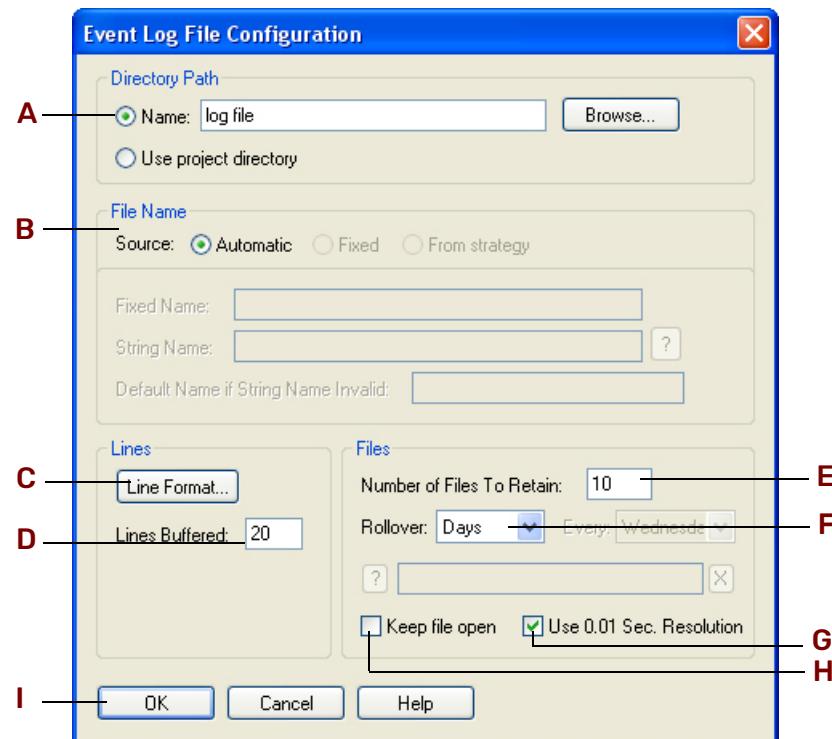


- Type a new name, and then press Enter.

The name cannot contain spaces, and it cannot begin with a SQL reserved word for that database type.  
Examples: INTEGER, VALUE BACKUP CURRENT\_DATE

- Click OK to confirm your changes and close the dialog box.

#### Event Log File Configuration Dialog Box



**(A) Name.** Choose the directory where the event log file will be saved. Click Name and enter the directory path in the field next to it, or click Browse to find a directory path. Click Use Project Directory to save the event log file to the PAC Display project directory. (This occurs by default if you don't specify a location.)

**NOTE:** To create a single networked file that logs the events of all the networked PCs running PAC Display, make sure each PC writes to the same networked file. This allows you to view all the events of the networked PCs from a central location. In order for the date and time stamps to be useful, make sure that the time on each PC is synchronized with the standard network server time.

**(B) Source.** Automatic is the only choice for creating the event log file name, and is selected by default.

**(C) Line Format.** Click to configure the character, or delimiter, used to separate the data in the log file, to choose the type of quotes used for each data line, and where to insert carriage returns. You configure these parameters in the Line Format dialog box that appears. See “[Setting Log File Line Format](#)” on page 230 for more information.

**(D) Lines Buffered.** Enter the number of lines of data your PC will save to a memory buffer before writing the information to the event log file. When choosing a number, keep in mind that the lower the number of buffered data lines, the more frequently the computer has to write to the file. Alternately, the higher the number of data lines buffered in memory, the more data that will be lost if your PC loses power or has a system failure. A valid entry is any number between 0 and 999; the default is 20 files.

**(E) Number of Files to Retain.** Enter the maximum number of event log files that can be created using rollover before the oldest file is overwritten. For example, if you enter 10 and your rollover time period is set to hours, you will have 10 event log files created for 10 hours of data before the oldest file is overwritten with new data. See “[Naming Historical Data Log Files](#)” on page 230 for more information on rollover settings.

**(F) Rollover.** When you enable file logging, the default rollover period is Daily. To configure a different rollover period, select an option in the Rollover drop-down list. (For details about rollover files, see “[Naming Historical Data Log Files](#)” on page 230.) The size of the data log files is limited only by available disk space.

To save all data in a single data log file, select None. The file is named EVENTLOG.MSG.

If you select Weeks, also select the day of the week to have the files rollover. A new data file is created every week on the selected day at midnight. For example, if the configured rollover period is Monday, and data logging starts on Wednesday, the first log file will contain data from Wednesday until 11:59:59 on Sunday night. A new log file is created at 12:00 a.m. on Monday; thereafter, the weekly data files will contain data from 12:00 a.m. on Monday through 11:59:59 on Sunday night.

To use the Trigger option, see “[Using the Rollover Trigger Option](#)” on page 227. Logging begins when the Start Trigger is activated, and data collected will be appended to the existing data file.

**(G) Use 0.01 Sec Resolution.** Select this option to log the time in hundredths of a second.

**(H) Keep File Open.** Select Keep File Open to allow buffered data to be appended to the event log file more quickly. If you leave this box unchecked (the default setting), the file is closed after each time data is written to it. This provides greater data integrity than leaving the file open.

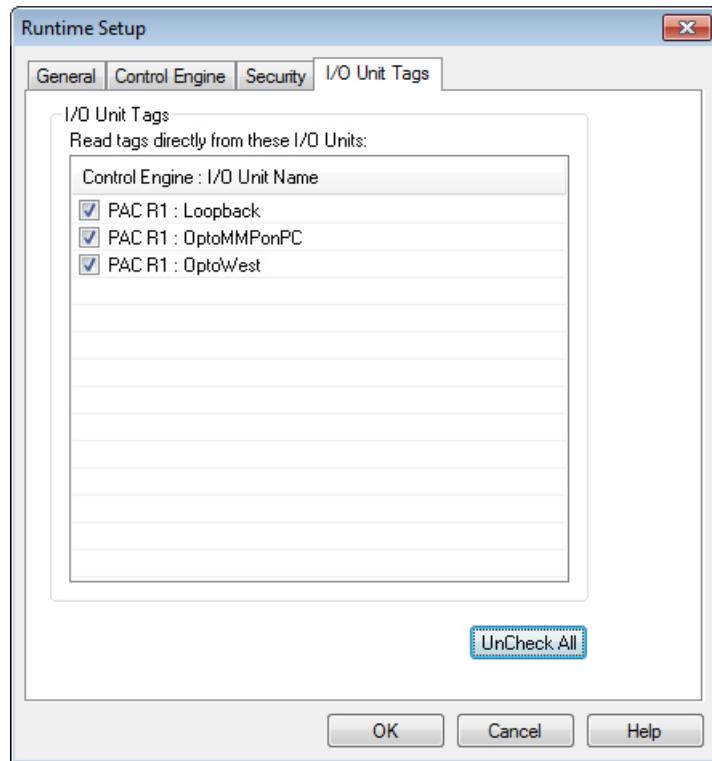
**(I) OK.** Click OK to save your settings and close the dialog box.

## RUNTIME SETUP: I/O UNIT TAG TAB

For the current PAC Display project, any Ethernet-based I/O units that are configured in the associated PAC Control strategy will be listed on the I/O Unit Tags tab of the Runtime Setup dialog box. All I/O units are selected by default. For each I/O unit, do the following:

- Select the check box to have the PAC Display project communicate directly with that I/O unit.
- Deselect the check box to have the PAC Display project not communicate directly with that I/O unit, and instead access I/O tags through the control engine.

*NOTE: To protect a strategy in case of a power loss, be sure to save the strategy to flash memory. You can save it to flash just once, when needed, or save every time the strategy is downloaded. For more information, see the [PAC Control User's Guide](#) (form 1700).*



Your control system probably uses Ethernet-based I/O units, which combine Opto 22 SNAP PAC R-series controllers or EB-series brains with I/O modules and an I/O rack. In the I/O Unit Tags tab, you can configure how the PAC Display project communicates with these units. Controlling how the PAC Display project communicates with an I/O unit can improve the response time for reading and writing remote I/O points over getting that information from the controller.

Normally a PAC Display project running on a PC gets information such as I/O point state or value by communicating directly with the I/O unit itself. Other information, however, is not obtained from an I/O unit (for example, the result of a calculation). Instead, this information comes from the tag variables on the control engine running the PAC Control or OptoControl strategy. In the I/O Unit Tags tab, you can configure whether the PAC Display project accesses I/O unit information directly from the unit, or accesses that information only from the control engine.

*NOTE: Being able to specify how this communication occurs also allows you to use the dual Ethernet interfaces of the SNAP PAC R-series brains to segment part of an Ethernet network.*

## USING RUNTIME

- ["Runtime Regular and Monitor-Only Versions" on page 321](#)
- ["Opening a Project in Runtime" on page 321](#)
- ["Logging In to and Out of Runtime" on page 322](#)
- ["Running Multiple Runtimes" on page 323](#)
- ["Using the Event Log Viewer" on page 325](#)
- ["Viewing Logged-In Users in Runtime" on page 325](#)

- "Viewing and Changing Control Engines" on page 326
- "Viewing and Changing Scanner Status" on page 327
- "Switching a Window Between Control Engines" on page 329
- "Viewing Alarm Graphics" on page 330
- "Modifying Alarm Points" on page 331
- "Disabling Alarm Points in Runtime" on page 333
- "Using SuperTrends in Runtime" on page 333
- "Using XY Plots in Runtime" on page 336
- "Writing Directly to Individual Elements" on page 336
- "How a Combo Box Behaves in Runtime" on page 337
- "Using a PID Button" on page 337

## Runtime Regular and Monitor-Only Versions

Two versions of PAC Display's Runtime application are provided with PAC Display: the regular version and a monitor-only version. The primary difference between these two versions is that the monitor-only version of PAC Display Runtime does not allow values to be sent to a control engine. This is a useful feature when operator intervention is not required or must be prohibited.

The monitor-only version of PAC Display Runtime has the following features:

- The File and Help menus are the only menu items displayed. If the PAC Display project has been configured to hide the menu bar, however, even these menus are not visible. See "[Restricting the Operator](#)" on page 299 for information on configuring the menu bar in Runtime.
- Opening and closing windows are the only operator-driven dynamic attributes that can be used in the Runtime monitor-only version. Keep this in mind when developing the PAC Display project; if, for example, there is a window that you do not want the operator to see, do not use the open/close dynamic attribute with a graphic object.

### Using Monitor-Only Runtime and Configurator

To use the monitor-only version of Runtime with this feature, you must change the file name of the application.

1. In Windows Explorer, change the file name of the regular version of PAC Display to a temporary name. For example, change "DisplayR.basic.exe" to "orig\_DisplayR.basic.exe" or something similar.
2. Now change the file name of the monitor-only Runtime application to the original name of the regular version. This is done by changing "DisplayX.basic.exe" to "DisplayR.basic.exe".

After making these changes, the monitor-only version of Runtime will start when you select Save Project and Load Runtime in PAC Display Configurator.

To use the regular version of Runtime again, reverse the steps above.

## Opening a Project in Runtime

When your PAC Display project is complete and you're ready to open it in Runtime, you can open it:

- [Using PAC Display Configurator](#).
- [Using PAC Display Runtime](#).
- Using a batch file. (For details, see "[Creating a Batch File to Start and Run a Project](#)" on page 51.)
- **Using PAC Display Configurator.**
  - In the PAC Display Configurator menu bar, click File > Save Project and Load Runtime. Changes to the current project in PAC Display Configurator are saved, and the project is opened in Runtime. The Save Project and Load Runtime feature lets you switch quickly from Configurator to Runtime, and is a convenient way to test a PAC Display project as you develop it.

- **Using PAC Display Runtime.**

- Start PAC Display Runtime.<sup>1</sup>
- In the PAC Display Runtime menu, click File > Open Project.
- In the Open Project dialog box that appears, select the PAC Display project you want to open.

When the project opens, it will start running and you'll see the operator interface created in PAC Display Configurator. The initial state of the draw windows that appear (open, closed, or iconified) is determined by the Runtime setup configuration. Unless you chose to hide the menu bar when you configured the project, the menu bar for the main window also appears.

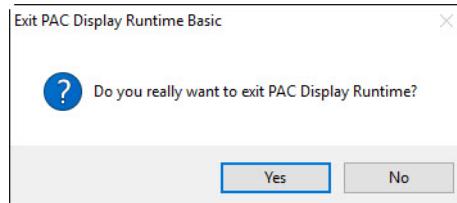
## Logging In to and Out of Runtime

If multiple users have been configured in Configurator, you can log out of Runtime to allow another user to log in.

See also, “[Logging In to and Out of Operator Driven Attribute Access in Runtime](#)” on page 311.

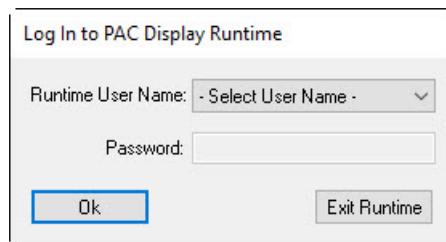
1. To log out of Runtime, choose Security > Log Out of PAC Display Runtime.

A dialog box asks you to confirm logging out.



2. Click Yes.

If Enable Runtime Operator Action Logging is enabled on the Runtime setup dialog box, an entry is made in the log and the Log In dialog box opens for the next user.



3. To log in, select your name from the drop-down list, type the password, and then click OK. Or, click Exit Runtime to shut down PAC Display Runtime.

*IMPORTANT: During the time this dialog is displayed, there can be no interaction between a user and PAC Display Runtime. The current Windows user cannot log off, nor can Windows be shut down.*

If the Runtime operator log is enabled, an entry in the log is made indicating whether the log in was successful or not and the operator who attempted or succeeded at the log in.

Also, the newly logged in user is set as the user whose actions will be logged in the Runtime operator log file.

---

<sup>1</sup>For instructions to start PAC Display Runtime, see [page 27](#).

## Running Multiple Runtimes

You can run more than one Runtime on the same PC either for the same project or for multiple projects.

*CAUTION: Before using this option, consider the following things:*

- *If each project is logging to files (SuperTrend, Historical, Operator Logging, etc.), are the projects saving data to the same file(s)? If so, system instability or a crash may occur.*
- *Performance will be reduced for each Runtime project.*

To configure Runtime to allow more than one Runtime:

1. Click Configure > Runtime to open the Runtime Setup dialog box.
2. At the bottom of the General tab under Allow Multiple Runtimes, select Allow Multiple Instances to Run.
3. Click OK.

### Running the Same Project in a New, Separate Runtime

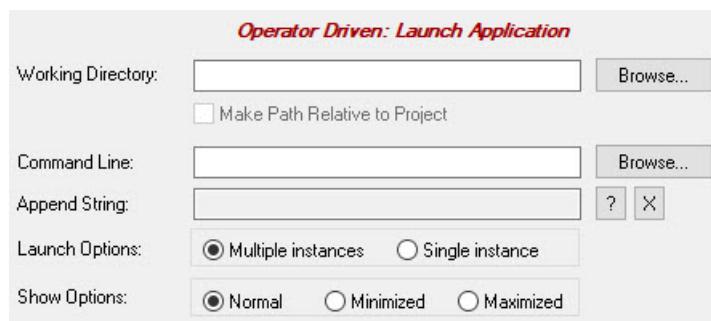
1. Launch the first Runtime in Configurator by selecting File > Save Project and Load Runtime.
2. Launch a second Runtime directly through Windows.  
In the PAC Display Runtime menu, click File > Open Project.  
Navigate to the location of the project file.  
Click the project to select it, and then click Open.

### Running a Different Project in a New, Separate Runtime

To run a different project in a new, separate Runtime, you can use a Launch Application dynamic attribute tied to a graphic object in a currently running Runtime. Alternatively, you can use a command line or a batch file.

#### Using a Launch Application Dynamic Attribute

1. Using the Select tool, double-click the graphic object to which you want to assign the dynamic attribute. For more information, see ["Assigning a Dynamic Attribute to a Graphic Object" on page 165](#).
  2. In the Graphic Dynamic Attributes dialog box, under Operator Driven Attributes, double-click Launch Application.
- The Dynamic Attribute – Launch Application dialog box appears.



3. For the Working Directory, enter the full path to Runtime.  
Example: C:\Program Files (x86)\Opto22\PAC Project
4. For the Command Line, enter DisplayR.<basic or pro>.exe "<Full Path To.UUI Project File>"  
Examples:  
DisplayR.basic.exe "C:\My Projects\My PAC Display Project.UUI"  
DisplayR.pro.exe "C:\My Projects\My PAC Display Project.UUI"
5. Next to Launch Options, select Multiple instances.
6. Click OK, then click OK again.

### Using a Command Line or Batch File

To start one or more Runtimes using a command line or batch file, use the following format:

```
cd "<Full Path To Runtime>"
```

```
DisplayR.<basic or pro>.exe "<Full Path To .UUI Project File>"
```

Example:

```
cd "C:\Program Files\Opto22\PAC Project"
DisplayR.basic.exe "C:\My Projects\ProjectA\ProjectA.UUI"
```

#### Example: Using Batch Files to Run Multiple Projects

The following example shows one way to use batch files to run multiple Runtimes on the same PC. A master batch file launches two project batch files, each of which launches a different project.

1. Create a batch file for each project. In this example there are two projects: Project A and Project B.

Each project batch file has the following format:

```
cd "<Full Path To Runtime>"
DisplayR.<basic or pro>.exe "<Full Path To .UUI Project File>"
exit
```

The Project A batch file is named LaunchProjectA.bat:

```
cd "C:\Program Files\Opto22\PAC Project"
DisplayR.basic.exe "C:\My Projects\ProjectA\ProjectA.UUI"
exit
```

The Project B batch file is named LaunchProjectB.bat:

```
cd "C:\Program Files\Opto22\PAC Project 9.1"
DisplayR.basic.exe "C:\My Projects\ProjectB\ProjectB.UUI"
exit
```

*NOTE: You can substitute DisplayR.pro.exe. Make sure to include the surrounding quotes.*

2. Create a master batch file that will run both of the project batch files. This is the batch file that is actually invoked.

The master batch file has the following format.

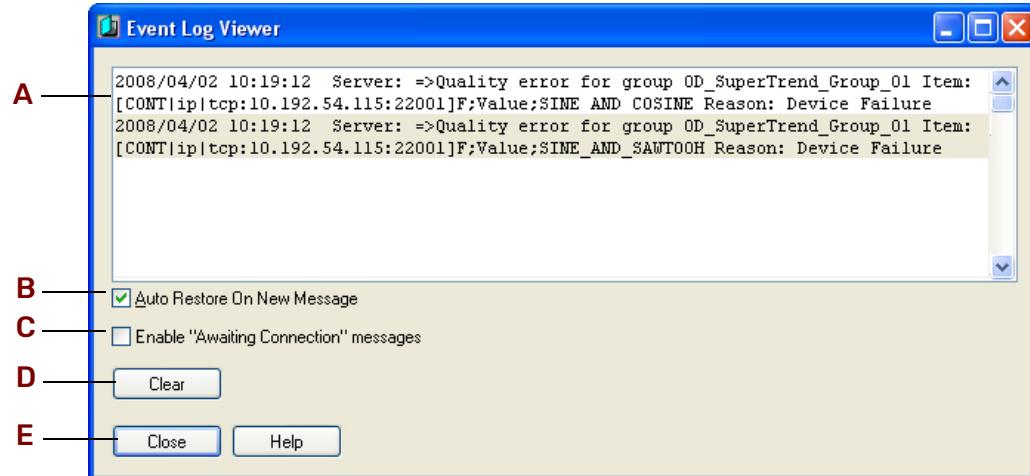
```
cd "<Full Path To The Directory Containing Project Batch Files>"
START <Name of Project A Batch File>
START <Name of Project B Batch File>
exit
```

Both LaunchProjectA.bat and LaunchProjectB.bat are in the same directory, C:\batch:

```
cd "C:\batch"
START LaunchProjectA.bat
START LaunchProjectB.bat
exit
```

## Using the Event Log Viewer

The Event Log Viewer is started at Runtime by default. This window displays a list of communication transactions and error messages for a project. If the Event Log Viewer is not open, choose View > Event Log to open it. The window that appears will be similar to the following example.



**(A) List Area.** The list area posts event messages as they occur. Messages will have a date and time stamp, and a brief message describing the communications event that occurred.

See also, ["Appendix A: PAC Display Troubleshooting"](#).

Messages posted to the event log can also be saved to a disk file. Refer to ["Configuring the Event Log File" on page 316](#) for more information about doing this.

**(B) Auto Restore on New Message.** To make the Event Log Viewer appear in the foreground whenever a new message is posted, select Auto Restore on New Message. This option won't be available if Prevent disabling was selected when the project was set up in PAC Display Configurator.

**(C) Enable "Awaiting Connection" Messages.** To display or hide common error messages that occur when a PAC Display project starts, select or deselect the Enable "Awaiting Connection" Messages option.

**(D) Clear.** Click Clear to erase the list of event messages.

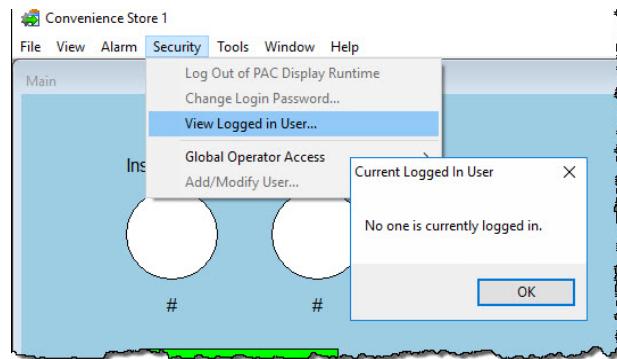
**(E) Close.** After reviewing an event message, you can keep the Event Log Viewer window open, or close it using the Close button (E).

## Viewing Logged-In Users in Runtime

NOTE: For additional security features, see:

- ["Protecting a Project with a Password" on page 46](#) to assign a password to the PAC Display project to prevent unauthorized users from opening it in PAC Display Configurator.
- ["Modifying Draw or URL Windows" on page 94](#) to assign a password to individual windows in a PAC Display project to prevent unauthorized users from opening them.
- ["Security Settings for Graphic Objects and Dynamic Attributes" on page 176](#) to allow or deny operator access to individual graphic objects, based on configured, authorized users and groups.
- ["Runtime Setup: Security Tab" on page 297](#) to allow operator access to the HMI, as well as log all HMI use and operator actions to an encrypted archive.

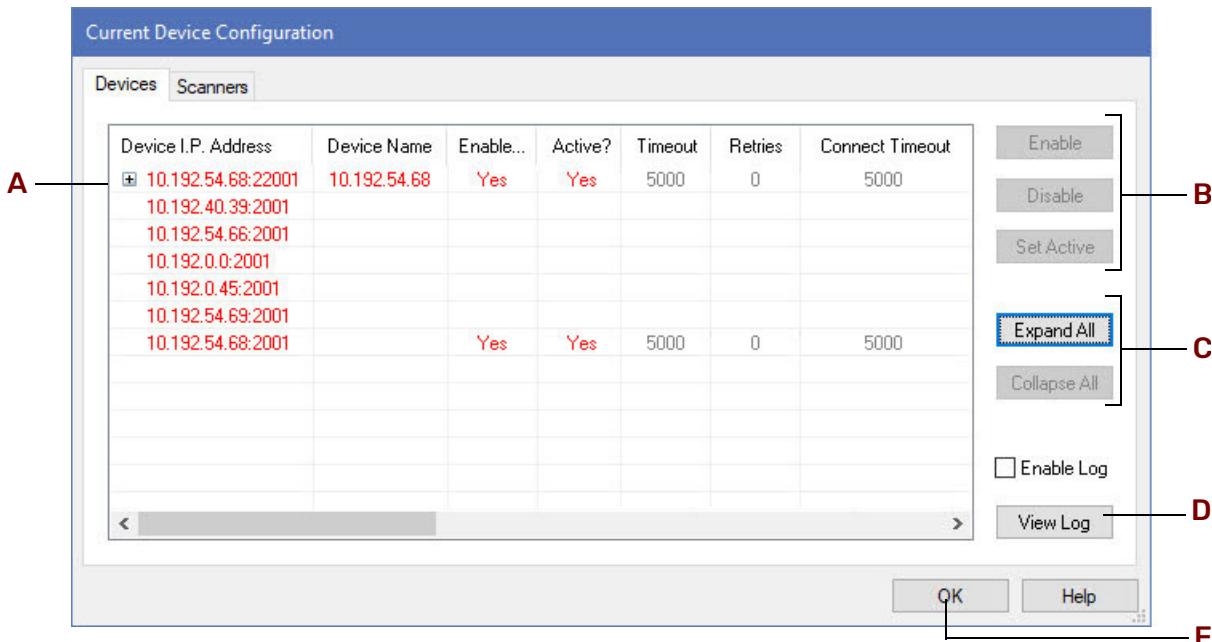
In the Runtime menu bar, click Security > View Logged-in User to view users who are currently logged in to the project.



### Viewing and Changing Control Engines

To view and change the control engines and I/O units configured for the PAC Display project, choose View > Configuration Status to open the Current Device Configuration window and then click the Devices tab. The information in this window updates automatically as control engines and I/O units—or *devices*—are enabled or disabled, or change states between active and inactive.

The Current Device Configuration window can be left open or minimized while the PAC Display project is running.



**(A) IP Addresses.** IP addresses for both primary and secondary control engines, as well as any Ethernet-based I/O units used with those control engines, are listed here. For each device the following information is displayed:

**Device IP Address.** Assigned IP address for the device. If a secondary control engine or an I/O unit has been configured for that device, a plus sign "+" appears in front of the IP address. Click the plus sign "+" to see the IP

address and status information for that device. Primary control engine IP addresses are displayed in red, and other devices are displayed in blue.

**Device Name.** User-friendly name for the controller (typically configured in PAC Control or PAC Terminal). If a name has not been configured, the device's IP address is displayed.

**Enabled/Disabled State.** Device availability status; if the device is enabled, it is available for use with a PAC Display project and can be made active. If the device is disabled, it cannot be made active.

**Active/Inactive State.** Device activity status; an active device is a control engine or I/O unit that the PAC Display project is currently trying to communicate with. An inactive device is one that is not being used for communication.

**Timeout.** When a connection has been established with a device, this is the length of time (in ms) that the PAC Display project will attempt to communicate with the control engine after no communications are received.

**Retries.** When sending and receiving information to and from the primary control engine, this is the number of times that the PAC Display project will attempt to communicate with the control engine after no communications are received.

**Connect Timeout.** When trying to connect to the primary control engine, this is the length of time (in ms) that the PAC Display project will try to communicate before switching to another control engine.

**(B) Enable/Disable/Set Active.** Select a device and do one of the following:

- Click Enable to make that device available for use by the PAC Display project.
- Click Disable to make the selected device unavailable to the PAC Display project.
- Click Set Active to deactivate any currently active device and make the selected device active.

**Timeouts and Retries**—For any control engine that's selected, you can also change Timeout, Retries, and Connect Timeout values.

**(C) Expand/Collapse All.** Click Expand All to show primary and secondary control engines plus any Ethernet-based I/O units. Click Collapse All to show only the primary control engines and I/O units.

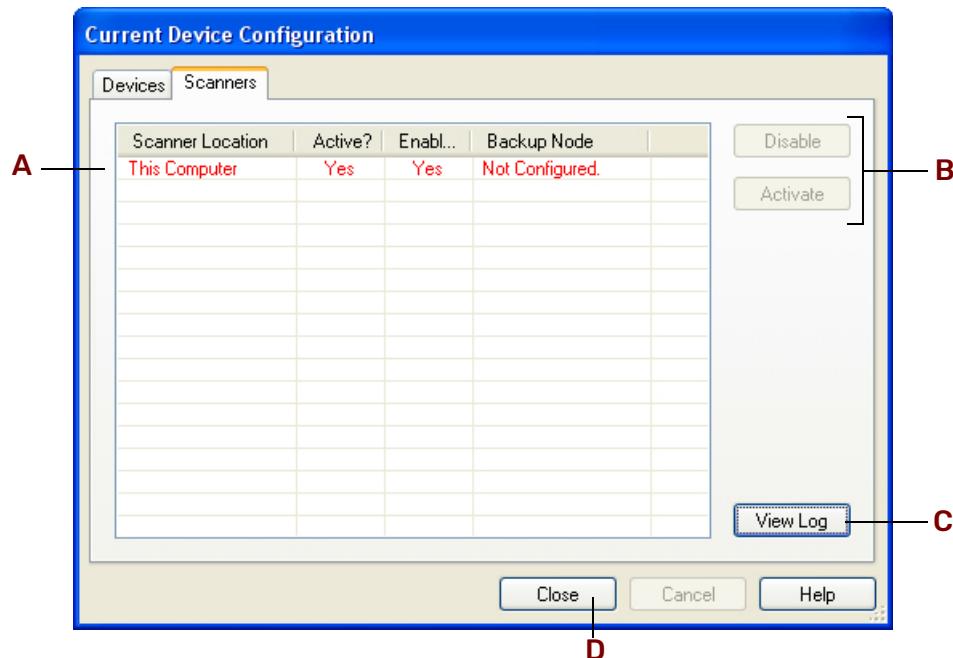
**(D) View Log.** Click View Log to open the file ConfigInfo.txt in Windows Notepad. This text file is created and updated whenever any of the listed device parameters are modified.

**(E) Close and Save.** Click OK to close the window and save any changes you made.

### Viewing and Changing Scanner Status

To view and change the status of scanners used in the PAC Display project, choose View > Configuration Status to open the Configuration Status window, and then click the Scanners tab. This window updates automatically as the scanners are enabled or disable, or change states between active and inactive, and can

be left open or minimized while the PAC Display project is running. (For information on what a scanner is, see “Configuring the Scanner” on page 67.)



**(A) List Area.** Scanners used by the PAC Display project are listed here by the Windows Network name of the computer the scanner is running on. For each scanner the following information is displayed:

**Scanner Location.** Name of the PC running the scanner. Primary scanners are displayed in red, and secondary scanners are displayed in blue.

**Active/Inactive State.** Scanner activity status; an active scanner is checking control engine tags and I/O unit values, while an inactive one is not.

**Enabled/Disabled State.** Scanner availability status; if the scanner is enabled, it can be used with a PAC Display project and can be made active. If the scanner is disabled, it cannot be made active.

**Backup Node.** If a secondary scanner has been configured, that scanner is listed here. (See “Configuring a Remote Scanner in PAC Display Pro” on page 69 for instructions on doing this.)

**(B) Disable/Activate.** For an *inactive scanner*, select the scanner and do the following:

- Click Disable to prevent the PAC Display project from using this scanner.
- Click Activate to force the PAC Display project to switch to this scanner from the scanner listed under Backup Node.

For a *currently active scanner*, select the scanner and do the following:

Click Disable to stop this scanner and force the PAC Display project to switch to the secondary scanner (if one has been defined).

**(C) View Log.** Click View Log to open the file ConfigStatus.txt in Windows Notepad. This text file is created and updated whenever any of the device parameters listed in B are modified.

**(D) Close.** Click Close to close the window and save any changes you made.

## Switching a Window Between Control Engines

If a draw window's properties have been set to allow switching between control engines, you can access different control engines that are running the same PAC Control strategy. When you switch control engines in Runtime, graphic objects that display control engine data will be updated to show data from the newly selected control engine. For example, if five control engines are all running the identical strategy, you create only one draw window instead of making a separate window for each control engine. For instructions on setting up a draw window, see ["Modifying Draw or URL Windows" on page 94](#).

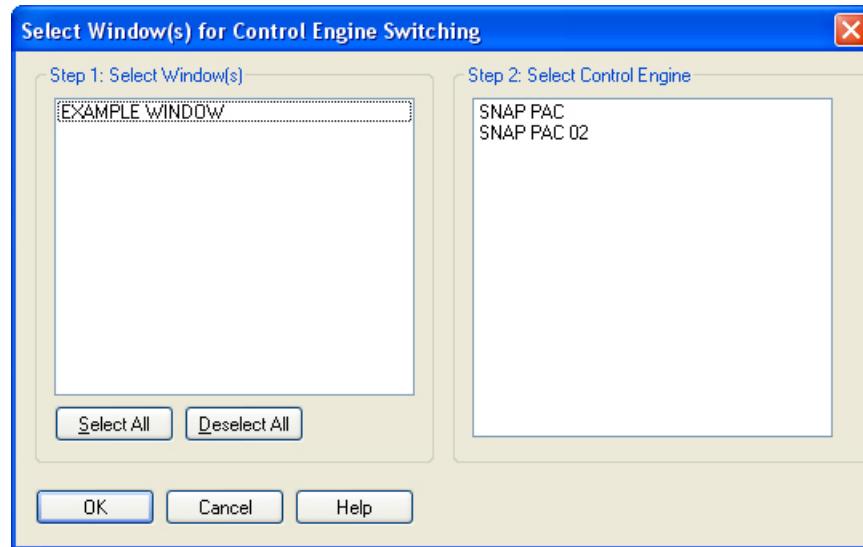
There are some important considerations to note when using this feature:

- Additional control engines that you want to switch between must be associated with the PAC Display project using the Configure > Control Engines menu item.
- If you switch to a different control engine and then exit PAC Display Runtime, when the project is restarted the default control engine for the project—not the one you switched to earlier—will be selected.
- Trends and SuperTrends must have the Disable Scanning option set to either "When Closed" or "When Minimized and Closed."
- All tags for the graphic objects in the window must reference the same control engine.
- Tag names should not include the name of a control engine. For example, don't name a variable "Control Engine1\_flowrate" in PAC Control if the strategy uses a control engine named "Control Engine1."
- Control engine names must be at least three characters in length.
- The "Always in memory" windows property should not be selected.
- Alarms and graphic objects using the Alarm Point control engine-driven attribute may not be used.
- Recipes cannot be used.

To switch between control engines, start the PAC Display project and do the following:

1. Select Window > Switch Control Engines.

The Select Window(s) for Control Engine Switching dialog box appears.



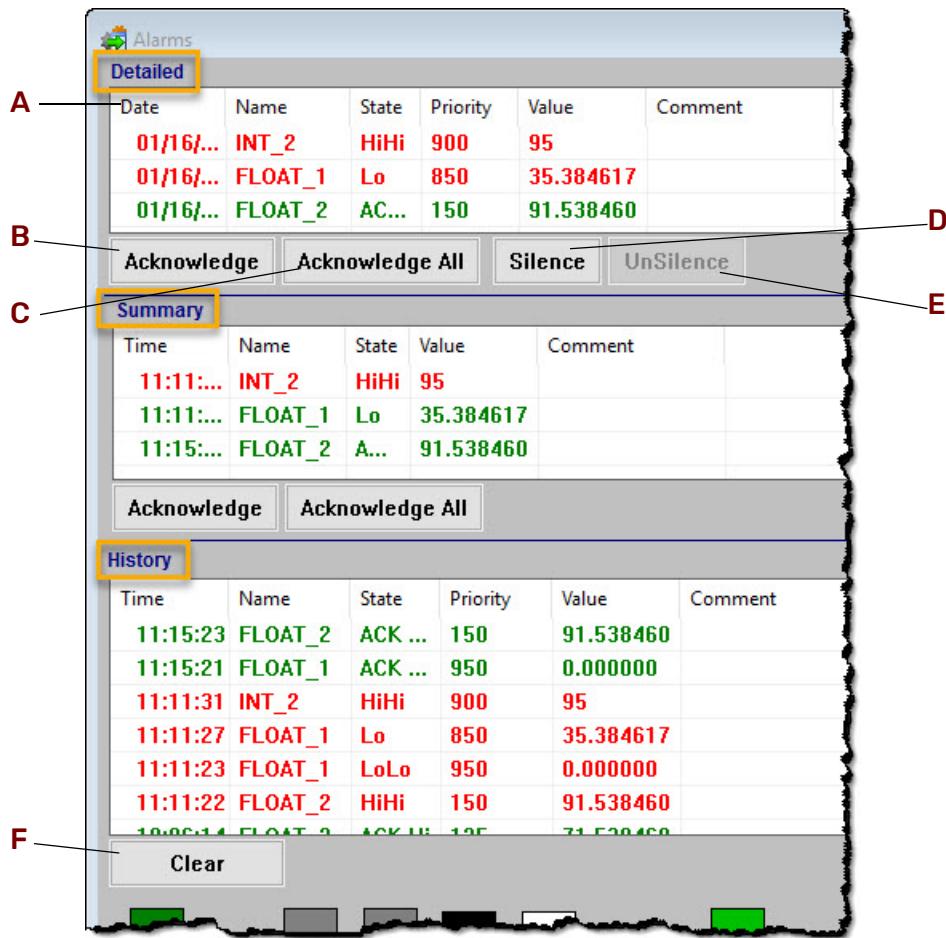
2. Select the name of the window you want to view.
3. Select the name of the control engine you want to view.
4. Click OK.

Graphic objects with dynamic attributes now use values from the control engine you selected. The name of the currently connected control engine appears in the window's title bar.

### Viewing Alarm Graphics

You may see detailed, summary, and history alarms in a PAC Display project if it has been configured to let the operator do so. See “[Adding Alarm Graphics](#)” on page 273 to learn more about these types of alarms.

The image below shows an example of three types of alarm graphics: Detailed, Summary, and History. Note that alarm data can be configured to indicate its status (Alarm, Normal, Warning, Acknowledged, and Silenced).



**(A) List Area.** To sort the information, click the column name of the item you'd like to sort by. Click the column name again to reverse the sort order. To change the location where columns appear in an alarm graphic, click the name of a column and drag it to a new location.

**(B) Acknowledge.** To acknowledge and turn off a single active alarm, select an alarm and click Acknowledge.

**(C) Acknowledge All.** Click this button to acknowledge and turn off all active alarms.

**(D) Silence.** (Detailed alarms only) To silence a single active alarm, select an alarm and click Silence. Silencing an alarm is similar to acknowledging an alarm, and the alarm will not re-alarm until it has been unsilenced.

**(E) UnSilence.** (Detailed alarms only) To unsilence an alarm that has been silenced, select the alarm and click UnSilence.

**(F) Clear.** (History alarms only) Clears the list of alarms.

## Modifying Alarm Points

You may be able to modify alarm points in the PAC Display project if it has been configured to let the operator do so. See “[Configuring Alarm Points](#)” on page 258 to learn more about configuring alarm points. Also see “[Configuring Project Alarms](#)” on page 277 for information about setting alarm options in Runtime.

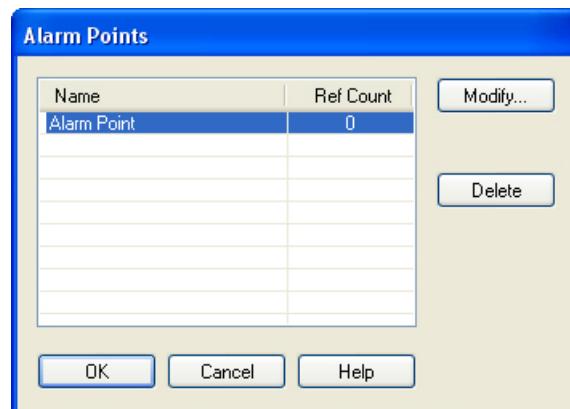
Alarm point settings can be changed in each one of the four alarm ranges available: HiHi, Hi, Normal, Lo, and LoLo. Each alarm point state has a value that defines its range:

- **HiHi** alarms are greater than or equal to the HiHi Value.
- **Hi** alarms are greater than or equal to the Hi value and less than the HiHi value.
- **Lo** alarms are less than or equal to the Lo value and greater than the LoLo value.
- **LoLo** alarm are less than or equal to the LoLo level.

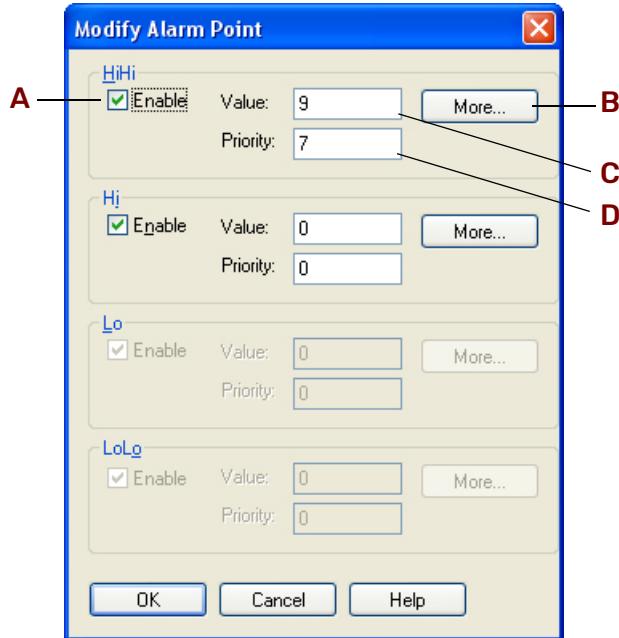
The normal state is between the Hi and Lo values. Each level can be enabled or disabled, but at least one alarm state (HiHi, Hi, Lo, or LoLo) must be enabled.

To view the alarm point settings:

1. Select Alarm > Modify Alarm Points to open the Alarm Points dialog box.

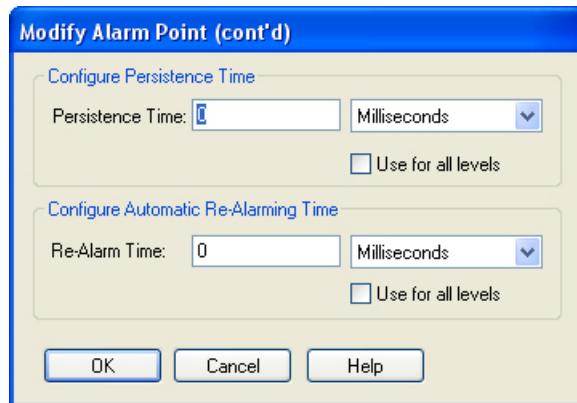


2. Select the alarm point name and then click Modify.



**(A) Enable.** Select this check box to enable the alarm level for an alarm range.

**(B) More.** Click the More button to change the Persistence Time or the Automatic Re-Alarming Time in milliseconds or seconds. The persistence time is the time that elapses before the alarm point is triggered. The re-alarming time is the time that elapses before the alarm point is re-triggered.



**(B) Value.** Enter the value for an alarm level in the Value field.

**(C) Priority.** To set a priority for an alarm point, enter an integer value between 0 and 999.

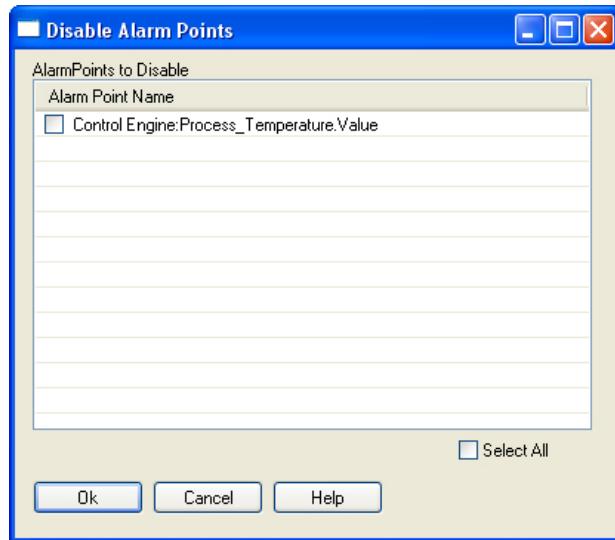
Priority fields define an integer value for each alarm level, and can be useful for displaying the relative importance of different alarm points. Additionally, you can filter out alarms with lower priorities.

## Disabling Alarm Points in Runtime

You can **disable** individual alarm points in Runtime for the current Runtime session only. This is not a persistent option. Disabling an alarm point takes effect after any current processing is being performed on the selected alarm point.

To disable one or more alarm points:

1. Select Alarm > Disable Alarm Points.



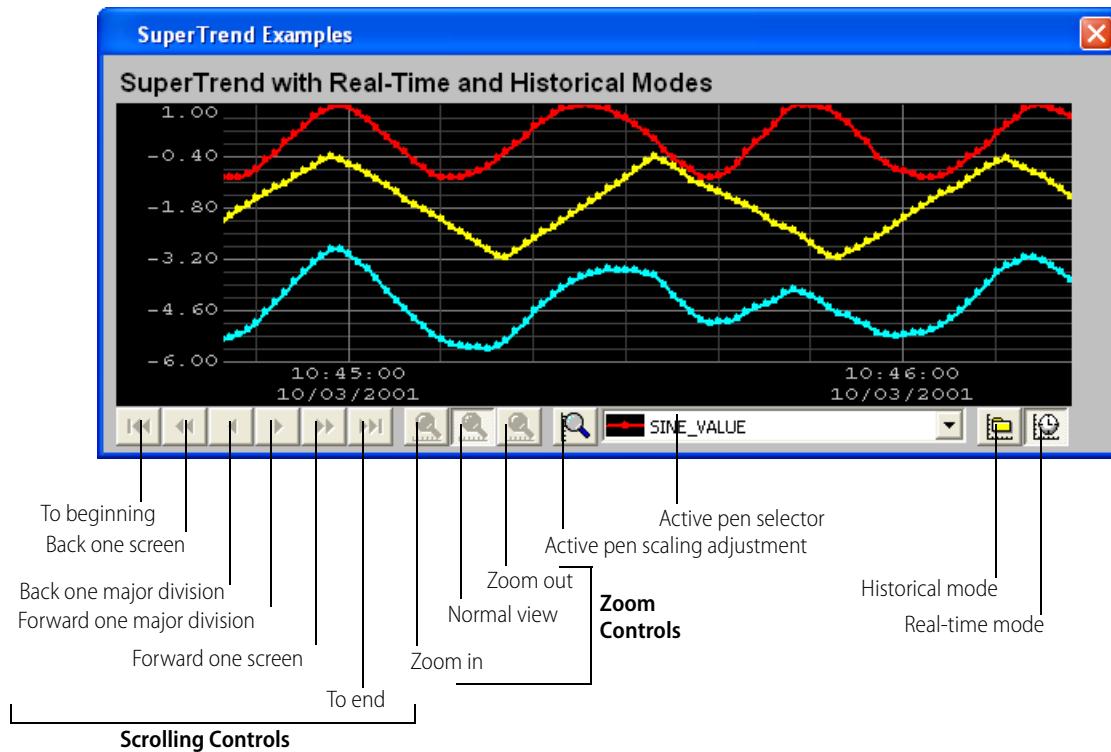
2. In the Disable Alarm Points dialog box, select individual that want to disable, or select Select All.
3. Click OK.

*NOTE: If you re-enable an alarm point, re-enabling will not actually take effect until the current value of the alarm point changes. If the alarm point is re-enabled while in an alarmed state, this could mean that an alarm point will not appear in an alarm graphic, and its configured sound may not play.*

## Using SuperTrends in Runtime

If a SuperTrend is included in a PAC Display project, you can control how you view the trend data that appears in the SuperTrend window. For example, you can zoom in to see a smaller slice of a trend line, or, if historical data is being collected, you can switch between views of real-time and historical data.

A sample SuperTrend window appears below. It shows the controls you can use to display SuperTrend information. Note that most of the controls that appear below are available only when historical mode has been selected.



- Use **scrolling controls** to move back and forth in a graph of historical data.
- Use **zoom controls** to increase or reduce the image visible in the graph.
- To **select an active pen**, click the drop-down list and select a pen from the names that appear. If the y-axis scaling was based on pens (see “Configuring Y-Axis Parameters” on page 194), the scale of the active pen will be displayed.
- To **change the scale of an active pen**, click the Active pen scaling tool and enter new minimum and maximum values in the dialog box that appears.  
If the y-axis scaling is Logarithmic (see “Configuring Y-Axis Parameters” on page 194), the pen Default Min and Default Max values are limited to powers of ten. For example, if you want to plot a pen in the range of 1 to 50 with a logarithmic SuperTrend, the SuperTrend will calculate the Default Max value to 100, since that is the smallest factor of 10 greater than 50. If you want to be able to zoom in on the active pen, use a range such as 1–10, 0.1–1, or .001–10. If you want to zoom out, use something like 10–1000 or 1–1000.
- To **see all pens scaled the same when using Pen scaling**, select a pen, click the scaling button (magnifying glass), enter the scale, and hold the Shift key down while clicking OK.  
SuperTrends are normally set up in Configurator with Pen scaling (see “Configuring Y-Axis Parameters” on page 194). But with Pen scaling, when one pen is selected in the display, only that pen matches the scaling shown; other pens do not appear to be at the correct value. By holding down the Shift key while clicking OK, Default scaling is used so that all pens are scaled the same.
- To **revert to Pen scaling** (each pen individually scaled), select a pen, click the scaling button (magnifying glass) and hold the Ctrl key while clicking OK. Nothing needs to be entered or changed in this dialog box. All pens will revert to Pen scaling.

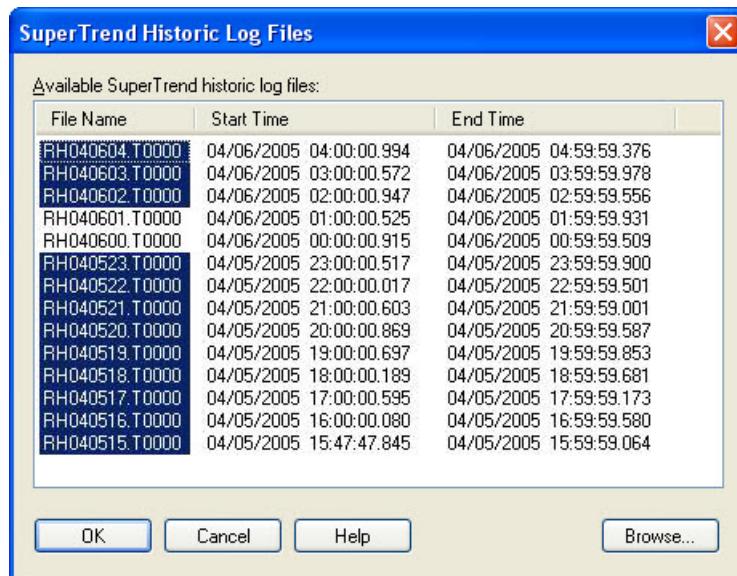
#### Switching between Historical and Real-Time Modes

If a SuperTrend is both a historical and a real-time trend (that is, historical data is being collected), you can easily change views to see real-time or collected historical data.

- To switch between historical and real-time modes, click the Historical mode button  or the Real-time mode button .

When you switch from Real-time mode to Historical mode, the SuperTrend Historical Log Files dialog box opens, listing the names of SuperTrend historical log files and the time each log started and stopped recording.

*NOTE: If there are a lot of historical log files, it can take a long time to display the files. To view the files more quickly, hold down the Shift key when you click the Historical mode button. This lists the log files by name only without the start and end times. You can also speed up the display time by having each SuperTrend log its files to a different folder. See "SuperTrend Historical Log File Names" on page 202.*

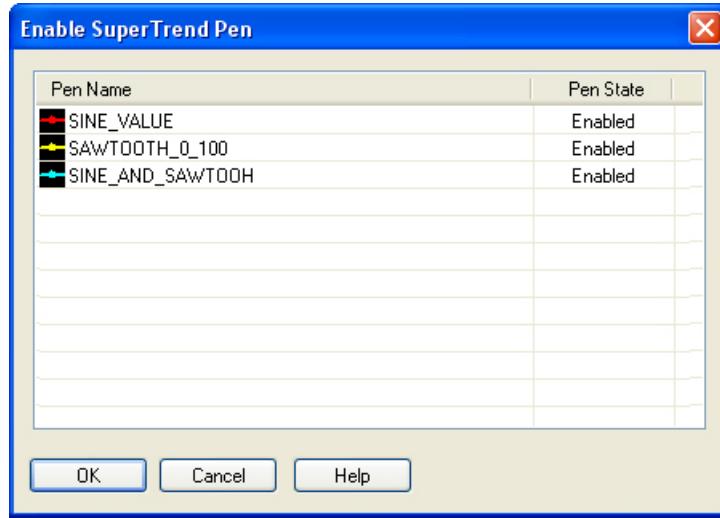


- To view SuperTrend historical log files, select one or more files and click OK.  
To select multiple log files, hold down either the Shift key (for selecting contiguous items) or the Ctrl key (for selecting non-contiguous items) and click a file name.  
To open a different SuperTrend historical log file, click the Browse button and browse to the folder containing the file.  
The information in the log file will be shown in the SuperTrend graph. Use the controls at the bottom of the graph to view the information. (See "Using SuperTrends in Runtime" on page 333.)
- When you are finished viewing the SuperTrend historical log file, click the Real-time Mode button to return to the real-time view of SuperTrend information. Note that you will need to reselect log files each time you switch to historical mode.

#### Enabling and Disabling SuperTrend Pens

Individual SuperTrend pens can be displayed (enabled) or hidden (disabled) in Runtime.

1. Right-click a SuperTrend to open the Enable SuperTrend Pen dialog box.



2. Click a pen name to toggle it between these states:
  - **Enabled**—pen data is being scanned and logged to a file (if configured).
  - **Hidden**—pen data is being scanned and logged to a file (if configured), but the pen data is not graphed on the SuperTrend.
  - **Not Scanning**—pen data is not scanned or logged to a file (if configured).

When enabling and disabling SuperTrend pens, note that the active pen in the SuperTrend object cannot be toggled between enabled, hidden, and not scanning.

#### Converting SuperTrend Historical Log Files

A software utility is included with PAC Display that converts binary log files to text format in order to view their contents. This utility is also available in PAC Display Configurator. For guidelines and instructions, see ["Converting SuperTrend Historical Log Files to Text Format for Viewing" on page 205](#).

### Using XY Plots in Runtime

You can change the range of values used for the x-axis and y-axis of an XY plot object if this option has been set in PAC Display Configurator. To change range values, right-click the XY plot and in the dialog box that appears enter new minimum and maximum values for each axis.

### Writing Directly to Individual Elements

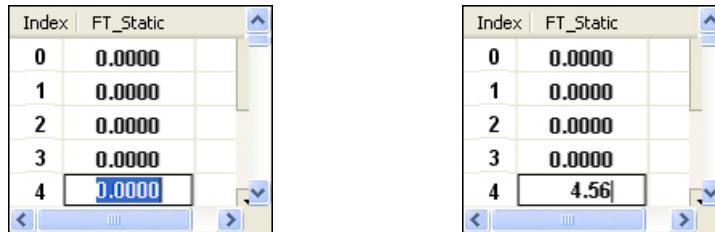
If you use tables in PAC Control to organize variables used for similar tasks, you can modify individual integer, float, and string table elements in PAC Display Runtime. For example, you can change things such as the setpoint of a PID controlling the AC, an oven temperature or cook time, or the speed of a conveyor belt. To learn how to modify multiple variables all at once, see ["" on page 239](#).

*NOTE: You can use this feature only if the table has the Allow Edit feature turned on in PAC Display Configurator. See ["Creating a Table" on page 134](#).*

To modify an individual table element:

1. Click the table element.

The element is selected and a border appears around the table element.



- Enter the new value and then press Enter to confirm, or press ESC to cancel.

### How a Combo Box Behaves in Runtime

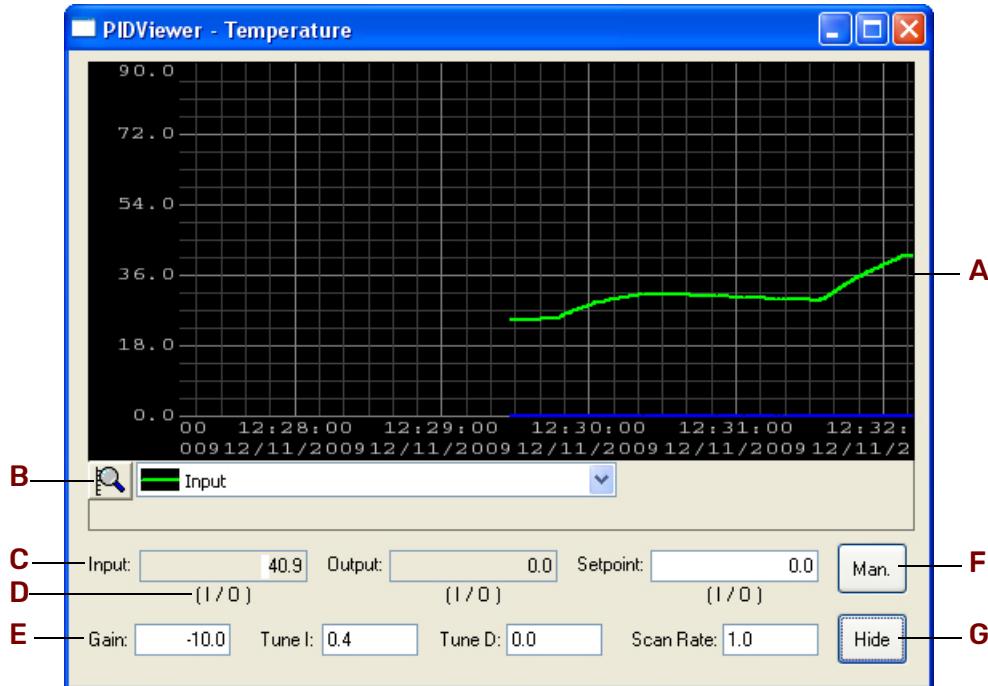
In Runtime, a combo box you created in Configurator behaves as follows:

- A combo box appears initially with no items selected.
- Once you select an item from the list, its operator-driven dynamic attributes are executed (after verifying Security, if configured).
- Any items that have the “Text-in” attribute are updated in real time when you click the drop-down arrow to display the list, and when the item is the item you have selected in the list.

See also, [“Adding a Windows Combo Box” on page 124](#).

### Using a PID Button

Click a configured PID Button in Runtime (see [“Adding a Windows Button or a PID Button” on page 121](#)) to display a SuperTrend in the PIDViewer for the configured PID loop. If Security has been configured for the PID button, then security restrictions may apply for a given user or group.



**(A) Plots.** The SuperTrend plots the Setpoint in red, the Input in green, and the Output in blue.

**(B) Pen Scale.** Click the icon to change the scale of an active pen. In the dialog box that appears, enter new minimum and maximum values.

**(C) Pen Value.** Shows the numerical value for the Input, Output, and Setpoint pens. To change a value, see “[Changing the PID Values in Runtime](#).”

**(D) Source/Destination.** Indicates the source/destination of the field: Host, I/O, or PID.

**(E) PID Tuning.** Use Gain, Tune I, Tune D, and Scan Rate to tune the PID.

For more information on PID tuning, see the [PAC Control User’s Guide](#) (form 1700). See also, the [OptoTutorial: SNAP PAC PID](#) (form 1641), which we highly recommend for detailed information on PIDs on Ethernet-based I/O units. Both forms are available for download from our website at [www.opto22.com](http://www.opto22.com).

**(F) Manual/Auto.** The PIDViewer starts in its current mode, either auto or manual. Switch to manual mode by clicking the Man button, or switch to auto mode by clicking the Auto button. A password will need to be entered if one has been assigned.

**(G) Tune/Hide.** Click Tune to display the four PID tuning fields (Gain, Tune I, Tune D, and Scan Rate). Click Hide to hide them. A password will need to be entered if one has been assigned.

#### Changing the PID Values in Runtime

The following chart shows whether the fields may be changed in Auto and Manual mode, depending on the Source or Destination of the fields:

Mode	Source/Destination	Input	Output	Setpoint
Manual	I/O (PID)	No	Yes	No
	Host	No	Yes	Yes
Auto	I/O (PID)	No	No	No
	Host	No	No	Yes

The fields update in real-time as the values of the PID change. To manually send a value to the field, click in the field and enter a new value.

For touchscreen terminals, if “Use on-screen keyboard for touchscreens” is set in the Configure > Runtime preferences dialog, an on-screen keyboard will appear for a writable edit field when the user clicks inside the field. For more information, see the description for Keyboard Setup in “[Runtime Setup: General Tab](#)” on page 290.

# A: PAC Display Troubleshooting

This appendix provides tips and procedures for resolving problems you may encounter while creating or running your PAC Display project.

If you are having problems with creating a PAC Control strategy, see Appendix A, "PAC Control Troubleshooting," in the *PAC Control User's Guide* (form 1700). For information about types of errors and lists of error messages that may appear in PAC Display Runtime, see "[Appendix B: PAC Display Errors](#)."

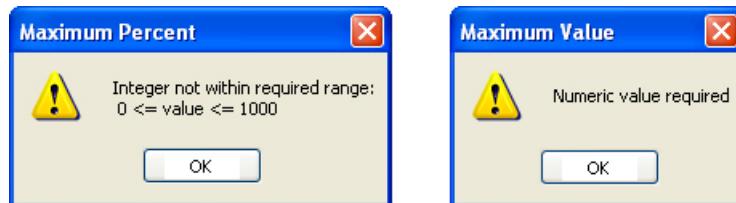
## HOW TO BEGIN TROUBLESHOOTING

Most errors that you encounter in PAC Display occur when you run your project in the Runtime component. Runtime errors can be the result of several factors: problems communicating with the control engine, problems in communication between the control engine and I/O, or problems in how an on-screen object is configured. Errors occurring in PAC Display Configurator, on the other hand, are usually due to incorrect values being entered in dialog boxes.

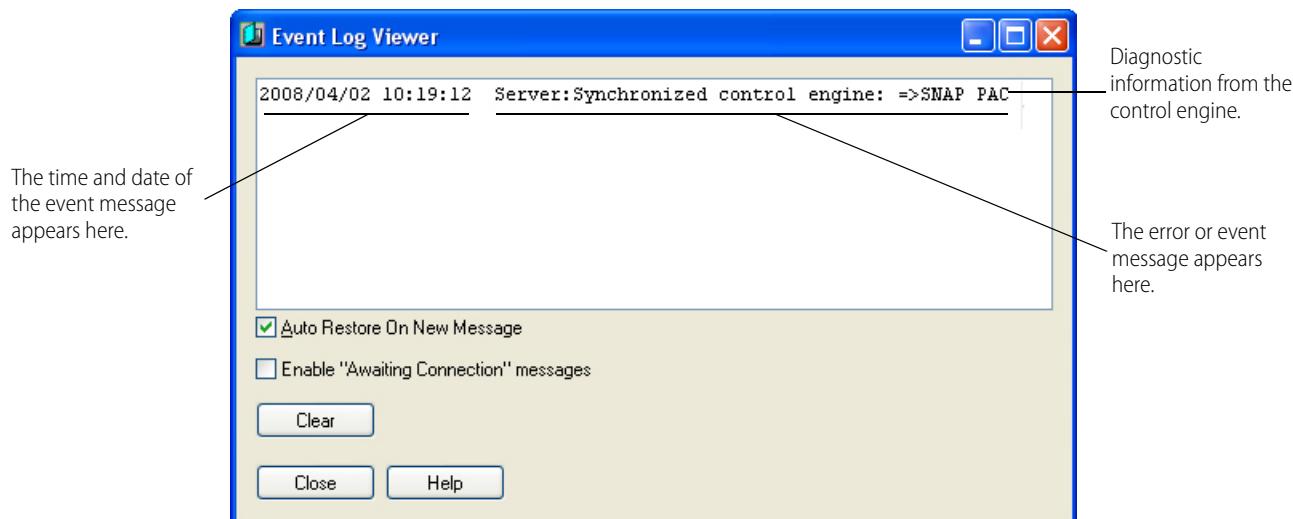
The following steps may help you track down the cause of a PAC Display error:

### 1. Read any Error or Event Messages

Error messages in PAC Display Configurator appear in standard message windows. These messages usually indicate how to correct the reported problem, as shown in the examples below:



Error or event messages in PAC Display Runtime appear in the Event Log Viewer as the project runs. To open the Event Log Viewer window, select View > Event Log. The messages appear along with other diagnostic information related to your project, as shown in the example below:



See "[Appendix B: PAC Display Errors](#)" for information about error messages that may appear in PAC Display Runtime.

## 2. Check Communication with the Control Engine

If no error message appears, or the error indicates that there may be a communication problem, first check whether the computer running PAC Display is communicating with the control engine. Next, check that communication settings specific to PAC Display are configured correctly.

1. Follow the communication troubleshooting procedure in Appendix A, "Checking Communication with the Control Engine," in the *PAC Control User's Guide* (form 1700). If the message is "Cannot connect to scanner," see also "[Problems Due to Microsoft Fast Startup/Fast Reboot](#)" on page 344.
2. Check the refresh time settings used in the PAC Display project (Configure > Refresh Times). These settings determine how frequently a tag on a control engine is scanned by PAC Display. See "[Chapter 5: Configuring Control Engines and Tags](#)" on page 61 and "[Scanning to Update Graphic Objects](#)" on page 182 to learn how these settings are configured and optimized.

## 3. Review Other Sections in this Appendix

Check the other sections in this appendix for the following items:

- If multiple "Bad Quality" or "Not Connected" messages appear when PAC Display Runtime starts, see "[Hiding or Displaying Runtime Startup Messages](#)" on page 341.
- If you are having problems saving project files to your hard drive or other storage location, see "[Problems Saving a Project](#)" on page 342.
- If an on-screen text string object disappears when you run the project, see "[Making an Empty String Visible](#)" on page 342.

## 4. Call Product Support

If you cannot find the help you need in this book or in the *PAC Control User's Guide* (form 1700), call Opto 22 Product Support. See "[Product Support](#)" on page 3 for contact information.

## HIDING OR DISPLAYING RUNTIME STARTUP MESSAGES

When a PAC Display project starts in Runtime, multiple “Bad Quality” or “Not Connected” messages may appear in the Event Log Viewer. These startup messages appear when the PAC Display project requests values from the scanner before the scanner communicates with the control engine.

### PAC Display Configurator

You can use PAC Display Configurator to prevent these messages from appearing. To hide or display these Runtime startup messages, do the following:

1. Start PAC Display Configurator<sup>1</sup>, and in the menu bar, click Configure > Scanner Location.  
The Select Scanner Location dialog box appears.
2. Select or deselect the Enable “Awaiting Connection” Messages check box to display or hide any “Bad Quality” or “Not Connected” messages that may occur when the PAC Display project starts.
3. Click OK to close the dialog box and save your settings.

### PAC Display Runtime

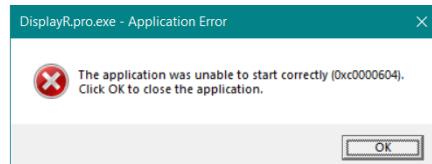
When running the project in PAC Display Runtime, the operator can also prevent these error messages from appearing in the Event Log Viewer. To hide or display these Runtime startup errors, do the following:

1. Start PAC Display Runtime<sup>2</sup>, and in the menu bar, click View > Event Log.
2. In the Event Log Viewer window that appears, select or deselect the Enable “Awaiting Connection” Messages check box to display or hide any messages that may appear when the PAC Display project starts.
3. Click OK to close the Event Log Viewer.

## PROBLEMS STARTING PAC DISPLAY RUNTIME PROFESSIONAL

If you are running on Windows 10 and observe any of these issues, the problem may be with a Windows security setting:

- In PAC Display Configurator Professional, if you select File > Save and Load Runtime, nothing happens and no error message is displayed.
  - You start PAC Display Runtime Professional with either of the following methods:
    - From the start menu or by double-clicking the application.
    - The technique described in [“Creating a Batch File to Start and Run a Project” on page 51](#).
- and you consistently see this message:



To resolve this issue, you need to change a Windows 10 security setting:

1. On the Windows Task bar, click Start, then click Settings.
2. In the Settings window, click Update & Security > Windows Security > App & browser control.

<sup>1</sup>For instructions to start PAC Display Configurator, see [page 7](#).

<sup>2</sup>For instructions to start PAC Display Runtime, see [page 27](#).

## PROBLEMS SAVING A PROJECT

3. In the Exploit Protection section, click Exploit protection settings, then click the Program Settings tab.
4. Click "+" Add program to customize, then choose "Add by program name".
5. In the Add program to customize window, type `DisplayR.pro.exe` in the Enter program name field. Click Add.
6. Windows displays the Program Settings: `DisplayR.pro.exe` window. In the Arbitrary Code Guard (ACG) section:
  - If Override system settings is not checked, select the checkbox. If the slider is set to Off, leave it as Off. If the slider is set to On, click on it to switch it to Off.
  - If the Override system settings is checked, make sure that the slider underneath it is set to Off. If it is not, click on it to switch it to Off.
7. Click Apply. If Windows displays a message asking you to confirm that you want to allow the app to change your device, click Yes.
8. You can close the Windows Security window and the Settings window.

## PROBLEMS SAVING A PROJECT

When trying to save a project in PAC Display Configurator, you may see an error message stating that no storage space is available on the computer's hard drive. If this message appears, yet you know that there is enough storage space for the PAC Display project files, check to see if one or more files are marked "Read Only."

To do this, open the PAC Display project folder in Windows Explorer, right-click a project file, and select Properties from the pop-up menu that appears. If the file is marked Read Only, the check box "Read Only" at the bottom of the Properties window is checked. Clear this check box, click OK to close the Properties window, and try saving the project again in PAC Display Configurator.

For additional information on viewing file properties in Windows, see the documentation from Microsoft and your computer manufacturer.

## MAKING AN EMPTY STRING VISIBLE

In a PAC Display project, if a text string object in a display sends an empty string to a control engine, the text string object becomes invisible and can't be selected again. This might happen, for example, if an operator accidentally cleared a field while entering values in a display.

This problem occurs because the control engine's string variable is empty, so when the text string object linked to this variable checks the control engine, it has nothing to display.

To correct this condition, do the following:

1. Open the PAC Display project.
2. Draw or import a graphic object to be used as a push button.  
The object should be approximately the same size as the text string object.
3. Double-click the new graphic object and, in the Graphic Dynamic Attributes dialog box that opens, double-click "Send String" from the Operator Driven Attributes list.
4. In the Dynamic Attributes - Send String dialog box that appears, select "Prompt for Data" in the Source group and click OK.
5. Click OK to close the Graphic Dynamic Attributes dialog box and save your changes.
6. Now place the new graphic object behind the text string object as follows:
  - a. Using the Select tool, select the graphic object and move it until it's directly over the text string object.
  - b. With the graphic object still selected, choose Edit > Z-Order > Send to Back.

7. Save your project and run it in PAC Display Runtime.

If you click in the area of the text string object and new push button graphic object, the Enter String dialog box should appear, even if an empty string has been sent to the control engine.

## PROBLEMS WITH WINDOWS USER PERMISSIONS

When you set up controllers on a computer running the Microsoft Windows operating system, typically you are using the computer with top-level “administrator” privileges. If someone later uses this same computer to run PAC Control or PAC Display, but logs in to the computer with lower-level, non-administrator privileges, the application may not recognize control engines that have been previously configured.

If this problem occurs, you can modify the permissions to let specific users access previously configured control engines without having administrator access. This is done using the Registry Editor utility. Follow the steps below.

**CAUTION:** *Use the Windows Registry Editor carefully. It is strongly recommended that you make a backup copy of your Windows Registry before continuing with this procedure. Without a backup copy, if you delete the wrong properties and cannot return the Registry to its original state, application and system files can become unusable and will have to be reinstalled.*

1. Log on as an administrator on the computer where PAC Control or PAC Display is installed.
2. On your keyboard, press the Windows Start key, type **run** and then press Enter. The Run dialog box appears.
3. In the Open field, type **regedit32** and then press Enter:

*NOTE: This is NOT regedit.exe, which is a similar tool.*

If a User Account Control window appears, click Yes to continue.

The Registry Editor window appears.

4. In the left pane, double-click the HKEY\_LOCAL\_MACHINE folder to expand it.
5. In the HKEY\_LOCAL\_MACHINE folder, double-click the SOFTWARE folder to expand it.
6. Navigate to the Opto 22 folder by following the instructions for your system type.
  - For 32-bit operating systems, in the SOFTWARE folder, click the Opto22 folder to highlight it.
  - For 64-bit operating systems:
    - In the SOFTWARE folder, double-click the WOW6432Node folder to expand it.
    - In the WOW6432Node folder, click the Opto22 folder to highlight it.
7. With the Opto22 folder highlighted, click Edit > Permissions on the Registry Editor menu bar.  
The Permissions for Opto22 dialog box opens.
8. Click Add.
9. In the Select Users, Computers, or Groups dialog box, type the name of the user or group that should have control engine access, and then click OK.  
The Permissions for Opto22 dialog box reappears.
10. If it is not already selected, check the “Full Control—Allow” box in the Permissions area.
11. Click OK to save your changes and close the dialog box.
12. Click File > Exit to close the Registry Editor.

The added users will need to restart their computers for the new permissions to take effect. Then they will be able to use control engines without having administrator access.

## PROBLEMS DUE TO MICROSOFT FAST STARTUP/FAST REBOOT

Windows Fast Startup (called Fast Boot in older Windows) is a default Windows setting that helps computers boot up faster.

When Fast Startup/Fast Boot is enabled, Windows does not perform a fresh boot when you start your PC. Instead, it reuses some information about Windows that it saved when you shut down the PC.

Some applications (including PAC Display, OptoOPCServer, OptoDataLink, and SoftPAC) need a fresh boot up to properly function and communicate with other applications. When Fast Startup/Fast Boot circumvents this process, you may see issues such as these:

- Windows reports an error reading or finding a DLL file.
- Communication failures ("Cannot connect to scanner" errors) may prevent PAC applications from reading or updating tag values.

To resolve the issue, disable Windows Fast Startup/Fast Boot, and then restart the computer in order to get a fresh start.

Another solution that sometimes works is to uninstall PAC Project, reboot the computer, and then reinstall PAC Project.

For more information, see OptoKnowledgeBase article [KB87235, Windows Fast Startup \(Fast Boot\) can cause issues](#).

## OPTODISPLS AND PAC DISPLAY RUNTIME

**Applicable only to PAC Display versions R9.4g and lower**—OptoDispLS.exe is a Windows service that is installed with PAC Display versions R9.4g and lower. This file is not used in PAC Display R9.5a and higher.

For PAC Display Runtime versions R9.4g and lower to launch properly, Windows must start the OptoDispLS.exe service before it starts PAC Display Runtime. Under normal circumstances, Windows starts OptoDispLS.exe when the computer boots up. However, if you have added PAC Display Runtime to your Windows Startup menu, OptoDispLS.exe may not finish loading by the time Windows starts Runtime.

To make sure that the OptoDispLS.exe service starts *first*, you can create a batch file that delays the automatic startup of Runtime. For details, see "[Creating a Batch File to Start and Run a Project](#)" on page 51.

## OTHER TROUBLESHOOTING TOOLS

### Checking PAC Project File Versions

Sometimes problems may be caused by older or misplaced files. Product Support may ask you to run OptoVersion to check the versions and paths of your Opto 22 .DLL and .EXE files. Here's how:

1. Start OptoVersion:
  - In Windows 10, click the Windows Start button, and then click Opto 22 > OptoVersion 10.5.
2. In the OptoVersion window, click Find.  
The utility searches your hard drive and prints a list of Opto-related files found.
3. To see more information on any file, double-click its name. To sort the list in a different order, click any column heading.
4. To e-mail the information to Opto 22 Product Support, click E-mail.  
The utility saves the list to a file named Version.bd in the same directory that contains OptoVersion.exe. If you use Microsoft Outlook as your e-mail program, a new message automatically appears addressed to Product Support, with the version file attached.

5. If you use Microsoft Outlook, add comments to the new message and click Send.
6. If you use another e-mail program, attach the Version.bd file to an e-mail message and address the message to **support@opto22.com**, along with an explanation of the problem you're experiencing.

## OTHER TROUBLESHOOTING TOOLS

# B: PAC Display Errors

This appendix lists error messages you may see while running a project in PAC Display Runtime. The cause of each error message is described, and, if possible, corrective action you can take to resolve the problem.

## TYPES OF ERRORS

While using the Configurator and Runtime components of PAC Display, several types of errors may occur due to incorrect equipment setup, out-of-date files, or equipment failure. These errors generally fall into three categories:

- **Runtime Errors**—These may occur while running a project in PAC Display Runtime. Most of these errors can be traced to control engine configuration problems or configuration problems with the I/O unit(s) connected to the control engine. Runtime errors can be further grouped into several subcategories based on the type of error that occurs; see “[Error Messages in PAC Display Runtime](#)” on page 347 for lists of error messages in each subcategory.
- **Configurator Errors**—These may occur as you use PAC Display Configurator to create a project (for instance, adding a dynamic attribute to a graphic object). Errors most commonly occur when entering data into a dialog box; if an error occurs while doing this, simply re-enter an appropriate value and continue.
- **Windows Errors**—These may occur while using either the Runtime or Configurator components of PAC Display. The most common Windows errors occur when too many applications are running at the same time, reducing the amount of memory available for the operating system. These errors are issued by the Microsoft Windows operating system running on your computer; see the documentation from Microsoft and your computer manufacturer for more information about Windows errors.

*NOTE: If Windows reports an error reading or finding a DLL when you try to start PAC Display, see “[Problems Due to Microsoft Fast Startup/Fast Reboot](#)” on page 344.*

## ERROR MESSAGES IN PAC DISPLAY RUNTIME

Error messages that may appear in PAC Display Runtime can be grouped into several categories, which appear in the table below. Messages for each category, as well as possible causes for the error and corrective actions to resolve it, are listed for each category.

*NOTE: Many of these error messages also appear when running PAC Control. For additional troubleshooting information, see Appendix A, "PAC Control Troubleshooting," and Appendix B, "PAC Control Errors," in the [PAC Control User's Guide](#) (form 1700).*

Runtime Error Category	See
File Access Errors	<a href="#">page 348</a>
Launch Application Errors	<a href="#">page 348</a>
Port Errors	<a href="#">page 349</a>
Recipe Upload/Download Errors	<a href="#">page 349</a>
Scanner Errors (Quality Errors)	<a href="#">page 350</a>
System Errors	<a href="#">page 352</a>

## File Access Errors

The File Access errors listed below are generated by PAC Display if an error occurred while PAC Display is working with files or with historical logs.

File access errors usually occur because PAC Display is attempting to modify a file that is marked as Read Only. If a file access error occurs, first check the Windows file settings for the file being modified (or written to). Make sure that Read Only is **not** selected, and verify that the file has the correct access permissions for the operators who need to use the PAC Display project.

Error Message	Possible Causes
Bad string, using default file name.	The tag name used as a source for a file name could not be used. The default file name will be used instead. The default file name was set up in the Configurator.
Can't make directory	A directory could not be created. Check if the directory is being created in a read-only directory. Change the protection to allow you to create it.
Directory now created.	Status message indicating that the directory was created.
Drive is full. Writing has been suspended.	A file was being written to a drive, but not enough free space was available to complete the transaction. Free up some space on the drive to continue.
Drive is no longer full. Writing has been resumed.	Status message indicating that the destination drive has enough space available to complete the file writing transaction.
Initial Writing of file: File name	Status message indicating that a file name is going to be created.
Invalid directory bad directory name. Using default.	The specified directory could not be used. The default directory will be used instead. The default directory was set up in the Configurator.

## Launch Application Errors

The following error messages may appear if an error occurred while working with the Launch Applications feature of PAC Display:

Error Message	Possible Causes
File not found	The executable file specified for a launch application setup could not be found. Verify the directory where the file actually resides.
Path not found	The drive/directory path specified for the executable in a launch application setup does not exist. Verify the actual path of the executable file.

Error Message	Possible Causes
WinExec error #	A Windows executable error occurred. Check Microsoft help sources for clarification about the error number.
Working directory invalid	The working directory specified for a launch application setup is incorrect. Verify the drive and path.

## Port Errors

The following errors are generated by PAC Display if a port-related error occurred:

Error Message	Possible Causes
Could not read value(s) from Registry	The registry could be corrupt. Contact Opto 22 Product Support.
Could not write new entry to Registry. Make sure you have administrative rights for the computer.	There was a problem writing information to the registry. Contact your network administrator.
Please reboot for changes in the Registry to take effect	Reboot your computer so that changes to the registry are activated.

## Recipe Upload/Download Errors

The following error messages are displayed if an error occurs while downloading or uploading a recipe:

Error Message	Possible Causes
Could not find the selected directory for the recipe destination file. Please check to ensure the path is correct. (Recipe Upload)	The path configured for the destination file of the uploaded recipe is invalid. Make sure the drive/directory path is correct.
Could not find the selected directory for the recipe format file. Please check to ensure the path is correct. (Recipe Upload)	The path configured for the format file of the uploaded recipe is invalid. Make sure the drive/directory path is correct.
Could not find the selected recipe format file. Please check to ensure the file name is correct.	The file name configured for the format file of the uploaded recipe was not found. Make sure you configured the correct tag name.
Could not make directory for Destination File: (Recipe Upload)	The path configured in the destination path could not be created. Check the drive specified in the path. Also check the read/write protection of the directory.
Invalid type specified. Valid types are: "Integer Table, Integer 64 Table, Float Table, String Table, and Chart"	An invalid type was specified in the recipe. Only tags of types integer table, float table, string table, and chart are allowed in a recipe.
String for destination file was empty: (Recipe Upload)	A PAC Control tag name was configured to contain the name of the destination file, but its contents were empty. Make sure you configure the correct tag name.
String for format file was empty	A PAC Control tag name was configured to contain the name of the format file, but its contents were empty. Make sure you configured the correct tag name.
The recipe file does not exist! (Recipe Upload)	The recipe upload file does not exist. Verify the spelling of the file.
The specified chart state is invalid. Valid states are Stop, Suspend, Start, or Continue.	Make sure the chart state sent in a chart control instruction was Stop, Suspend, Start, or Continue.

Error Message	Possible Causes
The specified control engine does not exist in this project.	The control engine specified in the recipe's PAC Control tag is not recognized by this project. Verify the control engine name for the tag name requested. Check the control engine's spelling.
The tag info is formatted incorrectly. Should be: "Control Engine:Tag Type.Tag Name"	The syntax for the PAC Control tag is incorrect. Make sure it follows this pattern: Control Engine Name:Tag Type.Tagname, where Control Engine Name is the name of the control engine; Tag Type is "Integer Table," "Integer 64 Table," "Float Table," "String Table," or "Chart;" and Tagname is the name of a PAC Control tag or chart name of the type specified in Tag Type.
The tag value is formatted incorrectly. Should be: "Index (optional): Value"	Check the syntax of the tag value(s) specified for the indexes. Make sure a colon separates the index from the actual value, and also verify that the index is within the table's range.
Uploaded/Downloaded to File: file name	Status message indicating file name was uploaded or downloaded.

## Scanner Errors (Quality Errors)

The PAC Display Runtime error messages listed below are displayed if an error occurs with the scanner.

Error Message	Possible Causes
Non-specific	The value is bad but no specific reason is known.
Cannot connect to scanner	Typically caused by a communication failure. Follow the communication troubleshooting procedure in Appendix A, "Checking Communication with the Control Engine," in the <a href="#">PAC Control User's Guide</a> (form 1700). If the message is "Cannot connect to scanner," see also " <a href="#">Problems Due to Microsoft Fast Startup/Fast Reboot</a> " on page 344.
Configuration Error	<p>There is some server-specific problem with the configuration. For example, the item in question has been deleted from the configuration.</p> <p>Reading a tag that is a type that should contain a floating point value (analog input, Float variable, or Float table element) that does not contain a valid floating point number (it contains an invalid floating point number); in other words, the value is "not a number", which is sometimes represented as "NAN", "nan", "-1.#QNAN", or "1.#QNAN".</p> <p>A "NAN" can occur in the following situations:</p> <ul style="list-style-type: none"> <li>• A floating point variable that is the result of a division by zero</li> <li>• An analog input point where the analog module is not installed</li> </ul> <p>An analog input point where the brain cannot read the analog module (the brain thinks the module is not installed).</p> <p><b>To troubleshoot the root cause:</b></p> <ol style="list-style-type: none"> <li>1. Use the PAC Control Debugger to inspect the variable or analog input point to find out what the current value is.</li> <li>2. Inspect the controller's message queue, which may contain related errors or warning messages.</li> <li>3. Inspect the I/O unit using PAC Manager to check the I/O point configuration and view the Status Read page to check the "Smart Modules Present" mask and the "Module &lt;module number&gt; Times Discovered" fields.</li> <li>4. Measure the voltage downstream of the fuse on the rack where the analog appropriate input module is installed. The voltage should be 5.00 to 5.20 VDC.</li> </ol>
Awaiting Connection	The input is required to be logically connected to something but is not. This may reflect that no value is currently available, for reasons such as the value not having been provided by the data source.

Error Message	Possible Causes
Device Failure	The control engine has returned an Undefined Command error (-1). This error usually occurs because the requested tag is not defined in the downloaded strategy.
Sensor Failure	A sensor failure had been detected (the Limits field can provide additional diagnostic information in some situations).
Last Known Value	Communications have failed, but the last known value is available. Note that the "age" of the value may be determined from the TIMESTAMP in the OPCITEMSTATE.
Comm Failure	Communications have failed and no last known value is available.
Out of Service	The block is off scan or otherwise locked. This quality is also used when the active state of the item or the group containing the item is Inactive.
Last Usable Value	Whatever was writing this value has stopped doing so. The returned value should be regarded as 'stale'. Note that this differs from a bad value with Substatus 5 (Last Known Value). That status is associated specifically with a detectable communications error on a 'fetched' value. This error is associated with the failure of some external source to 'put' something into the value within an acceptable period of time. Note that the 'age' of the value can be determined from the TIMESTAMP in OPCITEMSTATE.
Sensor Not Accurate	Either the value has reached a sensor's minimum or maximum limit (in which case the limit field should be set to 1 or 2), or the sensor is otherwise known to be out of calibration via some form of internal diagnostics (in which case the limit field should be 0).
Engineering Units Exceeded	The returned value is outside the limits defined for this parameter. Note that in this case (per the Fieldbus Specification) the 'Limits' field indicates which limit has been exceeded but does not necessarily imply that the value cannot move farther out of range.
Sub-Normal	The value is derived from multiple sources and has less than the required number of Good sources.
Local Override	The value has been Overridden. Typically this means the input has been disconnected and a manually entered value has been 'forced'.
0xC0040008	<p>Invalid item ID. PAC Display generated an invalid ID (typically, for an MMIO tag). Verify:</p> <ul style="list-style-type: none"> <li>• Port numbers of affected tags. (Be sure you're using port 2001 and not port 22001.)</li> <li>• IP addresses of affected I/O units.</li> </ul> <p>After verifying IP addresses and port numbers, use the PAC Display &gt; Tools menu to autocorrect the tags and regenerate I/O scanner tag names.</p>

Error Message	Possible Causes
0x800401F3	<p>This invalid class string is usually caused by an improperly-installed OptoOPCServer.</p> <p>To test this, start the OptoOPCServer Registry Checker:</p> <ul style="list-style-type: none"> <li>• In Windows 7, click the Windows Start button, and then click All Programs &gt; Opto 22 &gt; PAC Project 10.5 &gt; OptoOPCServer &gt; Registry Checker 10.5.</li> <li>• In Windows 10 or 11, click the Windows Start button, and then click Opto 22 &gt; Registry Checker 10.5.</li> </ul> <p>If any entries in the Value column read "Key not found" or something similar, then OptoOPCServer is installed improperly.</p> <p>To correct this problem:</p> <p>Re-install PAC Project. This is likely to fix it. If it doesn't, open a command prompt, navigate to the Windows\system32\OptoCom\ folder, and try the next solution.</p> <ul style="list-style-type: none"> <li>• If the error is for the first entry (OptoOPC.exe), run this command: <code>OptoOPC.exe -regserver</code></li> <li>• For any of the other dynamic-link library files (DLLs), if they are located in the OptoCom folder, run this command: <code>regsvr32.exe -&lt;dllname&gt;</code></li> </ul> <p>If it is successful, a message will appear saying "DIIRegisterServer succeeded for &lt;DLL name&gt;"</p> <p>NOTE: Some of the DLLs are located in the Program Files\...\PAC Project X.X folder. If that is the case, navigate to that folder in the command window and run the same command.</p>

## System Errors

The following error is displayed if a system error occurred:

Error Message	Possible Causes
System: Floating point error N caught by signal handler	<p>The data returned from the control engine was detected to have a floating point error. This error could have occurred during data manipulations at the control engine. Verify that the data has been handled or cast properly according to its type.</p>

# C: PAC Display Files

This appendix lists the files used in a PAC Display project, including those created automatically when a project is saved. Use this information as a reference when you are looking through your PAC Display files or working directory.

DisplayC.basic.exe	PAC Display Configurator Basic executable program file.
DisplayC.pro.exe	PAC Display Configurator Professional executable program file.
DisplayR.basic.exe	PAC Display Runtime Basic Runtime executable program file.
DisplayR.pro.exe	PAC Display Runtime Professional executable program file.
DisplayX.basic.exe	PAC Display Runtime Basic monitor-only version executable program file.
DisplayX.pro.exe	PAC Display Runtime Pro monitor-only version executable program file.
*.\$\$\$	ASCII text file created by PAC Display Configurator using the AutoCorrect Tags option. The file displays any changes made by the AutoCorrect Tags tools to tag names in strategies that were incompatible with PAC Display. The file also lists tag name errors that could not be corrected.
*.alm	Alarm log file.
*.bin	SuperTrend historical log file saved in binary format.
*.bmp	Bitmap file, created by other programs or by PAC Display. Graphic objects saved as bitmaps from PAC Display are not saved with any dynamic attributes that may have been configured.
*.H####	Historical data log file, created by PAC Display Runtime. (#### represents the data log file's internal ID number.)
*.fdb	Main strategy file from a PAC Control program. Lists all objects and other global information used in a program, as well as control engine configuration information.
*.ini	The PAC Display initialization file created by PAC Display Configurator. Microsoft Windows typically names the file type as a Configuration Settings file.
*.jw	Exported window file created using PAC Display Configurator. Contains all objects and tags in a specified window in a PAC Display project.
*.uui	Main project file for a PAC Display project.

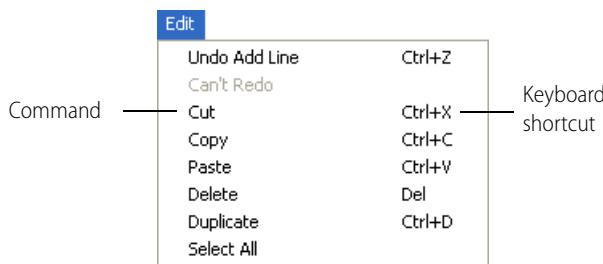
*.msg	Event log file, created by PAC Display Runtime.
*.rcp	Recipe file, created by a text editor. Used to send a set of parameters or to read a set of parameters from a control engine.
*.smb	Symbol file, created by PAC Display Configurator. Symbol files contain graphic objects and their configured attributes for use in PAC Display projects.
*.T####	SuperTrend historical log file, created by PAC Display Runtime. (#### represents the SuperTrend's internal ID number.)
*.txt	Dynamic attribute (or "tag info") report file, created by PAC Display Configurator.
*.W####	Draw window file, generated by the PAC Display Configurator.
*.adl	Comma-delimited file containing exported alarm points.
*mpdlin	Internal use only.
*pdlinh	Internal use only.
*pdlin	Saved user login file.

# D: Menus

This section lists in detail the contents of PAC Display menus for both Configurator and Runtime components:

- “[Configurator Menus](#)” (below).
- “[Runtime Menus](#)” on page 370

Note that if a keyboard shortcut is available for a menu command, the shortcut is listed next to the command in the menu as shown in the example below:



Many menu commands can also be accessed by right-clicking an object or in a window, and then choosing the command from the pop-up menu that appears.

## CONFIGURATOR MENUS

### File Menu

**New Project.** (Ctrl+N) Creates a new project. After selecting this menu option, choose a location and provide a name for the project in the dialog box that appears. See “[Creating a Project](#)” on page 42.

**Open Project.** (Ctrl+O) Opens an existing project. After selecting this menu option, navigate to and select the project you want to open in the dialog box that appears. Only one PAC Display project may be open at a time. See “[Opening a Project](#)” on page 47.

**Close Project.** Closes the project that is currently open. If the project has been modified, you are prompted to save changes. See “[Closing a Project](#)” on page 50.

**Save Project.** (Ctrl+S) Saves any modifications to the files for the current project. See “[Saving a Project](#)” on page 48.

**Save Project As.** (Shift+Ctrl+S) Saves any modifications to the current project to a name and project directory. This menu option is similar to Save Project, except that you can specify a new name and location for the saved project in the dialog box that appears. This is a good way to make a copy or a backup version of a project. See “[Saving a Project](#)” on page 48.

You can also copy a PAC Display project to a different computer or drive without using the Save Project As menu option. To do this, use “[Archive Project](#)”.

**Save Project and Load Runtime.** Saves the current project and then opens it in PAC Display Runtime. This is a quick way of switching between Configurator and Runtime when you are developing a project. See “[Saving a Project](#)” on page 48.

**Archive Project.** The project is archived to the current project directory with all the files necessary to transfer the project to another computer. See “[Archiving a Project](#)” on page 49.

**Archive Project and Email to Opto 22.** The project is archived to the current project directory with all the files necessary to transfer the project to another computer. The project is attached automatically to an email addressed to Opto 22 Product Support. In order for Product Support to better assist you, a message will advise you to use PAC Control to archive the strategy files to submit along with the PAC Display archive. See “[Archiving a Project](#)” on page 49.

**Export Project.** Exports the project to a text file, which can be used to compare to another project’s exported text file using a file comparison utility. See “[Exporting a Project](#)” on page 49

Each exported text file is formatted for easy reading and includes all the information about the project, including windows, graphic objects, dynamic attributes, alarm points, historical logs, recipes, and so on.

**Project Path.** Displays the full directory path to the project’s saved location. The project’s path is also displayed in the title bar, but if it is too long to fit there, you can use this command to see the directory path. Click the Open Folder button to open the project’s folder in Windows File Explorer.

**Password Protect Project.** Protects your PAC Display project with a password to prevent others from opening and modifying the project using PAC Display Configurator. The project can still be opened and run in PAC Display Runtime. See “[Protecting a Project with a Password](#)” on page 46.

*CAUTION: Make sure to keep your password in a safe place. If you forget your password, you will not be able to open your project in PAC Display Configurator.*

**Configurator Options.** Opens the Configurator Options dialog box.

*Load Previous Project at Startup*—Select this option to have last project that was opened in Configurator open automatically the next time the application is run.

*Auto Increment Version on Save*—Select this option to have a numbered version of the PAC Display project file created each time the project is saved.

*Use Older Dynamic Attribute Dialogs*—Select this option to follow the process used in PAC Display R9.6 for configuring dynamic attributes. For more information, see [Appendix , “F: Using the Old-Style Dynamic Attribute Dialog Boxes.”](#)

*Scroll Bars in Windows (Project must be saved, closed, and re-opened)*—Select this option to globally add (or remove) scrolling capabilities for all existing windows in the project (both in Configurator and in Runtime). Enabling scroll bars allows you to bring into view information that extends beyond the borders of a window.

*Notes:*

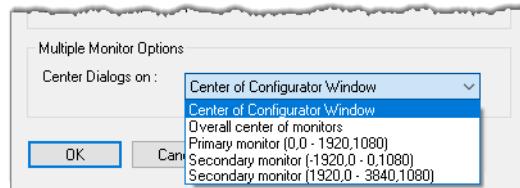
- To enable or disable scroll bars on individual windows, see “Show Scroll Bars” on the “[Window Properties Dialog Box](#)” on page 316.

- After you change this option, you must save, close, and then re-open the project in order for the change to take effect.
- This option adds scroll bars to (or removes them from) windows currently in the project. If you enable scroll bars and then add new windows to the project, the new windows will not have scroll bars. (If this happens and you want all windows to have scroll bars, unselect this option, save, close, and restart the project, and then re-enable the option.)

**Search Grouped Objects**—Select this option if you want AutoCorrect Tags to search the dynamic attributes of individual graphic objects inside a group of objects. If this option is not selected (default), AutoCorrect Tags searches the dynamic attributes only of the *graphic object group* (and not of the individual objects in the group). Selecting this option results in a more thorough search and prevents errors caused when a graphic object with dynamic attributes that refer to invalid tags is separated from a group. See also “[Saving Versions of a Project](#)” on page 48.

**Multi-Monitor Options: Center Dialogs on**—Select this option to specify where PAC Display Configurator dialog boxes should open when you have more than one monitor.

*NOTE: This option cannot center the following Microsoft Windows common dialog boxes: Color, Font, File Open, File Close, and Print. These dialog boxes open where they were last positioned.*



- *Center of Configurator Window.* (Default) Dialog boxes are centered on the main window of PAC Display Configurator. They will keep centering on PAC Display's main window, even if you move the main window to a different monitor.
- *Overall center of monitors.* (For use with an odd number—3, 5, 7, and so forth—of monitors.) Dialog boxes are centered at the center of all monitors. (The center of all monitors is defined by your computer's graphics card settings or Microsoft Windows display settings.)
- *Primary monitor (n,n - nnnn,nnnn).* Dialog boxes are centered on the primary monitor, regardless of which monitor displays PAC Display Configurator. (The primary monitor is defined by your computer's graphics card settings or Microsoft Windows display settings.)  
The numbers in the parentheses are the top left and bottom right coordinates of the primary monitor. These numbers may differ depending on the monitor's size and position relative to the other monitors being used.
- *Secondary monitor (nnnn,nnnn - nnnn,nnnn).* Dialog boxes are centered on the secondary monitor(s). All monitors other than the primary monitor are displayed in the list as “Secondary” monitors.  
The numbers in parentheses are the monitor's top left and bottom right coordinates *relative to the primary monitor*. For example, a secondary monitor with coordinates of (-1920,0 - 0,1080) would be to the “left” of the primary monitor, and a secondary monitor with (1920,0 - 3840,1080) coordinates would be to the “right” of the primary.

**Choose Bitmap.** Selects a bitmap file for use in the project. After selecting this menu option, in the dialog box that appears, navigate to and select the bitmap you want to include in the project. Use the Bitmap tool to place the selected bitmap in the project's draw window. See “[Adding a Graphic Object](#)” on page 20.

**Save As Bitmap.** Saves the selected graphic object(s) as a bitmap. After selecting this menu option, in the dialog box that appears, specify a file name and location for the new bitmap. If no graphic objects are

selected, then everything in the draw window is saved to the bitmap file name. Any dynamic attributes you have configured are not saved with the bitmap. See “[Saving Objects as Bitmaps](#)” on page 109.

**Printer Setup.** Selects an available printer and sets its attributes. See “[Printing](#)” on page 137.

**Print.** Prints the contents of any displayed main and draw windows. You can specify the number of copies to be printed and other options in the Printer Setup command. See “[Printing](#)” on page 137.

**(Previous File List).** The names and directory paths of projects that had been previously opened in Configurator are listed near the bottom of the File menu.

**Exit.** Closes the current Configurator windows and exits the application. If you modified the current project, you will be prompted to save it.

## Edit Menu

**Undo/Redo.** (Available only when you have performed an action that can be undone or redone.) Reverses an earlier action you have performed, or repeats an action performed earlier. For example, if you have deleted a graphic object from a window, select Undo to restore the object. If, after restoring the graphic object, you decide again to delete it, select Redo to repeat the earlier deletion. You can undo up to 50 actions.

**Cut.** (Ctrl+X) (Available only when you have selected something.) Copies selected graphic objects onto the clipboard and removes them from the draw window. Cutting something replaces anything stored there previously. See “[Deleting Graphic Objects](#)” on page 115.

**Copy.** (Ctrl+C) (Available only when you have selected something.) Copies selected graphic objects onto the clipboard without removing them from the draw window. Copying something to the clipboard replaces anything stored there previously. See “[Copying, Duplicating, and Pasting](#)” on page 109.

**Paste.** (Ctrl+P) (Available only when something has been copied or cut into the clipboard.) Inserts a copy of the clipboard contents into the middle of the active draw window. See “[Copying, Duplicating, and Pasting](#)” on page 109.

**Delete.** (Del) (Available only when you have selected something.) Removes selected graphic object(s) from a draw window. Unlike the Cut command, Delete removes the selection without placing it in the clipboard; once you delete something, you cannot retrieve it. See “[Deleting Graphic Objects](#)” on page 115.

**Duplicate.** (Ctrl+D) (Available only when you have selected something.) Creates a duplicate of the selected graphic object(s). The duplicate is placed directly below the selected graphic objects. Duplicating a selected graphic object does not use the clipboard. See “[Copying, Duplicating, and Pasting](#)” on page 109.

**Select All.** Selects all the completed graphic objects in the active draw window. Anything that is not selected within the active draw window when you use this command may be incomplete. Incomplete graphic objects can be erased by using the Redraw command under the View menu. See “[Selecting All Graphic Objects](#)” on page 104.

**Replace.** Modifies tag names attached to a graphic object or objects. Allows you to link graphic objects to a different control engine, item name, table index, or bit index. You can find and replace tags in the entire project, or just in the selected graphic object(s). See “[Finding and Replacing Tags in a PAC Display Project](#)” on page 81.

**Z-Order.** (Available only when you have selected something.) As objects are placed in draw windows, they’re assigned a stacking order (or “Z-order”) to define which object appears in front of or in back of another object. See “[Changing Stacking Order](#)” on page 113.

The position of objects in this stacking order can be modified as follows:

- **Bring to Front**—(Available only when you have selected something.) Positions the selected graphic objects in front of any other objects in the window.
- **Move Forward**—(Available only when you have selected something.) Moves the selected graphic objects one position forward in the stack.
- **Send to Back**—(Available only when you have selected something.) Positions the selected graphic objects in back of any other objects in the window.
- **Move Backward**—(Available only when you have selected something.) Moves the selected graphic objects one position backward in the stack.

**Align.** (Available only when you have selected more than one object.) Aligns selected objects in a variety of ways. See “[Aligning Graphic Objects](#)” on page 115.

The following choices are available:

- **Left**—Aligns the left edges of the selected graphic objects. All selected graphic objects are moved left to align with the left-most object in the group.
- **Center**—Aligns the vertical centers of the selected graphic objects. All selected graphic objects are moved left or right to align their centers with an imaginary vertical line down the center of the selected objects.
- **Right**—Aligns the right edges of the selected graphic objects. All selected graphic objects are moved right to align with the right-most object in the group.
- **Top**—Aligns the top edges of the selected graphic objects. All selected graphic objects are moved up to align with the top-most object in the group.
- **Middle**—Aligns the horizontal centers of the selected graphic objects. All selected graphic objects are moved up or down to align their centers with an imaginary horizontal line running across the center of the selected object.
- **Bottom**—Aligns the bottom edges of the selected graphic objects. All selected graphic objects are moved down to align with the bottom-most object in the group.
- **Space Evenly Vertically**—Distributes the selected graphic objects so there is an equal amount of vertical space between each object.
- **Space Evenly Horizontally**—Distributes the selected graphic objects so there is an equal amount of horizontal space between each object.

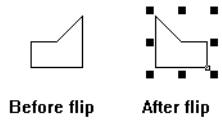
**Size.** When multiple graphic objects are selected, they can be resized equally so that all the objects have the same height and width. See “[Resizing Multiple Graphic Objects to Equal Dimensions](#)” on page 111.

The following choices are available:

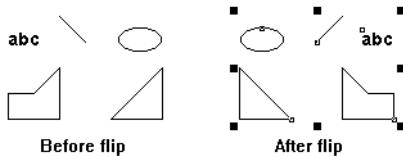
- **Grow to Largest Height**—All selected objects are resized to the height of the tallest object selected.
- **Grow to Largest Width**—All selected objects are resized to the width of the widest object selected.
- **Shrink to Smallest Height**—All selected objects are resized to the height of the smallest object selected.
- **Shrink to Smallest Width**—All selected objects are resized to the width of the least wide object selected.

**Flip/Rotate.** (Available only when you have selected one or more objects.) Changes the orientation and rotation of objects. See “[Rotating Objects](#)” on page 116.

- **Flip Horizontal**—Removes selected graphic objects and replaces them with mirror images of the objects flipped over a vertical center point. Text, trends, bitmaps, and metafiles have their positions changed but are not mirrored.

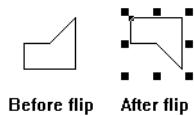


Horizontal Flip of a single graphic object

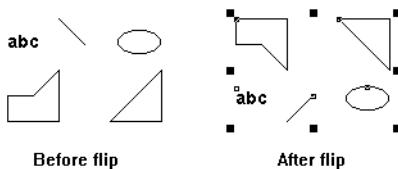


Horizontal Flip of multiple selected graphic objects

- **Flip Vertical**—Removes selected graphic objects and replaces them with mirror images of the objects flipped over a horizontal center point. Text, trends, bitmaps, and metafiles have their positions changed but are not mirrored.



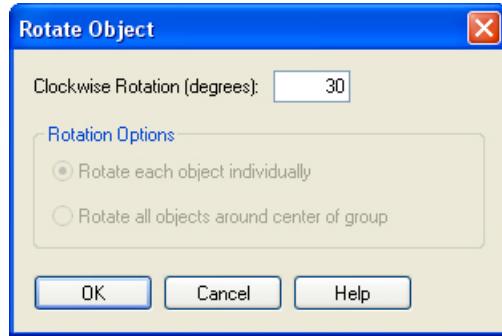
Vertical Flip of a single graphic object



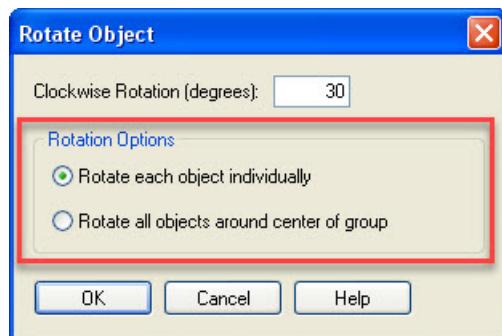
Vertical Flip of multiple selected graphic objects

- **Rotate**—Rotates the selected graphic object clockwise.  
You can rotate the following objects: Bitmaps, Metafiles, Curves, Polygons, Ellipses, Polylines, JPEGs, PNGs, Rectangles, Lines, and Text

- For one object:  
Enter the degrees of rotation, then click OK.

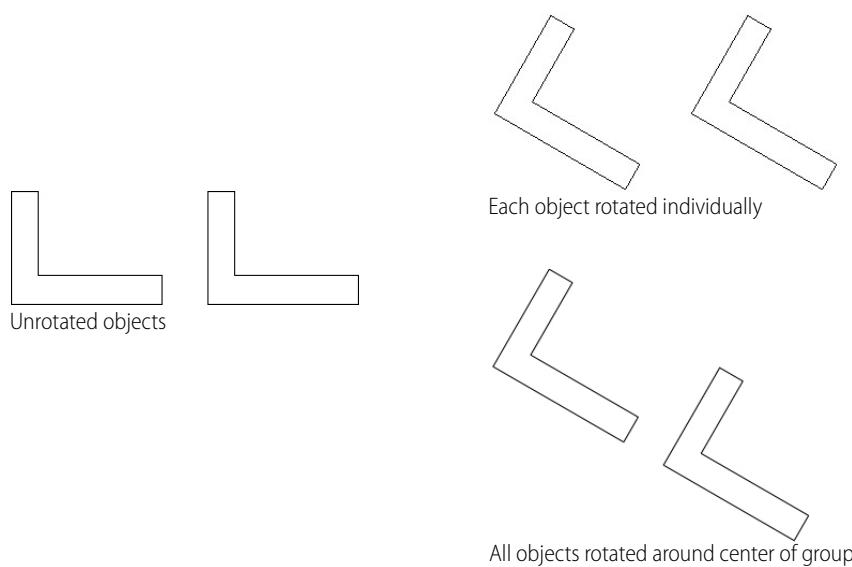


For *more than one* object:  
Enter the degrees of rotation, select one of the Rotation Options, and then click OK.



**Rotate each object individually** rotates each object the specified number of degrees around its own center.

**Rotate all objects around center of group** rotates each object around the center point of all the selected objects.



**Group.** (Available only when you have selected more than one object.) Gathers any combination of two or more graphic objects into a single object. You can then select the graphic object, move it, size it, or assign dynamic attributes to it as a single entity. In Runtime, only the dynamic attributes assigned to the grouped object are processed; any dynamic attributes assigned to individual objects that make up the group are ignored, including trends. See “[Grouping and Locking Graphic Objects](#)” on page 105.

**Group.** (Available only when you have selected more than one object.) Gathers any combination of two or more graphic objects into a single object. You can then select the graphic object, move it, size it, or assign dynamic attributes to it as a single entity. In Runtime, only the dynamic attributes assigned to the grouped object are processed; any dynamic attributes assigned to individual objects that make up the group are ignored, including trends. See “[Grouping and Locking Graphic Objects](#)” on page 105.

**Ungroup.** (Available only when you have selected a grouped object.) Splits a graphic object on which the Group command has been used into its original individual components. This allows each graphic object to be individually selected. If any of the graphic objects had individual dynamic attributes prior to grouping, those dynamic attributes will be restored, and then configured and processed at Runtime. See “[Grouping and Locking Graphic Objects](#)” on page 105.

**Copy to File.** (Available only when you have something selected.) Saves the selected object(s) to a file and saves any dynamic attributes you’ve assigned to the object(s). Specify the file name, location, and file format when prompted. The default file name extension is .smb.

**Save Metafile As.** (Available only when you have a metafile graphic selected.) Saves a selected Windows metafile graphic to a file. Specify the file name, location, and file format when prompted. You can save the selected metafile graphic to the Windows Metafile (WMF) format or to the Enhanced Metafile (EMF) format. Windows metafiles have the file name extensions .wmf and .emf.

**Paste from File.** Retrieves graphics from a file or from an included library of industrial graphics. See “[Importing a Metafile, JPEG, or PNG Graphic](#)” on page 108.

You can select a graphic using the following menu commands:

- **Built-in symbols**—Select this to choose a graphic that has been saved as a PAC Display symbol file. A dialog box prompts you for the file name, location, and file format of the file you’d like to open. (Symbol files have the file extension .smb.) Click the Open button to import the selected graphic.
- **Symbol Factory**—Select this to choose a graphic from a large library of graphics designed for industrial applications. These graphics are in Windows metafile (WMF) and other file formats. When the Symbol Factory window opens, browse through the categories and thumbnails provided to find an appropriate graphic, and then double-click the graphic to copy it to the Windows clipboard. (Another way to copy a graphic in the Symbol Factory is to select it and click the Copy button.) Now click the PAC Display project draw window to make it active, and then select Paste from the Edit menu to add the copied graphic to the window. (You can also paste the graphic by pressing Ctrl+V on the keyboard, or by right-clicking and selecting Paste from the pop-up menu.)
- **Import metafile**—Select this to choose a graphic that has been saved in either WMF or EMF (Enhanced Metafile) format. A dialog box prompts you for the file name, location, and file format of the file you’d like to open. (Metafiles have the file extensions .wmf and .emf.) Click the Open button to import the selected graphic. You are asked to navigate to and select an appropriate file.
- **Import JPEG**—Select this to choose a graphic that has been saved in either JPEG format. A dialog box prompts you for the file name, location, and file format of the file you’d like to open. (JPEG files have the file extensions .jpg.) Click the Open button to import the selected graphic. You are asked to navigate to and select an appropriate file.
- **Import GIF**—Select this to choose a graphic that has been saved in either GIF format. A dialog box prompts you for the file name, location, and file format of the file you’d like to open. (GIF files have the file extensions .gif.) Click the Open button to import the selected graphic. You are asked to

navigate to and select an appropriate file. GIF graphics behave differently than JPEG graphics in PAC Display. For more information, see ["Importing a GIF Graphic" on page 108](#).

- **Import PNG**—Select this to choose a graphic that has been saved in either PNG format. A dialog box prompts you for the file name, location, and file format of the file you'd like to open. (PNG files have the file extensions .png.) Click the Open button to import the selected graphic. You are asked to navigate to and select an appropriate file.

**Edit Dynamic Attributes.** (Available only when an object is selected.) Connects a graphic object to a PAC Control data item. See ["Assigning a Dynamic Attribute to a Graphic Object" on page 165](#). After selecting this menu option, all applicable dynamic attributes are shown in the dialog box that opens. (You may need to scroll down or enlarge the dialog box to see all applicable attributes.)

In the Control Engine Driven Attributes area, you configure attributes that are driven by tag values from the PAC Control strategy running in the controller; for example, you can set up connections so the value of a PAC Control tag changes the color and fill size of a graphic object.

In the Operator Driven Attributes area, you configure attributes driven by an operator's interaction with a graphic object in PAC Display; for example, operators can change the value of a tag in the controller as they "slide" the object on the screen.

You can configure many different combinations of dynamic attributes for a graphic object. The fields you need to configure often vary from one dynamic attribute to another.

**Copy Dynamic Attributes.** (Shift+Ctrl+C) (Available only when you have a single graphic object selected and a control engine is configured.) Creates and stores in the clipboard a copy of the selected graphic object's dynamic attributes. See ["Copying Configured Attributes to other Graphic Objects" on page 169](#).

**Paste Dynamic Attributes.** (Available only when you have something selected and have previously copied dynamic attributes to the clipboard.) Assigns copied dynamic attributes to a graphic object. You can paste dynamic attributes to one or more selected graphic objects. You can delete existing attributes, or replace or ignore any duplicate attributes. See ["Copying Configured Attributes to other Graphic Objects" on page 169](#).

**Delete Dynamic Attributes.** (Available only when you have something selected.) Removes dynamic attributes of a selected graphic object. You can delete the dynamic attributes of more than one selected graphic object. See ["Copying Configured Attributes to other Graphic Objects" on page 169](#).

**Edit Text.** (Available only when you have a text object selected.) Changes text in a text object. Select the text with the Select tool, choose this menu item, and then edit the text in the dialog box that appears. See ["Working with Text" on page 119](#).

**Edit Points.** (Available only when you have a polygon, polyline, or Bezier curve selected.) Changes individual points in a polygon, polyline, or Bezier curve. Select the object with the Select tool, choose this menu item, and then click and move individual points on the object. See ["Reshaping Graphic Objects" on page 113](#).

**Lock/Unlock Position.** (Available only when you have something selected.) Locks the position of one or more items in a draw window. See ["Grouping and Locking Graphic Objects" on page 105](#).

## View Menu

**Hide Menu Bar.** Hides the menu bar. The Esc key toggles the menu bar on and off. See ["Hiding the Menu Bar" on page 38](#).

**Hide/Show Toolbox.** (Ctrl+T) Hides or displays the Toolbox. The Toolbox shows the tools you need to create a project in PAC Display Configurator. If the Toolbox is hidden, the Show Toolbox command is displayed in this menu. See “[Configurator Toolbox](#)” on page 36.

**Configure Grid.** Displays a Grid dialog box that prompts you to toggle on or off both the Grid and the Snap On feature. Grids can aid your work in the draw window. You can also enter a Grid size in the Grains/Units area of the dialog box. The Grid size refers to the spacing of Grid points, measured in pixels. For example, a Grid size of 10 means a grid point will appear every 10 pixels. Sometimes grids do not appear because the grid size is too big for the draw window. You cannot display the Grid without specifying a Grid size first.

**Hide/Show Grid.** (The Grid must first be displayed using the Grids menu item.) Hides or shows the Grid. If the Grid is hidden, the Show Grid command is displayed.

**Turn Snap On/Off.** (The Grid must first be displayed using the Grids menu item. Also activate the Snap On feature in the same dialog box.) Toggles the Snap On feature on or off. Snap On cannot work without an active Grid. If Snap On is enabled, the Turn Snap Off command is shown.

**Redraw.** Redraws the contents of the active draw window. Incomplete graphic objects (such as an incomplete polygon) in the draw window are removed when you select this command. See “[Redrawing an Active Draw Window](#)” on page 37.

**Reset Dialog Positions.** Resets the following dialogs to appear in the middle of the active display window: Alarm Points, Application Managers, Control Engines, Historical Data Logs, Event Log Viewer, Sounds, Window Managers, and the Toolbox. This can help you find a dialog that you think should be open.

**Dynamic Attributes.** Generates a text file listing the dynamic attributes of objects in one or more draw windows. This report also lists the configured alarm points in the PAC Display project. The text file can be analyzed with the next command, Launch TagInfo View Utility. See “[Viewing Tags for One or More Objects](#)” on page 181.

**Launch TagInfoView Utility.** Starts a small utility program that lets you sort the order in which tags in the PAC Display project are displayed. See “[Using the TagInfoView Utility Program](#)” on page 181.

**Find Tag.** Used to locate specific tags used in a PAC Display project. See “[Searching for Tags in a PAC Display Project](#)” on page 81.

**Decrypt Runtime Operator Log File.** Starts a small utility program that decrypts encrypted Runtime operator log files.

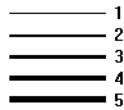
## Style Menu

Use the Style Menu to control the drawing attributes of the graphic tools. Whenever a graphic object such as a line or rectangle is drawn, the selected style attributes are applied. Combining different style settings allows you to draw an almost infinite variety of graphic objects. Text attributes, including font style, color, and size, are assigned in the Text menu.

*NOTE: Trends and bitmaps are not affected by style settings.*

**Line Color.** Presents a color palette you can use to assign or change the line color of the selected graphic object. If no graphic object is selected, the color you choose is set as the default and is then applied as the line color to all objects you subsequently draw. See “[Applying or Changing Line Attributes](#)” on page 105.

**Line Width.** Assigns or changes the line width of the selected graphic object. Line widths are shown in pixels. If no graphic object is selected, the line width you choose is set as the default and is then applied to all objects you subsequently draw. See “[Applying or Changing Line Attributes](#)” on page 105.



Sample Line Widths

**Line Style.** Assigns or changes the line style of the selected graphic object. If no graphic object is selected, the line style you choose is applied to all objects you subsequently draw. Line styles other than solid apply only to objects with a line width of 1. Line widths greater than 1 are always solid. The Invisible line style is used with rectangles, round rectangles, ellipses, and polygons. If these objects are drawn with the invisible line style, the border line around the object is not displayed; in order to see them, you must apply a fill. See “[Applying or Changing Line Attributes](#)” on page 105.



Sample Line Styles



Example of Invisible Line Style

**Fill Color.** Assigns or changes the fill color of the selected graphic object. If no graphic object is selected, the fill color you choose is applied to all objects you subsequently draw. Fill colors affect only rectangles, round rectangles, ellipses, and polygons. See “[Applying or Changing Fill Attributes](#)” on page 107.

**Background Color.** Assigns or changes the color used behind the fill pattern of the selected graphic object. If no graphic object is selected, the background color you choose is applied to the fill pattern of all objects you subsequently draw. Background colors for fill patterns affect only rectangles, round rectangles, ellipses, and polygons. See “[Applying or Changing Fill Attributes](#)” on page 107.

**Fill Pattern.** Assigns or changes the fill pattern of the selected graphic object. If no graphic object is selected, the fill pattern you choose is applied to all objects you subsequently draw. See “[Applying or Changing Fill Attributes](#)” on page 107.

Fill patterns affect only rectangles, round rectangles, ellipses, and polygons. If you select a Fill Pattern and your selected objects still remain unfilled, it may be that the Fill Color is set to white (or a color equal to its background), or that the Fill Pattern is set to Invisible. Also, you cannot apply more than one Fill Pattern to any graphic object. This includes using a Percent fill, which fills an object with a percentage of black, creating levels of gray.

**Opaque.** Determines how non-solid primary graphic objects, such as dotted and dashed lines, interact with overlapping objects and background colors. When the opaque style is set, overlapped graphic objects and background colors are overwritten. See “[Applying or Changing Line Attributes](#)” on page 105.

**Opaque.** Determines how non-solid primary graphic objects, such as dotted and dashed lines, interact with overlapping objects and background colors. When the opaque style is set, overlapped graphic objects and background colors are overwritten. See “[Applying or Changing Line Attributes](#)” on page 105.

**Transparent.** The opposite of Opaque, Transparent also determines how non-solid primary graphic objects, such as dotted and dashed lines, interact with overlapping objects and background colors. When the transparent style is set, overlapped graphic objects and background colors are overwritten only by the solid portion of the line. See “[Applying or Changing Line Attributes](#)” on page 105.

## Text Menu

The Text menu items allow you to control text attributes. Text attributes may be set before the text is placed in the draw window, or changed after it is placed. Style attributes selected from the Style menu do not affect text. See “[Formatting Text](#)” on page 120.

**Font.** Assigns or changes the font of the selected text. If no text is selected, the font you choose is set as the default and is then used for all text you subsequently place.

PAC Display supports all TrueType fonts, as well as the ones shown below:

```
Opto 22 Fixed Serif
Opto 22 Fixed SansSerif
Opto 22 Prop Serif
Opto 22 Prop SansSerif
Opto 22 Stroke Serif
Opto 22 Stroke SansSerif
Opto 22 Script
```

Examples of Supported Fonts

**Size.** Assigns or changes the size of the selected text. If no text is selected, the size you choose is set as the default and is then used for all text you subsequently place. Specify the size of the text in points; any value between 5 and 500 may be used.

```
Cyrano 10 Point
Cyrano 12 Point
Cyrano 16 Point
Cyrano 20 Point
```

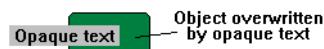
Examples of Prop Serif Font at Different Point Sizes

**Color.** Assigns or changes the color of the selected text. If no text is selected, the color you choose is applied to all text you subsequently place. PAC Display also supports custom color creation.

**Background.** Assigns or changes the background color of the selected text. If no text is selected, the background color you choose is applied to all text you subsequently place. Background colors apply only to opaque text; transparent text is not affected by this setting.

**Text Style.** Assigns or changes the style of the selected text. If no text is selected, the style you choose is applied to all text you subsequently place. PAC Display supports normal, bold, italics, underline, and strikeout text styles. You can apply multiple styles to text. For instance, you can apply both bold and italics to any text.

**Opaque.** Determines how text appears when overlapping other objects. Opaque style is applied to text just like any other style. If the text is set to Opaque, objects under the text will be overwritten by the text background color.



Example of Opaque Text

**Transparent.** Determines how text appears when overlapping other objects. The opposite of opaque, if the text is set to transparent, objects under the text will remain visible and unaffected by the text background color.



Example of Transparent Text

## Configure Menu

**Control Engine(s).** Selects which PAC Control strategy (or strategies) is used for this project. The PAC Display Configurator uses the tag database from the strategy to connect the appropriate PAC Control data item to the dynamic attribute of a dynamic object. The control engine Properties dialog box prompts for the PAC Control strategy. If a PAC Control strategy is not configured for this project, dynamic attributes cannot be assigned to any dynamic objects. See ["Configuring Control Engines" on page 61](#).

**Refresh Times.** Changes the scan time for a refresh time group. The Refresh Time dialog box prompts you for the new times. See ["Configuring Scan Rates" on page 183](#) for more information about configuring refresh times.

**Alarm Points.** Displays all configured alarm points by user-specified names. This dialog box also allows you to add, modify, or delete alarm points. See ["Configuring Alarm Points" on page 258](#).

**Alarming Setup.** Configures alarming features. The Options page sets up various Runtime options, the Logging page sets up file and printer logging, and the Sound page sets up sound functions. See ["Configuring Project Alarms" on page 277](#) for more information.

**Historical Data Log.** Creates historical data logs. A Historical Log List dialog box is displayed and lists the historical data log files that have been created. This command allows you to modify which points are recorded and how frequently data is logged to the files. See ["Configuring a Historical Data Log" on page 216](#) for more information about historical data logs.

**Event Log.** Records a message caused by an event which can be configured to log to a disk file. You can change parameters such as the number of messages saved, the delimiter used between messages, and the file rollover period. File name extensions are .msg. The number of files retained on disk for an event log is also set within the dialog box. When the limit is reached during Runtime, the file with the oldest time stamp is deleted. See ["Using the Event Log Viewer" on page 325](#).

**(Pro only)** You can also log event messages to an ODBC-compliant database. See ["Configuring the Event Log File" on page 316](#).



**SuperTrend Remote Logging.** If the same PAC Display project is running on more than one computer, this menu item allows you to select the computer that will collect and process SuperTrend historical data. See “[SuperTrend Logging](#)” on page 200.

**Applications.** Adds or modifies application managers for use in the project. The Application Manager List dialog box displays available application managers for the project. The Application Manager Configuration dialog box lets you select the program file, working directory, launch options, initial display view, and trigger for the application manager. See “[Launching Applications](#)” on page 233 for more information about launching applications based on a trigger.

**Recipes.** Configures download or upload of recipes to a control engine by a trigger. This method of recipe management does not require a graphic object to be selected during Runtime for the recipe action to occur. See “[Configuring a Recipe Upload](#)” on page 252 and “[Configuring a Recipe Download](#)” on page 252 for more information about trigger-based recipe uploads and downloads.

**Snapshots.** Captures the whole screen and saves it as a bitmap file. You can use snapshots to review what occurred in Runtime over a period of time, or to capture a triggered event. Snapshots are taken according to a time interval that you configure. You can use triggers to start and stop the process. See “[Configuring Screen Snapshots](#)” on page 52.

**Sounds.** Selects sounds and assigns their trigger for use in the project. The Sounds dialog box lists the available sounds for the project. The Sound Configuration dialog box lets you configure start and stop triggers with the Trigger dialog box. The Sound Configuration dialog box also prompts you for the sound file. See “[Configuring a Sound](#)” on page 237 for more information about triggering sounds.

**Window State.** Adds or makes changes to existing window managers. The Window Manager List dialog box displays all currently configured window managers and allows access to the Window Manager Configuration dialog box. The Window Manager Configuration dialog box allows you to change triggers with the Window Manager Start Trigger dialog box and control the draw window visual state with the Pop Window dialog box. See “[Configuring Trigger-Based Window States](#)” on page 238 for more information about trigger-based window states.

**Scanner Location. (Basic only)** Allows you to use a remote computer running OptoOPCServer as a scanner. And, you can set the Scanner Heartbeat Check Interval, the interval in seconds at which PAC Display will check to see if the scanner is operating. Select the Enable “Awaiting Connection” Messages check box to display all startup messages. See “[Configuring the Scanner](#)” on page 67.



**Scanner Defaults. (Pro only)** Opens a dialog box for you to set the Scanner Heartbeat Check Interval (the interval in seconds at which PAC Display will check to see if the scanner is operating). Select the Enable “Awaiting Connection” Messages check box to display all startup messages. See “[Configuring the Scanner](#)” on page 67.



**Secondary Scanner Location. (Pro only)** Opens a dialog box for you to set up a secondary scanner that will be used when the primary scanner is not available. See “[Configuring a Remote Scanner in PAC Display Pro](#)” on page 69.



**ODBC Data Source. (Pro only)** Opens a dialog that allows you to select an ODBC database that has been set up to log SuperTrend, historical, and Runtime operator data. Currently supported databases are MySQL, Microsoft Access, and Microsoft SQL Server. In order to use this feature, the database must already have been created, and the ODBC connector must be configured. For details, see [page 55](#).

**Runtime.** Opens a configuration dialog for setting up the PAC Display Runtime session, including appearance, security configuration, and much more. Using PAC Display Configurator, you can specify which windows are open or closed, whether the menu is displayed, and whether or not the operator can exit the

program. You can also customize options for the Event Log Viewer, a window that displays messages about the status and other characteristics of a PAC Display project. And you can control whether a PAC Display project gathers I/O unit information, such as I/O point states and values, from tags on a control engine or directly from an I/O unit itself. For more information, ["Configuring Runtime" on page 289](#).

## Tools Menu

**AutoCorrect Tags.** Run this tool when you first configure a strategy for your project and after making changes to your project. The tool verifies tag names from a strategy for compatibility with PAC Display and changes the tag names where necessary. The tool creates a text file with the file extension .\$\$\$ that summarizes the changes that the tool made to any tag names. Refer to ["Correcting Tags from a Strategy" on page 83](#) for more information about this command.

**Regenerate IO Scanner Tag Names.** Use this option to regenerate I/O scanner tag names. This is typically done after auto-correcting invalid tags. See also error 0xC0040008, ["Scanner Errors \(Quality Errors\)" on page 350](#).

**Create Recipe File.** Opens the Create Recipe File dialog box for creating either recipe download file or a recipe upload template. For more information, see ["Creating a Recipe Download File" on page 241](#) and ["Creating a Recipe Upload Template" on page 243](#).

**Edit Recipe File.** Allows you to edit an existing recipe file. See ["Editing a Recipe Download File" on page 245](#).

**Validate Recipe File.** Validates the format of a recipe file, including the structure, tags, and index values. See ["Basic Recipe File Format" on page 246](#).

**Convert SuperTrend Files.** Converts a SuperTrend either from text to binary format, or from binary to text format. See ["Converting a SuperTrend Historical Log File for Viewing" on page 206](#).

## Window Menu

PAC Display Configurator allows you to configure several draw windows per project. The Window menu items control the number and properties of each draw window in a project. You can create draw windows, delete draw windows, copy draw windows, and change properties of existing draw windows.



**New.** Creates a new draw or URL (**Pro only**) window and adds it to your project. You can specify the new window's name, size, behavior, and other attributes. You must provide a unique name for each draw window. See ["Creating and Deleting Windows" on page 92](#).



**Open.** Opens draw and URL (**Pro only**) windows that are configured but are currently closed. Select which window to open from a list of all draw that are closed. Windows that are open when a project is saved are open when the project is started at Runtime. This can be modified using the Configure > Runtime menu command. See ["Creating and Deleting Windows" on page 92](#).



**Close.** Closes draw and URL (**Pro only**) windows that are currently open. Select which window to close from a list of all windows that are open. Windows that are closed when a project is saved are closed when the project is started at Runtime. This can be modified by using the Configure > Runtime menu command.

**Copy.** Duplicates the active draw window. You must enter a unique name for the duplicate and specify any properties you wish to change. All graphic objects and their connections in the copied window remain the same in the new copy. See ["Creating and Deleting Windows" on page 92](#).

**Delete.** Removes the active draw window from the project. All graphic objects and their connections in the active draw window are also deleted. Use caution since deleted draw windows cannot be recovered. See “[Creating and Deleting Windows](#)” on page 92.

**Properties.** Modifies the properties of the active draw window. You can change the window’s name, size, behavior, position, color, and other attributes. See “[Modifying Draw or URL Windows](#)” on page 94.

**Export/Import Window.** A PAC Display window can be exported from one project, saved as a file, and then imported into another PAC Display project. The exported window file contains all the objects and tags that were in the original window. Exporting and importing draw windows is a convenient way to reuse the same window in different PAC Display projects. See “[Importing, Exporting, and Saving Windows](#)” on page 98.

**(Open Window List).** Displays at the bottom of the Window menu the names of up to nine currently open or iconified windows. Select a draw window’s name from this list to display that draw window and bring it to the front. If more than nine windows are open, a menu item named More Windows is added, which you can use to select a window’s name from a list to display it. A window must be open or iconified to be listed.

### Help Menu

**Contents and Index.** Starts Help and displays help topics for PAC Display Configurator.

**Manuals.** Opens the online version of the *PAC Display User’s Guide*. This document is in Adobe pdf format, and the Adobe Reader application is required to view it.

**Opto 22 on the Web.** Lists useful links to information on the Opto 22 website. Your PC must have an installed Web browser and be connected to the Internet to access these links.

**About PAC Display Configurator.** Displays version information about PAC Display Configurator.

## RUNTIME MENUS

Runtime menus provide access to the Runtime commands. These commands allow you to open and close projects, view the event log, and view the control engine configurations.

### File Menu

**Open Project.** Loads an existing project created in PAC Display Configurator. You must navigate to and select the project you want to open. Scanning and animation begin immediately once the project is loaded. See “[Opening a Project in Runtime](#)” on page 321.

**Project Path.** Displays the full directory path to the project’s saved location. The project’s path is also displayed in the title bar, but if it is too long to fit there, you can use this command to see the directory path. Click the Open Folder button to open the project’s folder in Windows File Explorer.

**Printer Setup.** Selects an available printer and sets its attributes.

**Print.** Prints the PAC Display Runtime window. You can specify the number of copies to be printed and also set up the options available in the Printer Setup command.

**Exit PAC Display Runtime.** Stops the scanner, closes all Runtime windows, and exits the PAC Display Runtime.

## View Menu

**Hide Menu Bar.** Hides the menu bar. The Esc key toggles the menu bar on and off.

**Event Log.** Displays the Runtime system event log. This log contains system errors and messages received during Runtime. The list box contains the most recent system event messages generated by PAC Display. Each message consists of a date and time stamp, and message text. The message text describes events such as communications and I/O errors. Use the scroll bar to view prior messages. If the text of the message is too wide to completely fit in the list box area, you can double-click the message to display it all. See “[Using the Event Log Viewer](#)” on page 325.



**Configuration Status. (Pro only)** Opens a dialog that allows you to view and change the control engines and I/O units configured for the PAC Display project, or to view and change the status of scanners used in the PAC Display project. See “[Viewing and Changing Control Engines](#)” on page 326 and “[Viewing and Changing Scanner Status](#)” on page 327.

**Sync Control Engine Time to PC.** Synchronizes the control engine clocks with the clock on the PC used to sync the control engine’s clock. To choose which PC to use to sync the control engine’s clock, see “[Runtime Setup: Control Engine Tab](#)” on page 294. See also, “[Using the Event Log Viewer](#)” on page 325.

## Alarm Menu

**Modify Alarm Points.** Allows the operator to change parameters for alarm points in the PAC Display project if it has been configured to let the operator do so. See “[Modifying Alarm Points](#)” on page 331. Also see “[Configuring Alarm Points](#)” on page 258 to learn more about configuring alarm points.

Alarm point settings can be changed in each one of the five alarm ranges available: HiHi, Hi, Normal, Lo, and LoLo. Each alarm point state has a value that defines its range.

**Alarms Enabled.** Disables alarming, including all alarm graphics, sound, and logging. This can be useful when starting or stopping a process during which alarm conditions may be expected to happen. This menu item can be initially enabled or disabled through the Alarming Setup dialog box in the Configurator. See “[Configuring Project Alarms](#)” on page 277. It can also be permanently grayed out and made inaccessible by unchecking the Alarms Enabled menu item option in the Alarming Setup dialog box. This option toggles alarms between enabled and disabled. A check mark next to Alarms Enabled indicates that alarms are enabled. No check mark indicates that alarms are not enabled.

**Disable Alarm Points.** Opens a dialog box that allows you to select individual alarm points to disable for the current Runtime session only. This is not a persistent option. Disabling an alarm point takes effect after any current processing is being performed on the selected alarm point. See “[Disabling Alarm Points in Runtime](#)” on page 333.

*NOTE: Re-enabling an alarm point will not take effect until the current value of the alarm point changes. If the alarm point is re-enabled while in an alarmed state, this could mean that an alarm point will not appear in an alarm graphic, and its configured sound may not play.*

**Priority Filter.** The priority filter level menu items can be used to accept only those alarm points with a certain priority level. For example, during a startup or shutdown procedure, you may wish to receive only the most serious alarms. The priority for each alarm point is configured in the Alarm Point dialog box in the Configurator. See “[Configuring Project Alarms](#)” on page 277.

**View Alarm Point Details.** Lists the configured alarm points and their details.

## Security

**Log Out of PAC Display Runtime.** If multiple users have been configured in Configurator, you can log out of Runtime to allow another user to log in. See “[Logging In to and Out of Runtime](#)” on page 322.

**Change Login Password.** Opens a dialog box for the currently logged-in user to change his or her password.

**View Logged-in User.** Opens a window showing the user who is currently logged in. Also, a message is displayed if no one is logged in. See “[Logging In to and Out of Runtime](#)” on page 322.

**Operator Driven Attribute Access.** If global users are configured, a configured user can log in and access any security-configured operator-driven dynamic attribute. See “[Configuring Global Operators](#)” on page 309).

**Add/Modify User.** Add, modify, or delete a user name in the list of users allowed to log in to Runtime. See “[Configuring Runtime Users](#)” on page 301.

## Tools

**Convert SuperTrend Files.** Converts a SuperTrend either from text to binary format, or from binary to text format. See “[Converting SuperTrend Historical Log Files to Text Format for Viewing](#)” on page 205.

## Window Menu

**Open.** Opens any Runtime window that is currently closed. An Open Window dialog box displays a list of closed windows from which you can select the window to open.

**Close.** Opens the Close Window dialog box. Use this dialog box to close windows. All currently open and iconified windows are listed and any number of them may be selected for closing. If windows are closed in PAC Display Runtime, any scanning of tag values associated with the windows ceases until the window is opened again.

**Switch Control Engines.** Use to connect to different control engines running the same PAC Control strategy. Select one or more project windows and then select a control engine. All objects with dynamic attributes will now use tag values from that control engine. See “[Switching a Window Between Control Engines](#)” on page 329 for more information.

**(Open Window List).** Displays currently open or iconified windows. Up to nine window names are displayed. Select a window’s name from this list to display that draw window and bring it to the front. If more than nine windows are open, a menu item named More Windows is added; use More Windows to select a window’s name from a list to display it. A window must be open or iconified for it to be listed.

## Help Menu

**Contents and Index.** Starts Help and displays help topics for PAC Display Runtime.

**Manuals.** Opens the online version of the *PAC Display User’s Guide*. This document is in Adobe pdf format, and the Adobe Reader application is required to view it.

**Opto 22 on the Web.** Lists useful links to information on the Opto 22 website. Your PC must have an installed Web browser and be connected to the Internet to access these links.

**About PAC Display Runtime.** Displays version information about PAC Display Runtime.



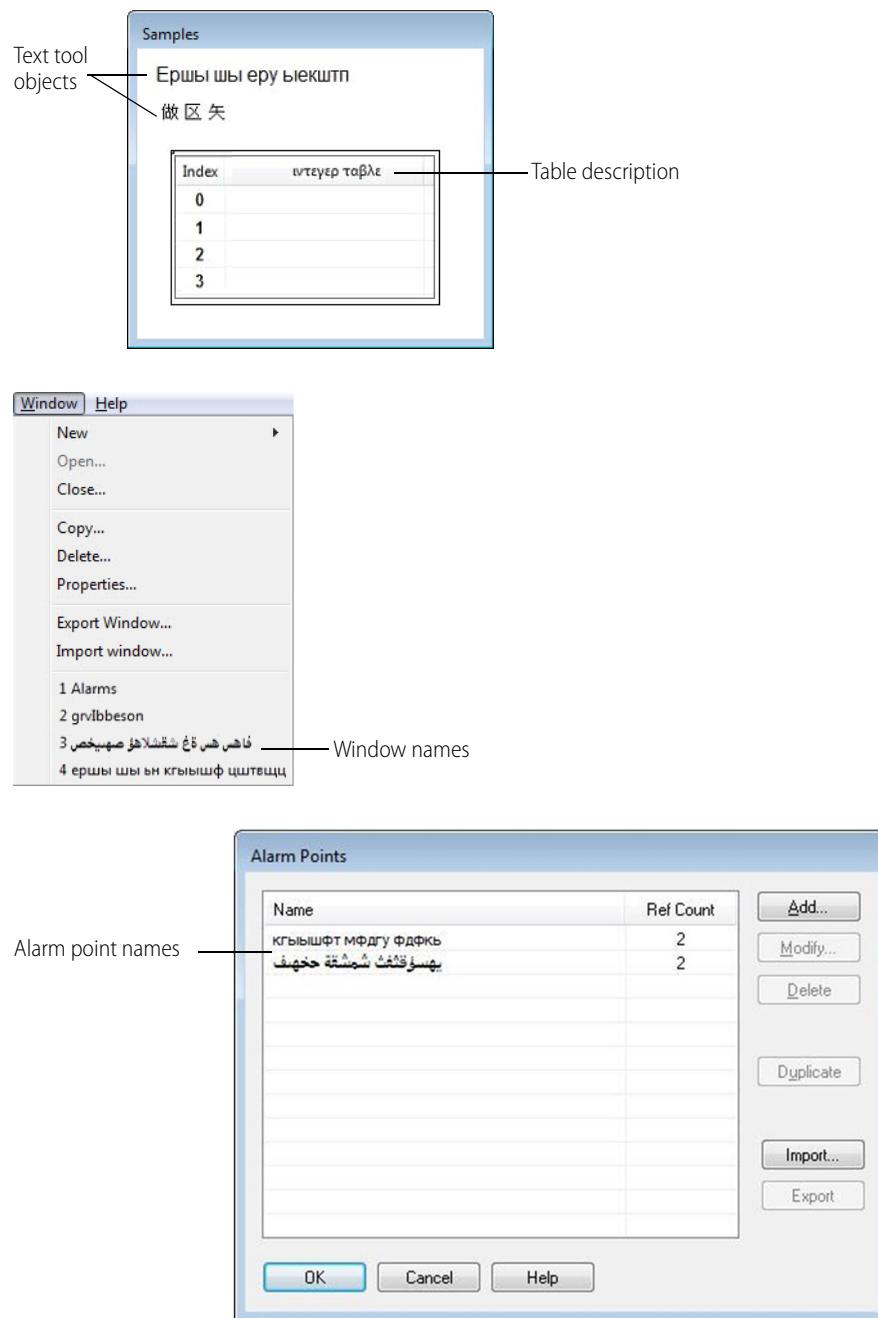
# E: International Characters

PAC Display and the Tag Information Viewer both support Unicode (UTF-16) text to support Asian, Middle Eastern, and other international languages in an HMI. International characters can be used in the following PAC Display items:

- Text tool objects
- Alarm point names and comments
- SuperTrend pen names
- Window names
- Historical data log names and point names
- Table control
- Refresh group names
- Recipe managers
- Window managers
- Application managers
- XY plot titles
- Button and PID button text
- Combo box control items
- View > Dynamic Attributes file
- Project export file
- Alarm point comma delimited file
- Operator Runtime logging file
- Alarm History file

## EXAMPLES

## EXAMPLES



## USING THE WINDOWS CHARACTER MAP

You can insert Unicode characters using the Windows Character map as follows:

1. Press the Windows Start key, type **Character Map** and then press the Enter key.
2. In the Character Map dialog box:
  - Click the Font list, and then select the font you want to use.
  - Click the special character you want to insert into the document.

- Click Select, and then click Copy.
- 3. Open your document and click the location in the document where you want the special character to appear.
- 4. In your document, click the Edit menu, and then click Paste.

## USING THE WINDOWS CHARACTER MAP

# F: Using the Old-Style Dynamic Attribute Dialog Boxes

*NOTE: These instructions apply only if PAC Display Configurator's options are set to display the older-style (R9.6 and lower) dynamic attribute dialog boxes (File > Configurator Options > Use Older Dynamic Attribute Dialogs).*

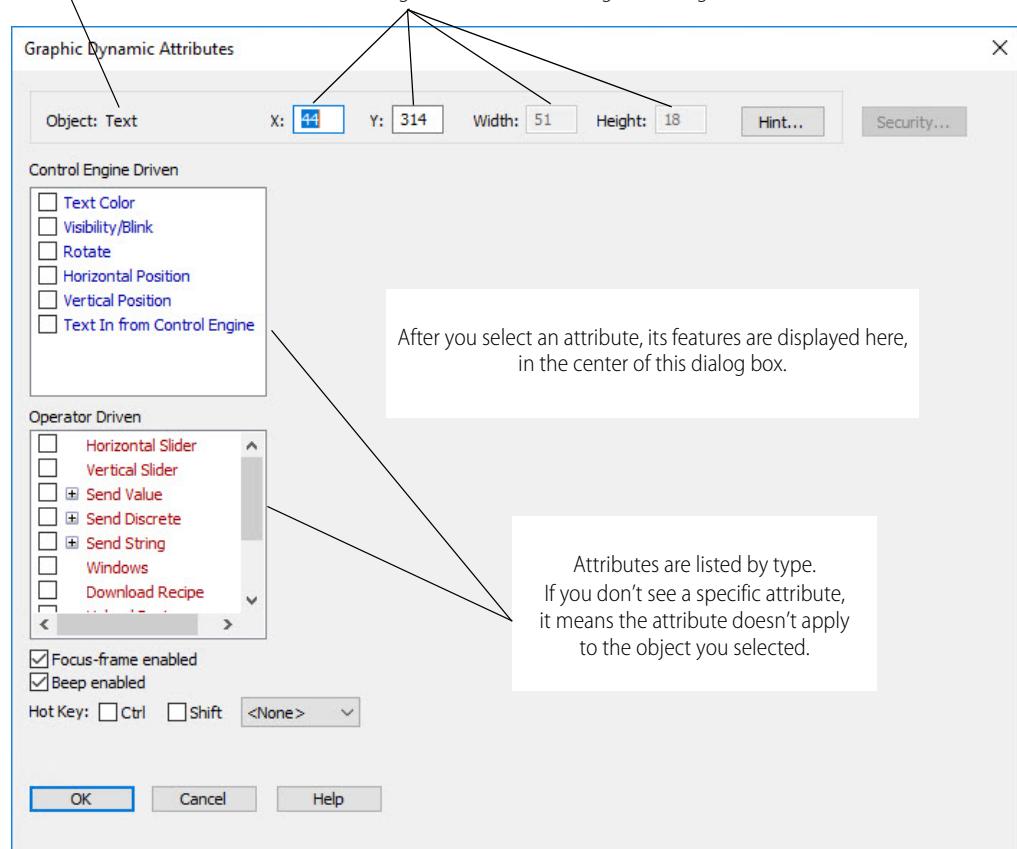
If you change your Configurator Options to use the older-style (PAC Display R9.6 and lower) dialog boxes, you can use these instructions to configure dynamic attributes.

1. With the Select tool , double-click the graphic object that you want to assign a dynamic attribute to. (Or, you can click the object once, and then click Edit > Edit Dynamic Attributes in the PAC Display menu bar).

The Graphic Dynamic Attributes dialog box appears.

This label shows the type of object you selected.

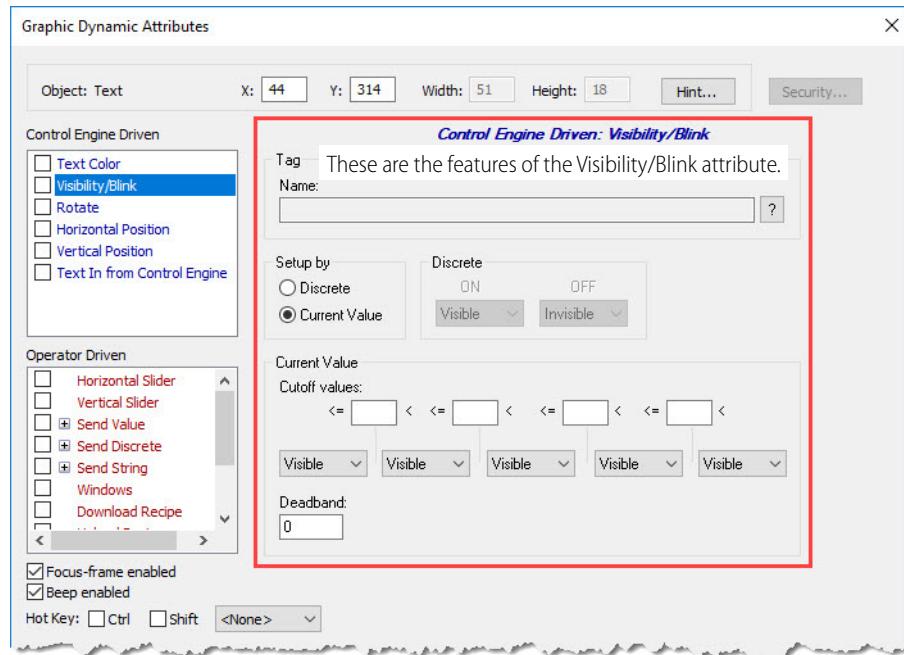
Use these fields to change the object's location (X and Y coordinates) and size. The Width and Height fields are grayed-out for this object because you can't change a Text Box's size using this dialog box.



After you select an attribute, its features are displayed here, in the center of this dialog box.

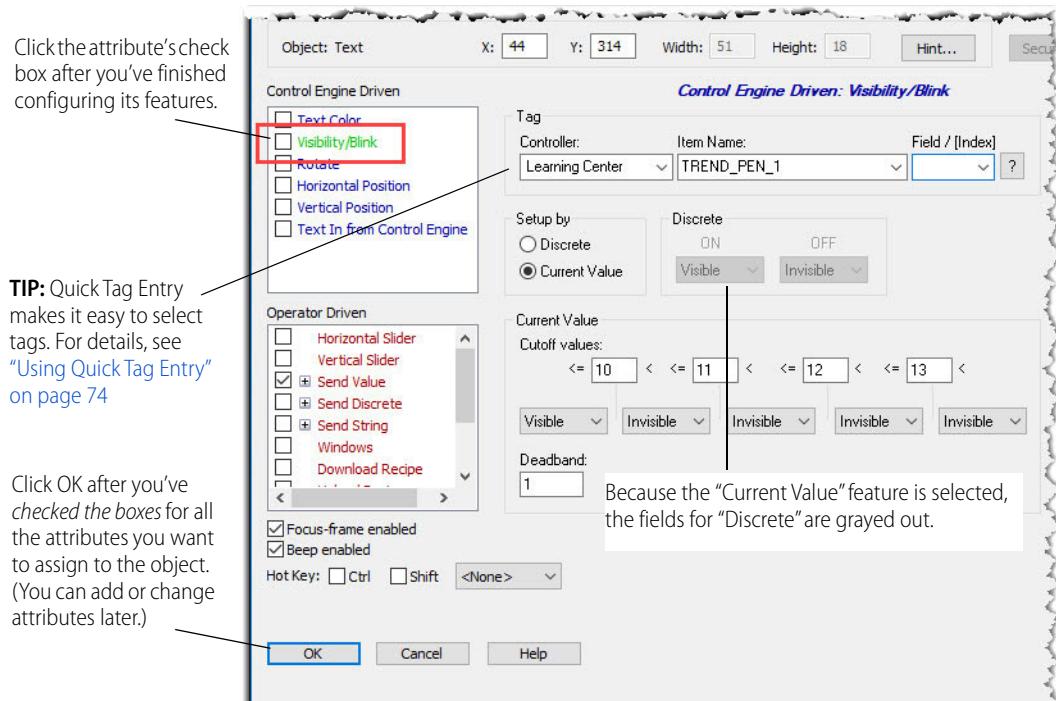
Attributes are listed by type.  
If you don't see a specific attribute, it means the attribute doesn't apply to the object you selected.

2. Click the name of the attribute you want to assign to the object. (Note: Click its name, not its check box.) In this example, we'll select Visibility/Blink.  
The attribute's features are then displayed in the center of the dialog box.



3. Configure the features. As you start to make changes, the color of the attribute's name changes to green, indicating that configuration is in progress and the *changes have not yet been saved*.

If you select a feature that can't be used with another of the attribute's features, the other feature is grayed out so you can't configure it.



- When you're finished configuring the feature, **click the attribute's check box**. Any errors in configuration will be displayed in a message box, and you'll need to fix them before the check box will stay checked.

If there are no errors, the green color disappears from the attribute's name.

To assign another attribute to the object, repeat steps 2–4.

*NOTE: The Send Value, Send Discrete, and Send String attributes can be assigned more than once to the same object. For details, see "Assigning Send Value, Send Discrete, and Send String" on page 169.*

- As long as you have assigned at least one attribute to the graphic object, you can also assign these options:

- Focus-frame enabled**—If this option is checked, a light border will appear around the object in Runtime when the operator moves the cursor over it. This border can be used as a visual aid to let the operator know that an event will occur when the object is clicked.
- Beep enabled**—If this option is checked, the operator will hear a beep when the object is clicked. Use this as an audio confirmation.
- Hot Key**—This option associates a keystroke sequence with the object. A *hot key* is a key on the keyboard (sometimes in combination with the Ctrl or Shift key) that when pressed, activates the object's operator-driver attributes. This lets the operator use a predefined keystroke sequence (instead of using a mouse click) to select a graphic object, thereby allowing PAC Display Runtime to be operated without a mouse or similar device.

*NOTE: The hot key works only for graphic objects that are in an opened or minimized window; closed windows are not affected.*

- Security**—This option defines whether the operator can use the object. For details, see "Security Settings for Graphic Objects and Dynamic Attributes" on page 176.

- **Hint**—This option will display Toolbar text when the operator hovers the mouse pointer over the object. (Applicable only to basic objects such as lines, rectangles, ellipses, and text). For details, see “[Adding Hint Text to a Graphic Object](#)” on page 175.)
6. When you’ve finished assigning attributes to the graphic object, check to see if any other attribute’s name is green.
- If you want to keep the attribute, finish configuring it, and then check the box next to its name.
  - If you don’t want to keep it, just ignore it. It will be cleared (reset) when you close the dialog box.
- Then, click OK to save the configuration and close the dialog box.

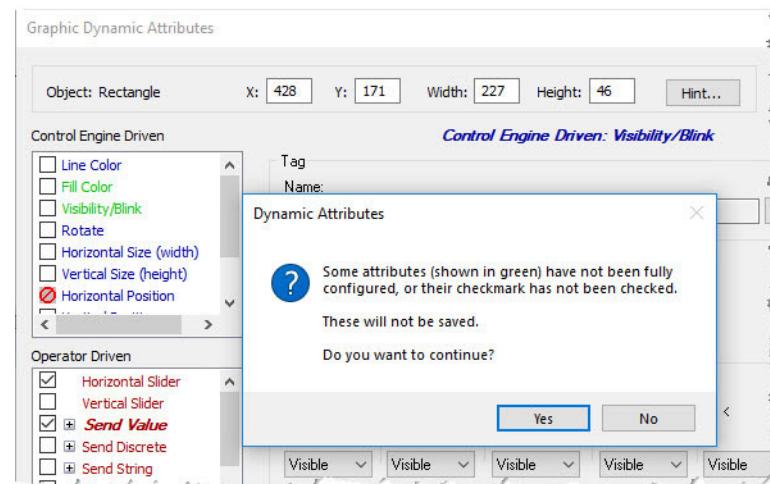
#### Notes

- You can assign dynamic attributes to only one object at a time. If you want several objects to have the same attributes, select the objects, and then choose Edit > Group to make them one object. (You can also right-click the selected graphic objects and choose Group from the pop-up menu.)

*NOTE: If you ungroup the objects, the attributes you configured when they were a group aren’t retained.*

- Sometimes after configuring an attribute and checking its check box, the Not Available indicator appears in a different attribute’s check box. This means that you can’t configure the other attribute because the two attributes cannot be used together in the same graphic object.
- When you assign more than one operator-driven dynamic attribute to a graphic object, the attributes are executed in the order they appear in the Operator Driven Attributes list.
- The color of an attribute’s name changes to green when:
  - A tag has been selected for the attribute.
  - One of the attribute’s features has been changed.

Its name remains green until you check its check box save the changes, or until you click OK and then click Yes on the dialog box that warns your changes will be lost.



In this example, the configuration hasn’t been saved for Fill Color and Visibility/Blink. (Their check boxes are not checked.)

This message appears when the user clicks the OK button to close the dialog box.

If you click Yes, the dialog box will close and the attributes in green will be reset.

- You don’t need to completely configure one attribute before starting to configure another. You can start another by clicking its name. Just remember to complete the configuration and check the box next to the attribute’s name before closing the Graphic Dynamic Attributes dialog box.

#### Editing Tag Names Manually

When editing tags for dynamic attributes, notifications and triggers, you can manually type in a valid tag name for a control engine, item name, table index, or bit index.

**CAUTION:** Use caution with this feature, as unexpected results may occur if you enter an invalid tag. For best results when configuring and editing tags, use Quick Tag Entry (see page 74) or the Tag Selection dialog box (see page 75).

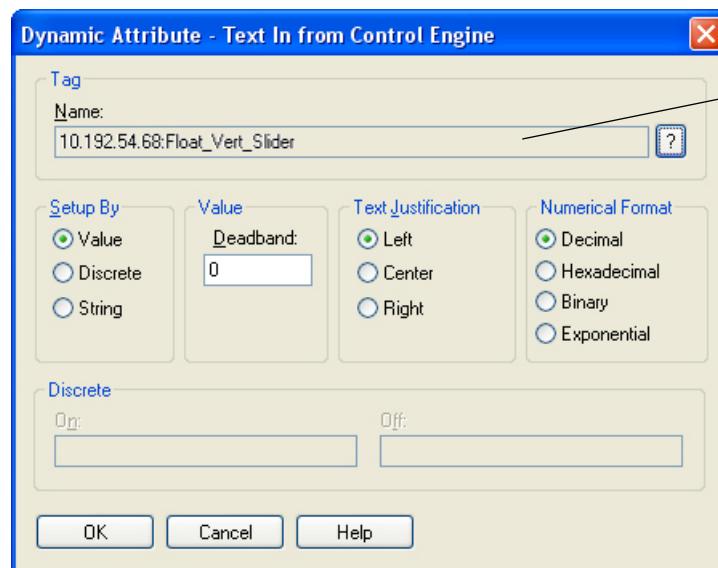
Use the following guidelines for tag names:

- Make sure the new tag name is the same item type. For example, if a strategy contains two Integer32 variables called MyInt\_1 and MyInt\_2, as well as a float variable called MyFloat, you are allowed to change MyInt\_1 to MyInt\_2 because they are both Integer32 variables. However, changing MyInt\_1 to MyFloat will result in an error because MyFloat is a different item type.
- Modify only pre-existing tags. You cannot create a new tag by entering the name. If no tag has been configured, double-clicking the tag name field will sound a beep, and the field will remain read-only.
- If the existing tag has a field attribute (such as Pid.Setpoint or ControlEngine.Date), you can change only the field attribute.

For example, ControlEngine.Date is a string tag and has a field attribute (.Date). You cannot change ControlEngine.Date to My\_String\_Variable, even though both are string types. You can change only the .Date field attribute to .Time, .StrategyName, etc. This applies to PIDs and other tags that have field attributes.

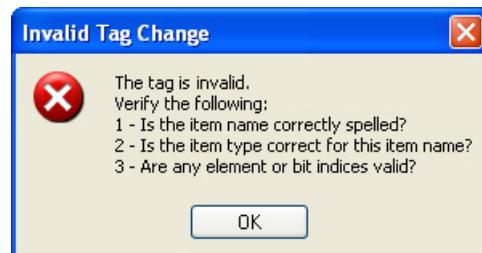
To edit a tag:

1. On a Dynamic Attribute dialog box, double-click in the Name field.



- A message box warns that Opto 22 does not recommend manually changing the tag name.
2. Click OK, and then edit the name using the guidelines detailed above.
  3. Click OK.

If the name is not valid, a message appears.



- Click OK to exit the message dialog, and then enter a valid tag name, or select a valid tag name in the usual manner.

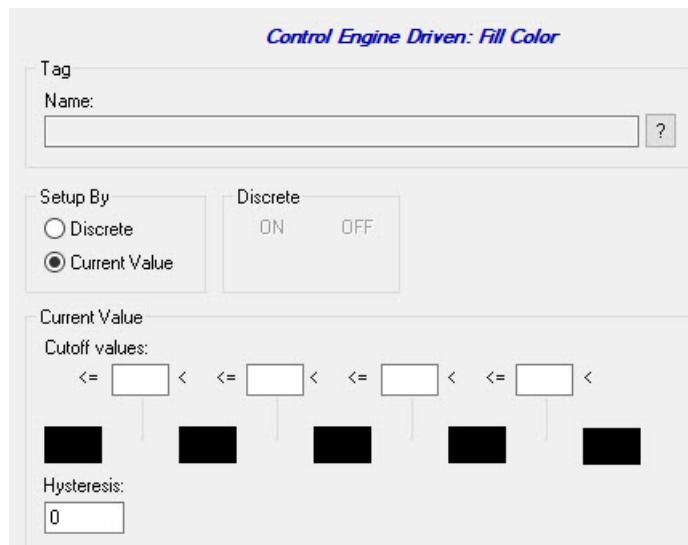
## Assigning a Chart State Value to a Graphic Object

You can assign chart states (such as stop and start) to a graphic object either as control engine-driven attributes or as operator-driven attributes.

### Control Engine-Driven

To assign chart states as control engine-driven attributes:

- Double-click the graphic object to which you will assign a chart state attribute.
- Under Control Engine Driven Attributes, double-click one of the color attributes you want to use (such as Fill Color). See also, ["Fill Color" on page 397](#).



- Under Cutoff values, enter the values as shown above. Each value (except 0, which is a placeholder) correlates to one of the following chart states.

Value	Chart State
1	Stopped
2	Suspended
3	Running

- Select a color for each value.
- Configure a tag for this dynamic attribute, then click OK. (See also, ["Configuring Tags" on page 74](#).)
- Click OK again to close the dialog box.

### Operator-Driven

To assign a chart state as an *operator-driven attribute*:

- Double-click the graphic object to which you will assign a chart state attribute.

2. Under Operator Driven Attributes, double-click Send Value. See also, "Send Value" on page 406.



3. Under Source, select either Fixed data or Prompt for data. For Fixed Data, enter one of the following values:

Value	Chart State
1	Stop
2	Suspend
3	Start
4	Continue

Or, for Prompted Data:

- a. Create a User Message.
- b. Enter a Min Value of 1.
- c. Enter a Max Value of 4.

In Runtime, the user enters 1, 2, 3, or 4 to stop, suspend, start, or continue the chart as indicated in the table above.

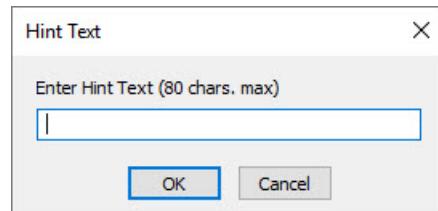
4. Configure a tag for this dynamic attribute, then click OK. (See also, "Configuring Tags" on page 74.)
5. Click OK again to close the dialog box.

### Adding Hint Text to a Graphic Object

Follow the steps below to add hint text to the Tooltips box of a basic graphic object such as a *line*, *rectangle*, *ellipse*, or *text*. The Tooltips box is displayed when the mouse is hovered over the graphic object in Runtime.

*NOTE: Only one instance of hint text can be applied to a graphic object. Hint text is not attribute-specific.*

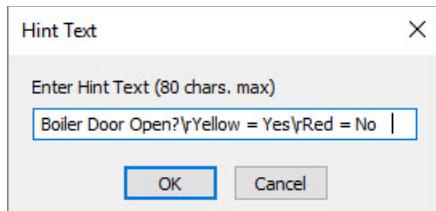
1. Double-click the graphic object to which you will provide hint text. This opens the Graphic Dynamic Attributes dialog box.
2. On the right side of the Graphic Dynamic Attributes dialog box, click the Hint... button to open the Hint Text dialog box.



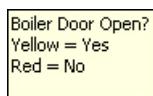
3. Enter the hint text. For example, you might enter, "To start the process, click the Start button." Hint text is limited to 80 characters.

To wrap text to the next line, add \r to the text. For example, if you enter the following text,

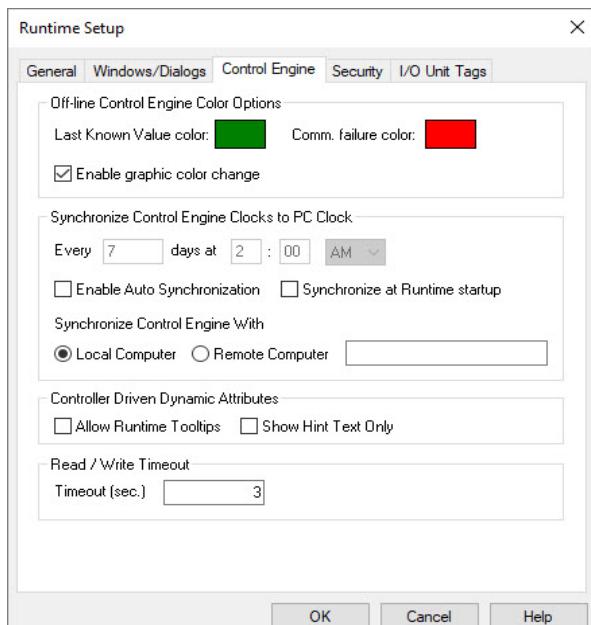
```
Boiler Door Open?\rYellow = Yes\rRed = No
```



The portions of text beginning with "Yellow" and "Red" will each wrap to the next line. In Runtime, the Tooltips box in Runtime will appear like this:



4. Click OK. Then, click Configure > Runtime to open the Runtime Setup dialog box. Then click the Control Engine tab.

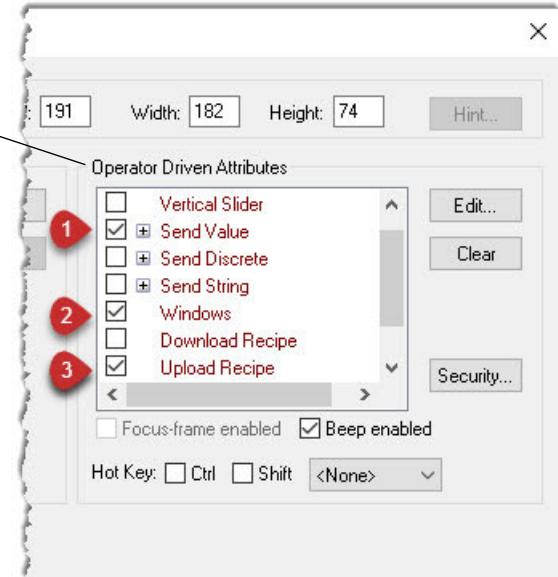


5. On the Control Engine tab, select Allow Runtime Tooltips, and then click OK to close the dialog box and save the settings.

## Assigning Multiple Dynamic Attributes to a Graphic Object

When you assign more than one dynamic attribute to a graphic object, the attributes are executed in the order they appear in the Operator Driven Attributes list.

When triggered during Runtime, multiple attributes are performed in the order they appear in the Operator Driven Attributes list.



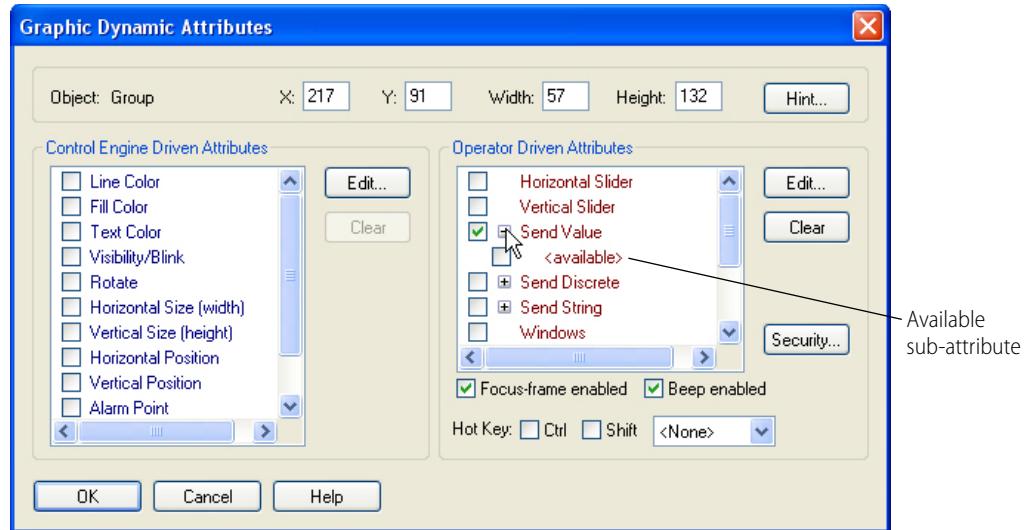
## ASSIGNING OPERATOR-DRIVEN SUB-ATTRIBUTES

You can assign multiple sub-attributes for three operator-driven attributes: Send Value, Send Discrete, and Send String.

1. Choose the Select tool from the toolbox and double-click the graphic object to which you want to assign a dynamic attribute.
2. Configure an initial attribute for Send Value, Send Discrete, or Send String. For more information, see ["Available Dynamic Attributes" on page 393](#).
3. In the Graphic Dynamic Attributes dialog box, click the + icon next to attribute you just configured. In this example, Send Value is used.

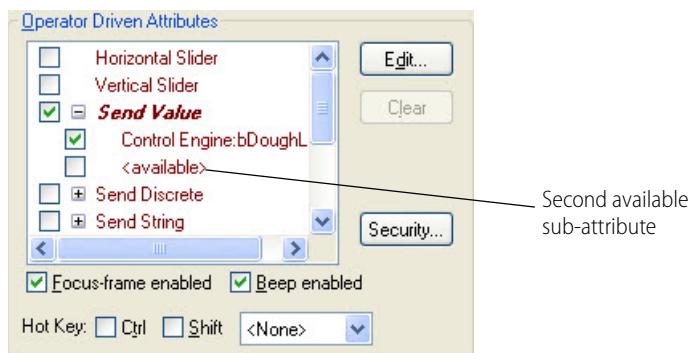
## ASSIGNING OPERATOR-DRIVEN SUB-ATTRIBUTES

A Send Value sub-attribute is now available.



4. Select the item marked <available>, and then click Edit to configure a new Send Value sub-attribute for this graphic object.

A second Send Value sub-attribute is now available.



The Send Value item is now displayed in a bold italic font. This indicates that the dynamic attribute has at least one sub-attribute configured. As more sub-attributes are added, additional <available> items

appear in the attribute tree. If you collapse the Send Value item, you can still see the sub-attributes by hovering over Send Value.



## Reordering Sub-Attributes

Dynamic sub-attributes are sent to the device in the order displayed in the list. To change the order of the sends, select a sub-attribute, and then drag it to a new position in the list.

*NOTE: Only sub-attributes can be reordered. A parent attribute (such as Send Value) cannot be moved.*

## Clearing Dynamic Sub-Attributes

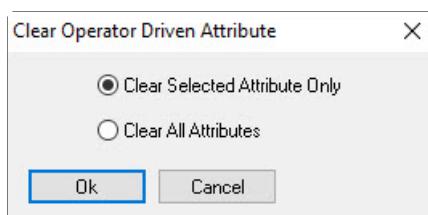
To clear a single dynamic sub-attribute:

1. Expand the attribute tree and select the sub-attribute.
2. Click Clear.

Any sub-attributes below the cleared sub-attribute will move up in the list.

To clear more than one sub-attribute:

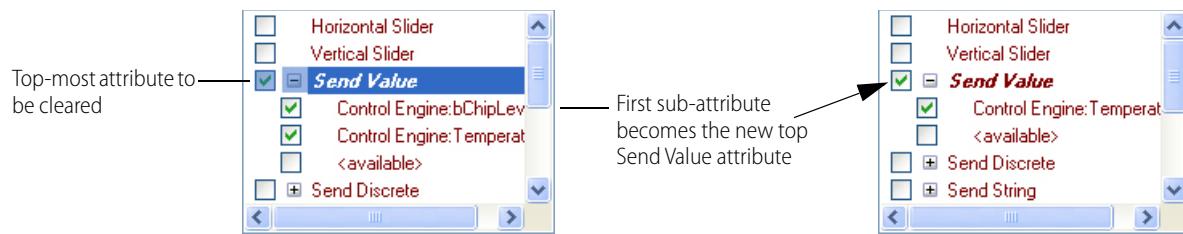
1. Select the top-most dynamic attribute, such as Send Value, and then click Clear. The Clear Operator Driven Attribute dialog box opens.



2. Choose one of the options:

- **Clear Selected Attribute Only** clears the top-most attribute, such as Send Value. The first sub-attribute moves up to replace the top-most attribute. All other sub-attributes move up in the list.

## CONFIGURING SECURITY PERMISSIONS FOR GRAPHIC OBJECTS



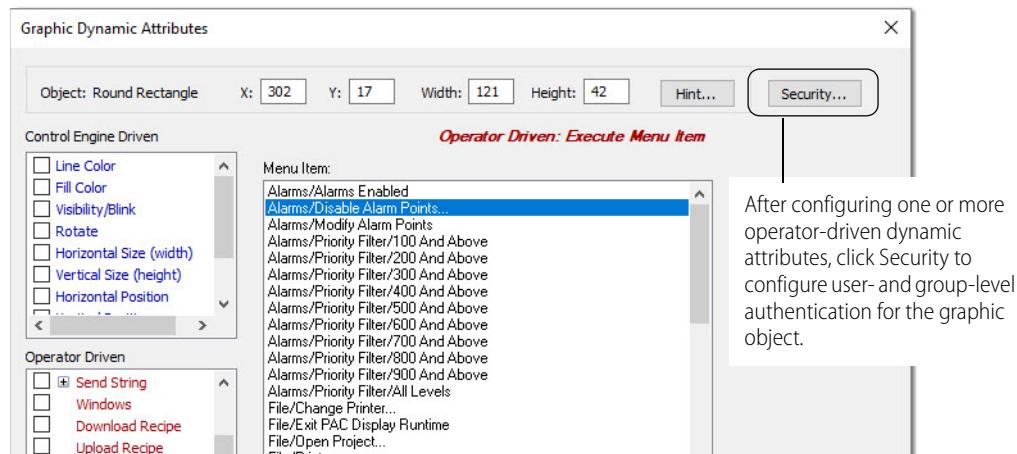
- **Clear All Attributes** clears the top-most attribute and all sub-attributes below it.

## CONFIGURING SECURITY PERMISSIONS FOR GRAPHIC OBJECTS

*NOTE: Security permissions are applied to all dynamic attributes selected before you click the Security button. If a graphic object needs to have multiple dynamic attributes, make sure to select and configure all attributes before configuring security settings.*

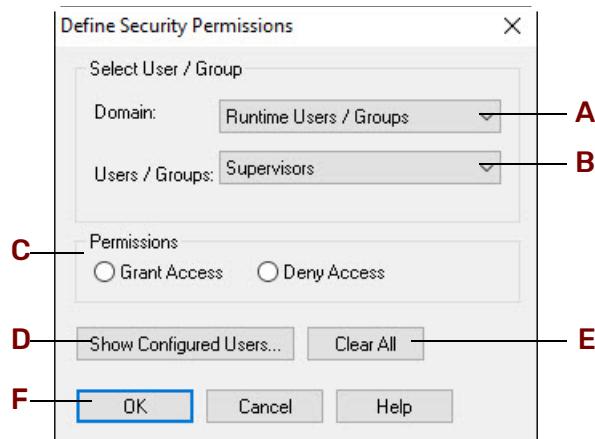
To assign user- and group-based security permissions to a graphic object:

1. Double-click the graphic object to which you will assign one or more operator-driven dynamic attributes. The Graphic Dynamic Attributes dialog box opens. Note that the Security button on the right side is not active.
2. Double-click an operator-driven attribute that you want to use, configure it as needed, and then click OK. The Graphic Dynamic Attributes dialog box is again visible, and the Security button is now active.



3. Click Security to configure user- and group-level authentication for the graphic object.  
The Define Security Permissions dialog box opens.

### Define Security Permissions Dialog Box



**(A) Domain.** To set permissions based on Windows authentication, select the Windows domain that contains the operator (or group) to whom you want to grant or deny access. To select a custom-configured user or user group, select Runtime Users / Groups.

**(B) User/Groups.** Select the user or group to whom you want to grant or deny access to the object.

**(C) Permissions.** For the selected user or group, select Grant Access or Deny Access.

**(D) Show Configured Users.** Click Show Configured Users to view all permissions currently assigned for the graphic object.

**(E) Clear All.** Click Clear All to erase all configured permissions for the graphic object.

**(F) OK.** Click OK to save changes, or click Cancel to close the dialog box without any changes being made.

### Copying Security Permissions to Other Graphic Objects

To make security configuration easier and less error-prone, you can copy a graphic object's security permissions and then apply them to:

- One or more selected graphic object
- All graphic objects in a PAC Display window
- All graphic objects in a project

#### To copy and apply security permissions:

1. Click the graphic object whose security permissions you want to copy.  
(Sizing handles—the small black boxes around the graphic object—indicate that it has been selected.)
2. Copy the graphic object's permissions. There are two ways you can do this:
  - Click the graphic object, and from the menu bar, click Edit > Security Permissions > Copy.

*NOTE: This method is required when copying or applying permissions to Alarms, XY Plots, Trend, and SuperTrends.*

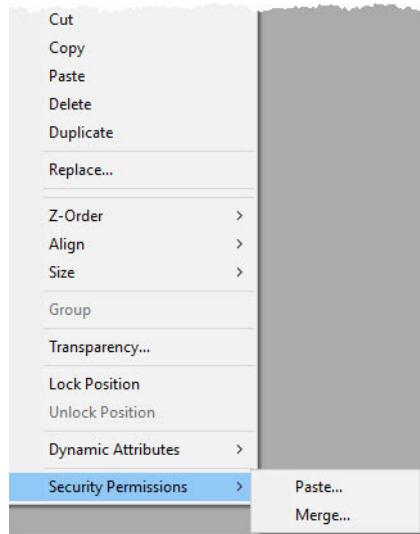
- Right-click the graphic object, and from the pop-up menu, click Security Permissions > Copy Security Permissions > Copy.

*NOTE: If the Copy selection is grayed out, it means the graphic object you selected doesn't have configured security permissions. First, you must configure permissions for the graphic object; then Copy will be enabled when you select the object.*

3. Select the graphic object to receive the copied security permissions.
  - To select more than one graphic object, press and hold the Shift key while clicking the objects.
  - To select all graphic objects in a window or all graphic objects in the project, click anywhere in the window.

*NOTE: In order to receive the copied permissions, the target graphic object must have at least one configured operator-driven dynamic attribute.*

4. Right-click to display the pop-up submenu (or in the menu bar, click Edit > Security Permissions).



- Select **Paste** to **overwrite** the target graphic objects' existing security permissions.
- Select **Merge** to **keep** the target graphic objects' existing permissions **and add** the copied permissions.<sup>1</sup>

The Security Attributes dialog box opens.



If you select Merge, the Merge Security Attributes dialog box opens. It has the same options as the Paste Security Attributes dialog box.

5. Choose the target:

- Chosen graphics—Selects only the currently selected graphic object (or objects).
- This Window—Selects all graphic objects in the current window.

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<sup>1</sup>When permissions conflict—for example, when you paste a Grant Access permission to a graphic object that is already configured with Deny Access for the same user (or user group)—PAC Display always applies the most restrictive permission. In this example, the user (or group) would be denied access to the graphic object.

- All windows—Selects all graphic objects in all windows in the project.
6. Click OK to save the settings and close the dialog box.

## AVAILABLE DYNAMIC ATTRIBUTES

You can add the dynamic attributes listed below to a graphic object. Note that not all attribute types are available for all types of graphic objects; only attributes that can be used with a particular graphic type appear in the Dynamic Attributes dialog box.

For Discrete control engine-driven attributes and the Send Discrete operator-driven dynamic attribute, you have the option of specifying a bit index for integer tag types by using either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)).

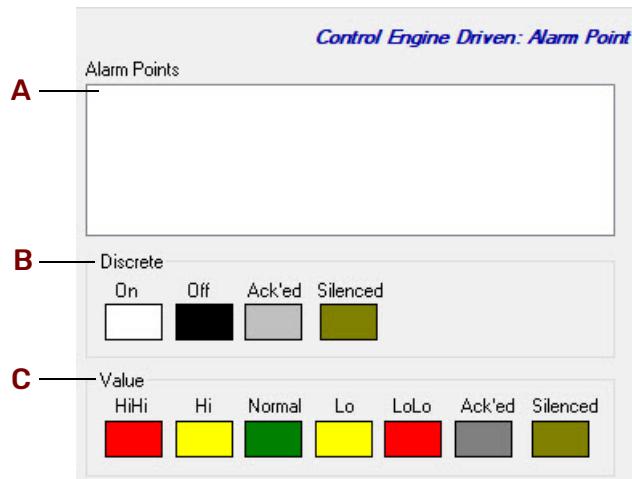
Dynamic Attribute	Type
<a href="#">Alarm Point, page 393</a>	control engine-driven
<a href="#">Control Engine Status, page 394</a>	control engine-driven
<a href="#">Download Recipe, page 395</a>	operator-driven
<a href="#">Execute Menu Item, page 397</a>	operator-driven
<a href="#">Fill Color, page 397</a>	control engine-driven
<a href="#">Horizontal Position, page 398</a>	control engine-driven
<a href="#">Horizontal Size (Width), page 399</a>	control engine-driven
<a href="#">Horizontal Slider, page 400</a>	operator-driven
<a href="#">Launch Application, page 400</a>	operator-driven
<a href="#">Line Color, page 402</a>	control engine-driven
<a href="#">Read and Clear, page 403</a>	operator-driven
<a href="#">Rotate, page 404</a>	control engine-driven
<a href="#">Send Discrete, page 405</a>	operator-driven
<a href="#">Send String, page 406</a>	operator-driven
<a href="#">Send Value, page 406</a>	operator-driven
<a href="#">Text Color, page 407</a>	control engine-driven
<a href="#">Text In from Control Engine, page 409</a>	control engine-driven
<a href="#">Upload Recipe, page 410</a>	operator-driven
<a href="#">Vertical Position, page 412</a>	control engine-driven
<a href="#">Vertical Size (Height), page 412</a>	control engine-driven
<a href="#">Vertical Slider, page 413</a>	operator-driven
<a href="#">Visibility/Blink, page 414</a>	control engine-driven
<a href="#">Windows, page 416</a>	operator-driven

### Alarm Point

Use this attribute to change the color of a graphic object based on the state of an alarm point. You can use this attribute with circles, rectangles, and polygons. By default, the color of the graphic object corresponds to the Normal, or unalarmed, state. See also, “[Configuring Alarm Points](#)” on [page 258](#) and “[Configuring Project Alarms](#)” on [page 277](#)

## AVAILABLE DYNAMIC ATTRIBUTES

Double-click Alarm Point in the Graphic Dynamic Attributes dialog box to display the Dynamic Attributes-Control Alarm Point dialog box.



**(A) Alarm Points.** The names of the alarm points configured for the project appear here. Click an alarm point in the list, and then set the colors that will be used for the graphic object in the Discrete group or the Value group.

Alarm points that monitor digital points are configured as discrete alarm points, and have four states: On, Off, Ack'ed, and Silenced. Alarm points that monitor analog points are configured as value alarm points, and have six states: HiHi, Hi, Normal, Lo LoLo, Ack'ed, and Silenced. See "[Configuring Alarm Points](#)" on page 258 for more information about setting up alarm points.

**(B) Discrete.** To select colors for a discrete alarm point's On and Off states, click the color box for each state and then choose a color in the dialog box that appears. If you have selected an alarm point for a digital I/O point, only the Discrete group will appear in the Dynamic Attribute - Alarm Point dialog box.

**(C) Value.** To select colors for a value alarm point's HiHi, Hi, Normal, Lo LoLo, Ack'ed, and Silenced states, click the color box for each state and then choose a color in the dialog box that appears. If you have selected an alarm point for an analog I/O point, only the Value group will appear in the Dynamic Attribute - Alarm Point dialog box.

## Control Engine Status

Use this attribute to change the color of a graphic object based on the status of one or more control engines. You can use this attribute with circles, rectangles, and polygons.

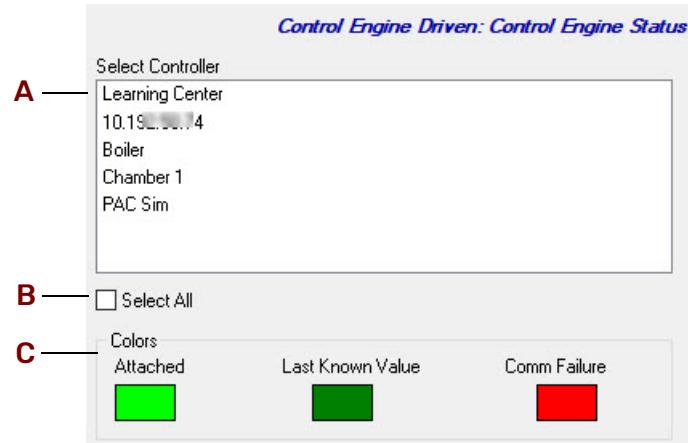
*NOTE: When the Control Engine Status dynamic attribute is selected, all other Control Engine-driven attributes are disabled.*

If the Control Engine Status attribute is used to monitor multiple control engines, the graphic object will display the status color for the control engine that is in the most critical condition. Least critical to most critical status is shown below:



Double-click Control Engine Status in the Graphic Dynamic Attributes dialog box to display the Dynamic Attributes-Control Engine Status dialog box.

#### Dynamic Attributes – Control Engine Status Dialog Box



**(A) Select Controller.** The names of the control engines configured for the project appear here.

Select a control engine. To select multiple control engines, hold down the Ctrl key and click each one you want to select.

**(B) Select All.** To select all control engines in the list, click Select All.

**(C) Colors.** To select colors for a control engine's state, click the color box for the state and then choose a color in the dialog box that appears.

#### Download Recipe

Use this attribute to download a recipe file to a control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. For more information about recipes, see ["Configuring Recipes" on page 239](#).

To display the Dynamic Attribute - Download Recipe dialog box, double-click Download Recipe in the Graphics Dynamic Attributes dialog box (Edit > Edit Dynamic Attributes).



**Name (Trigger-based recipe download).** Enter a name for this recipe. This name is used to refer to this trigger-based recipe in the Recipe Managers list dialog box. The name can be up to 40 characters long.

**(A) Directory.** Enter the directory location of the recipe file. Use the button **B** to quickly enter a directory name.

**(B) (Basic only) Browse.** Click to quickly find the recipe file directory for **A**. Use the Select Download File Directory dialog box that appears to navigate to the desired directory, and then click OK.

**(B) (Pro only) Log From.** Click to select whether to log from an ASCII recipe file or from a database table.

- If you click Log File in the pop-up menu, use the Browse for Folder dialog box to navigate to the desired directory, and then click OK.
- If you click Log File in the pop-up menu, use the Select Database Table dialog box to select the desired table, and then click OK. For more information about logging to a database table, see "[Configuring an ODBC Data Source](#)" on page 55.

**(C) Make Path Relative to Project.** When selected, if you copy the project and recipe files to a different computer, PAC Display will look in the same relative location to find the recipe files in Configurator and Runtime.

For example, if the project is saved in C:\proj\ and you configure recipes files to be in C:\proj\recipes\, then the relative path would be this: .\recipes\

If you then saved the project to C:\temp\newproj\, PAC Display would look for recipe files in the new location's relative path: C:\temp\newproj\recipes\

**(D) File Name.** Choose the source of the recipe file name:

#### Fixed Name

Check this if the recipe file is a file name you want to configure at this time. If this option is selected, the File Name edit box appears, prompting you for a file name. Make sure the file exists in the Directory entry, otherwise an error is posted. The file name may not be changed at Runtime.

The Extension parameter also appears and prompts for a one to three character long extension that's appended to the Fixed Name. The extension must not contain a period or a DOS wild card character. The default extension is "rcp".

#### Prompt For Name

Check this if the recipe file name is to be prompted at Runtime when the trigger occurs. If this option is selected, the Extension parameter also appears. Enter a one to three character long extension which does not contain a period or a DOS wild card. This extension is used as a filter to select which files are displayed when prompting a user for the recipe name at Runtime, however files with different extensions may be selected.

#### From Strategy

Check this option if you want to use a string tag name from the control engine strategy to specify the recipe file name. If this option is selected, the String Name edit box appears, prompting for the name of the PAC Control tagname you want to use. Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a tagname.

**(E) Fixed Name.** If Fixed Name was selected in File Name (**D**), enter the name of the recipe file located in Directory (**A**). Notice the file extension is .rcp.

**(F) Extension.** Specify the file extension for the recipe files available to this dynamic attribute by entering the extension in the File Extension field. The extension must be one to three characters long and must not contain a period or DOS wild card characters.

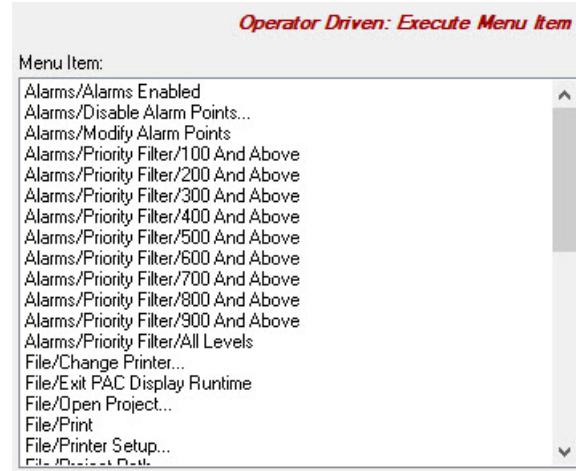
If Fixed Name is checked, this extension will be appended to the File Name entry to create the name for the recipe file. If Prompt For Name is checked, this extension will be used as a filter to select the files for display in a file selection dialog box when PAC Display Runtime executes this dynamic attribute; however, you may override this filtering if you wish to select a file with a different extension.

**(G) String Name.** If From strategy was selected in Fixed Name (**D**), use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a tagname.

## Execute Menu Item

Use this attribute to run a single Runtime command when an object is clicked. This is useful if you want to hide the menu bar and allow only limited access to certain items. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

Double-click Execute Menu Item in the Graphics Dynamic Attributes dialog box to display the Runtime Menu Commands.

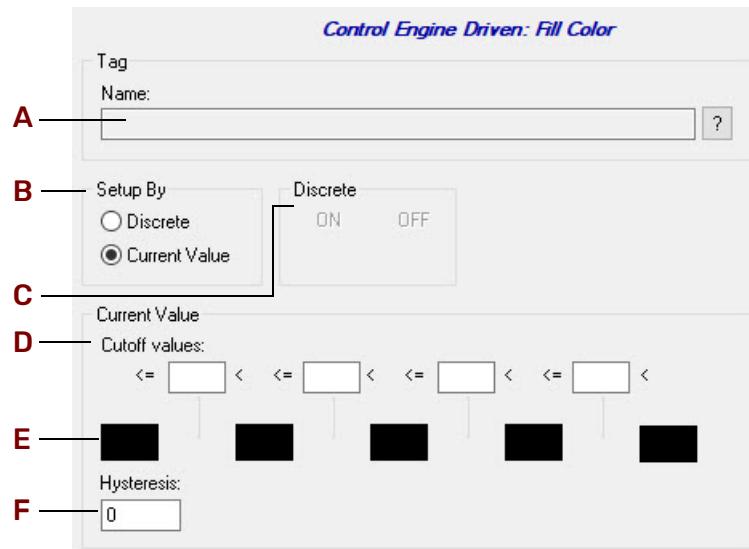


Select a command from the Menu Item list and click OK. (Click Cancel to close the dialog box without making any changes.) For more information on the Runtime commands, see “[Runtime Menus](#)” on page 370.

## Fill Color

Use this attribute to change a graphic object’s fill color based on a tag value from the control engine. This is a control engine-driven attribute and is available for rectangles, round rectangles, ellipses, and polygons.

Double-click Fill Color in the Graphics Dynamic Attributes dialog box to display the Dynamic Attribute - Fill Color dialog box.



**(A) Name.** Use either Quick Tag Entry (see page 74) or the Tag Selection dialog box (see page 75) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the Cutoff Values group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first CutoffValue box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in CutoffValues (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

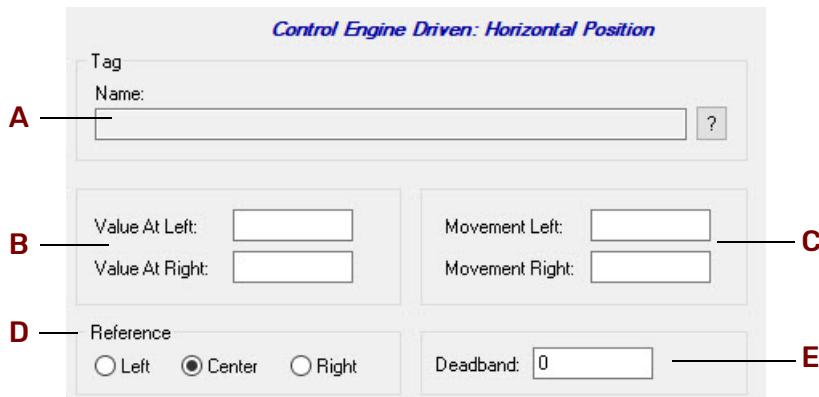
**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

## Horizontal Position

Use this attribute to adjust the horizontal position of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons, polylines, curves, bitmaps, and text.

Double-click Horizontal Position in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes, the graphic object's horizontal position is changed.

**(B) Value at Left/Right.** Enter the leftmost and rightmost value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Left/Right.** Enter the leftmost and rightmost movement the object can change. The movement units are in pixels. Suppose your left and right values are 0 and 100, and your left and right movements are 0 and 200. When the tag value is 50, the object will be moved 100 pixels to the right.

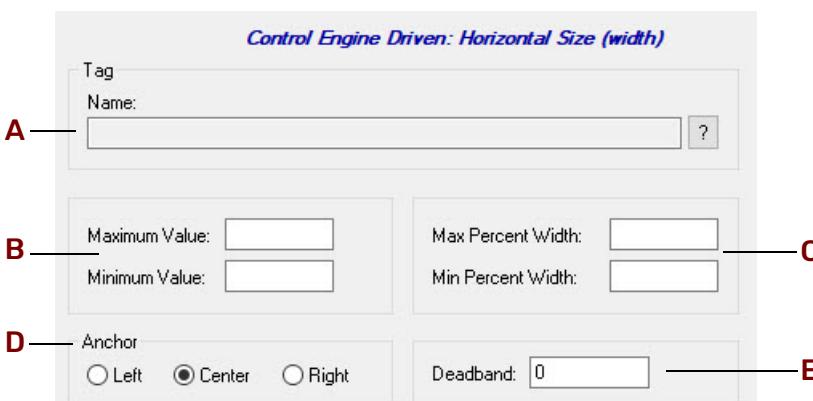
**(D) Reference.** Select the reference point for the object. The choices are left, center, and right. The Horizontal Size (Width) dynamic attribute must also be configured in order for this option to affect the graphic object.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the graphic object's movement will actually change. Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next tag reading must be greater than 55 in order for the graphic object to move.

### Horizontal Size (Width)

Use this attribute to adjust the width of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, and curves.

Double-click Horizontal Size (Width) in the Graphics Dynamic Attributes dialog box to display the Dynamic Attribute - Width dialog box.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes in the PAC Control strategy, the graphic object's width is changed.

**(B) Maximum/Minimum Value.** Enter the maximum and minimum value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Max/Min Percent Width.** Enter the maximum and minimum percentage the object can change. The percentage range is from 0 to 1,000 percent. Suppose your minimum value is 0 and your maximum value is 10, and the minimum and maximum percentages range is 0 to 200. When the tag value is 10, the object will

be twice as big as you've originally drawn it. When the tag value is 5, the object will be the same size you've drawn it, which is 100 percent.

**(D) Anchor.** Enter the anchor point for the object. This is the reference point on the object from which the graphic object changes. The choices are left, center, and right.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the graphic object's width will actually change.

### Horizontal Slider

Use this attribute to configure a horizontal slider when a graphic object is clicked. This is an operator-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, and bitmaps.

Double-click Horizontal Slider in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. The distance the horizontal slider is moved affects the value sent to the tag in the control engine.

**(B) Value at Left/Right.** Enter the leftmost and rightmost value for the tagname in **A**. For example, if you know your tag values can be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Left/Right.** Enter the leftmost and rightmost movement the object can change. The movement units are in pixels. Suppose your left and right values are 0 and 100, and your left and right movements are 0 and 200. If you move the tag 100 pixels to the right, the tag value sent will be 50.

**(D) Reference.** Select the reference point for the object. The choices are left, center, and right. Note that you must also separately configure the Horizontal Size (Width) dynamic attribute to use this option.

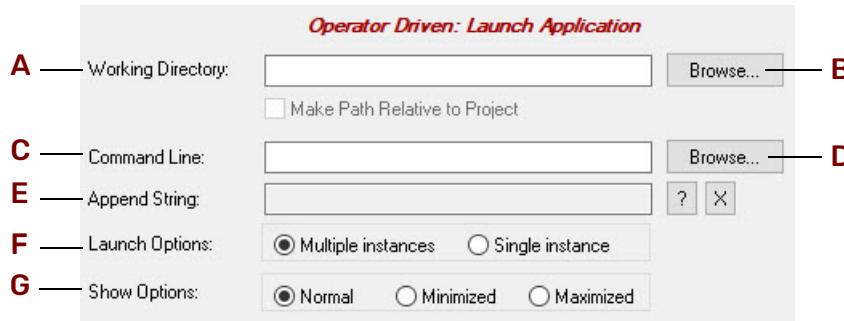
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the tag value should be changed.

Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next graphic object movement must be greater than 55 in order for the tag value to change.

### Launch Application

Use this attribute to start an application when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

Double-click Launch Application in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Working Directory.** (Optional) Enter the working directory you want to be in when you start the application. Use the Browse button **B** to quickly enter a directory name. If a working directory is not specified, the current PAC Display Runtime directory is used when launching the application. You can change the working directory at any time.

**(B) Browse.** Click to find the directory for **A**. The Working Directory Selection dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(C) Command Line.** Enter the complete path and file name of the application you want to launch. Use the Browse button **D** to quickly enter the path.

**(D) Browse.** Click to find the path and application name for **C**. The Application Manager Executable File Selection dialog box appears. Use it to select an application and click Open when you're done.

**(E) Append String.** (Optional) Enter the name of a string tag to use to append to the path entered in Command Line **(C)**. The string appended may be a file name the launched application should open.

Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.

Use the Delete button to clear an entry you may have made in this field. Only tag names may be entered. Literal strings are not accepted. If the appended string is a parameter, a space must be included in the Command Line string to separate it from the main command line.

**(F) Launch Options.** Select Single instance to have PAC Display Runtime check whether the graphic object has previously launched an application that is currently running. If the object has not previously started a currently running application, the application will be launched.

Select Multiple instances to allow the graphic object to start more than one instance of an application. Some applications allow only one session of an application to run, while others allow multiple sessions.

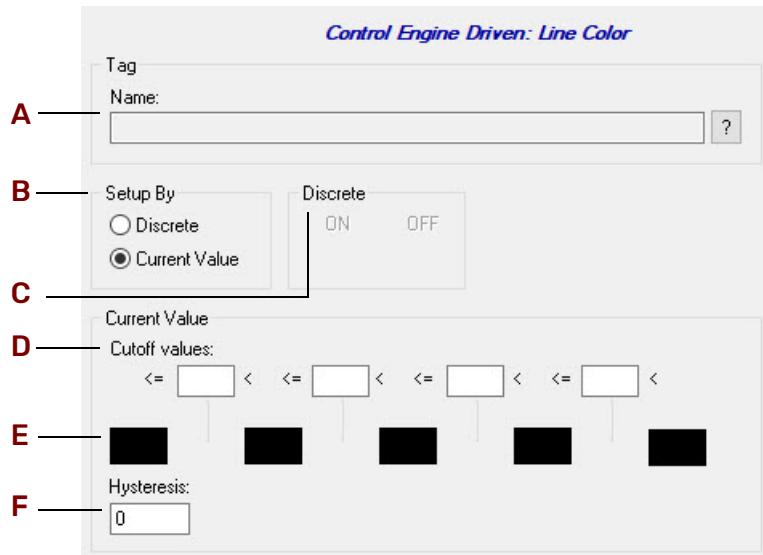
Note that the Single Instance option doesn't limit the number of active sessions of an application that is launched by other graphic objects and triggers. For example, if the graphic object launches a Microsoft Word session, that object can't launch any other application until the Word session ends. However, a trigger-based event can launch a second, separate session of Word, so two Microsoft Word sessions will be running concurrently.

**(G) Show Options.** Click here to configure how the application window will appear. Your choices are Normal, Minimized, and Maximized.

## Line Color

Use this attribute to change a line color or the line color around a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, and Bezier curves.

Double-click Line Color in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the Cutoff Values group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in Cutoff Values (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

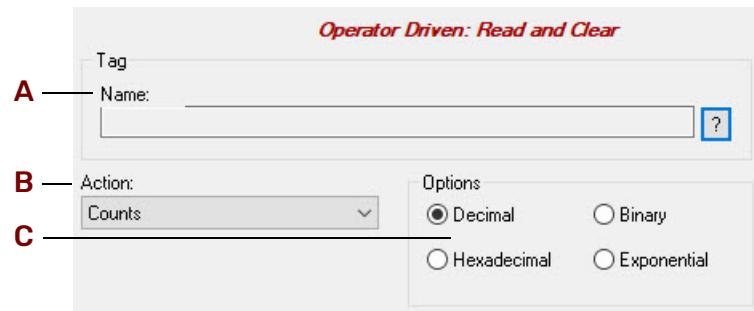
For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag

value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

## Read and Clear

Use this attribute to read a tag value and then clear (reset) it. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

Double-click Read and Clear in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name.

**(B) Action.** Choose the item to be read and cleared when the operator clicks the graphic object:

- Counts (returns an integer value and then clears counts)
- On time total
- Off time total
- Latch (ON)
- Latch (OFF)
- On pulse measure
- Off pulse measure
- Period
- Minimum
- Maximum

**(C) Options.** Formatting options for how values appear when read appear here. Depending on the item you selected in Action **(B)**, one of the following option groups will be available:

- Numerical formats—Decimal, binary, hexadecimal, and exponential formats are available for values returned as numbers (for example, the state of all 32 points on a high-density module).
- Text formats—Custom text that corresponds to a discrete value's on and off states can be entered here.

### Notes:

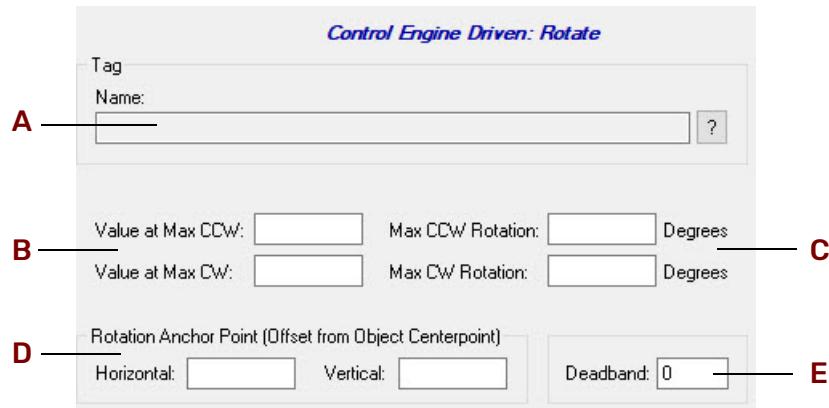
- If the Read and Clear dynamic attribute has been assigned to an object, a "Text In from Control Engine" dynamic attribute cannot also be assigned to that same object.
- If a text placeholder (##) is used to view return values, these placeholder characters will appear that way in Runtime until the operator triggers the read and clear. Once this has happened, the graphic object will not change until the read and clear is triggered again.
- If more than one graphic object in a PAC Display window is configured with the same Read and Clear dynamic attribute, each object is treated independently. The graphic objects are not linked to each other, so when one object is read and cleared, the other object will not reflect this.

## Rotate

Use this control engine-driven attribute to rotate any of the following graphic objects based on a tag value from the control engine: Bitmap, Metafile, Curve, Polygon, Ellipse, Polyline, JPEG, PNG, Rectangle, Line, or Text.

*NOTE: Dynamic rotation can be a CPU intensive. Use dynamic rotation judiciously.*

Double-click Rotate in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, the graphic object's line rotates.

**(B) Value at Max.** These fields are used to specify the return data from the tag that will produce the maximum counterclockwise (CCW) and maximum clockwise (CW) rotation. The Value at Max CCW may be either less than or greater than the Value at Max CW, so that rotation may proceed in either direction as the data from the tag increases or decreases. Therefore, the term "exceeds" is used below to indicate a value that may be either greater than or less than the CCW or CW Max value.

When the tag returns data that is equal to or exceeds the Value at Max CCW to PAC Display, the graphic object will rotate counterclockwise as far as possible, as specified by the Max CCW Rotation value explained below. When the tag returns data that is equal to or exceeds the Value at Max CW Rotation to PAC Display, the graphic object will rotate clockwise as far as possible, as specified by the Max CW Rotation value explained below.

**(C) Max Rotation.** These fields are used to specify the maximum counterclockwise and clockwise rotation angle that the graphic object may undergo (in degrees from its configured location). The entered values must be non-negative numbers. The Max CCW Rotation angle is achieved when the tag returns data that is equal to or exceeds the Value at Max CCW, as explained above. The Max CW Rotation angle is achieved when the tag returns data that is equal to or exceeds the Value at Max CW, as explained earlier in this section.

**(D) Rotation Anchor Point.** The rotation anchor point is used to specify the fixed location that the graphic object rotates around. This location is specified in terms of an offset (in units of pixels) from the center point of the graphic object at its configured location.

In the Horizontal field, enter a negative value to specify a position that is to the left of the configured location or enter a positive value to specify a position that is to the right of the configured location. In the Vertical field, enter a negative value to specify a position that is above the configured location or enter a positive value to specify a position that is below the configured location. If a value of zero is specified for both fields, then the graphic object will rotate about its center point.

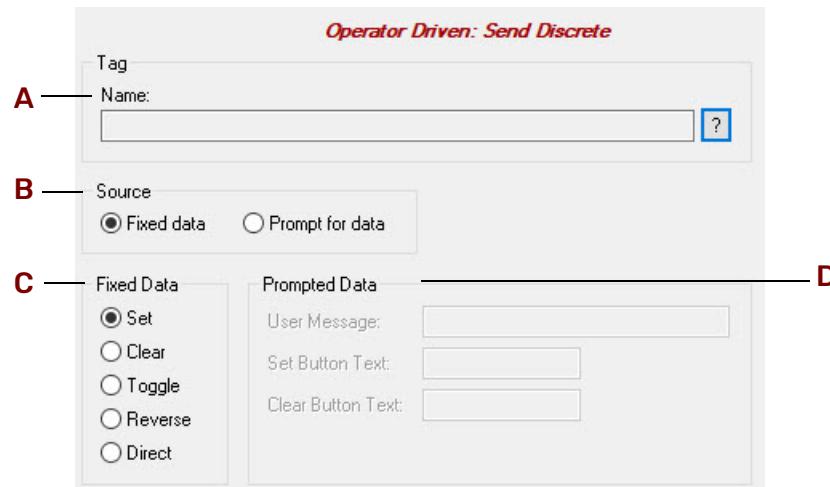
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine if the line's rotation angle should change.

For example, let's say the deadband is 2. A tag with a value of 50 is read. The next tag value read is 51. The line does not rotate because the value read is within the deadband range.

### Send Discrete

Use this attribute to send a discrete value to a tag in the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

Double-click Send Discrete in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the tag value entered by the operator or configured in this dialog box.

**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the setting selected in the Fixed Data field (**C**) is sent to the tag. If you select Prompt for data, the Prompted Data field (**D**) is activated and you can enter a message that will prompt the operator to select a discrete state for the tag.

**(C) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the setting to be sent to the tag. The **Set** option turns the tag on; **Clear** turns the tag off; **Toggle** changes the tag to the opposite of its current state (from on to off, or from off to on); **Reverse** changes the tag's state to off when the mouse is clicked on the graphic object, and on when the mouse button is released; **Direct** changes the tag state to on when the mouse is clicked on the graphic object, and off when the mouse is released.

**(D) Prompted Data.** If Prompt for Data was selected Source (**B**), enter a message here that will prompt the operator to select a tag state. Two buttons will be displayed to the operator. Enter the labels for the Set Button and the Clear Button. The Set Button sends a discrete value to set the tag to the on state, and the Clear Button sends a discrete value to set the tag to the off state.

## Send String

Use this attribute to send a string to the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. Double-click Send String in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the string tag entered by the operator or configured in this dialog box.

**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the setting selected in Fixed Data (**C**) is sent to the tag. If you select Prompt for data, the field in Prompted Data (**D**) is activated and you can enter a message that will prompt the operator to enter a string to send to the tag.

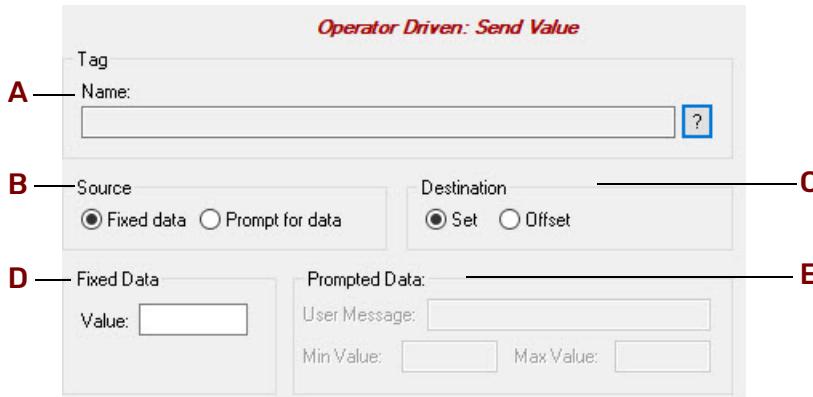
**(C) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the string to send to the tag.

**(D) Prompted Data.** If Prompt for Data was selected in Source (**B**), enter a message to prompt the operator to enter a string. Choose the Hide characters option if you don't want the text entered by the operator to be displayed.

## Send Value

Use this attribute to send a value to a tag name in the control engine when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

Double-click Send Value in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. This tag will receive the tag value entered by the operator or configured in this dialog box.

**(B) Source.** Select the source of the value to be sent to the tag. If you select Fixed data, the value entered in the Fixed Data field (**D**) is sent to the tag. If you select Prompt for data, the Prompted Data field (**E**) is activated and you can enter a message that will prompt the operator to input a value to send to the tag.

**(C) Destination.** Choose Set to assign the sent value to the tag, or choose Offset to add the value to the tag.

**(D) Fixed Data.** If Fixed Data was selected in Source (**B**), enter the value to send to the tag.

This value can be either a decimal or hexadecimal number. If entering a hexadecimal number, the number must be preceded by "0x" and contain no spaces (for example, "0x7FFFFFFF" and not "0x 7FFF FFFF").

**(E) Prompted Data.** If Prompt for Data was selected in Source (**B**), enter a message to prompt the operator for a value. Enter a minimum and maximum value the entered data should be within.

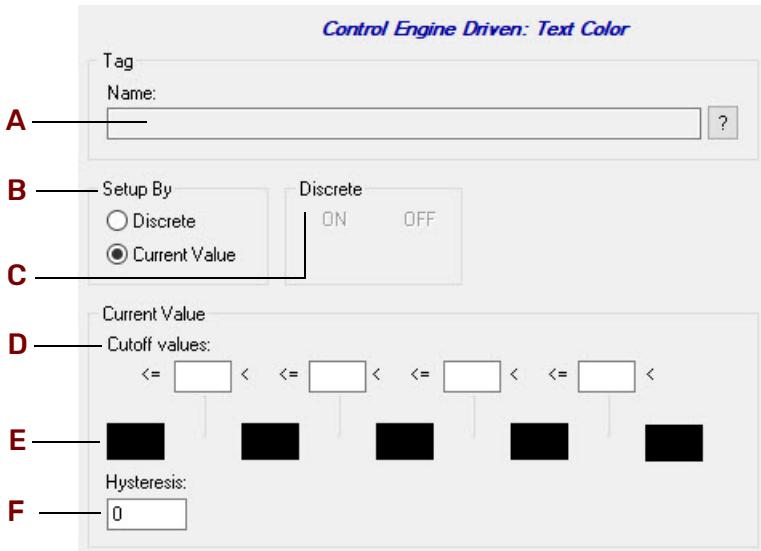
*IMPORTANT: If using hexadecimal numbers, enter a minimum number of 0x80000000 and a maximum number of 0x7FFFFFFF.*

### Text Color

Use this attribute to change the color of text in the interface based on a tag value from a control engine. This is a control engine-driven attribute and is available for grouped objects and text.

## AVAILABLE DYNAMIC ATTRIBUTES

Double-click Text Color in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag value changes in the PAC Control strategy, its value will determine the color you want.

**(B) Setup By.** Choose whether the tag you're configuring is a Discrete value (with a value of ON or OFF), or whether it's a Current Value you're looking for. For example, an integer will return a value of either ON or OFF, so you would choose Discrete. However, a chart will return the following three values: 1 = stopped, 2 = suspended, or 3 = running, so you would choose Current Value. To change chart states, use the following parameters: If you choose Discrete, the Discrete group (**C**) is highlighted; if you choose Current value, the Cutoff Values group (**D**) is highlighted.

**(C) Discrete.** Select the color you want for the ON state by clicking on the color field below ON. The Color dialog box appears; choose a color and click OK. Repeat this step for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value box to specify the range of values for each color group configured in the color fields. Values entered must be in increasing order. Each Cutoff value box must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value box requiring a value.

**(E) Color Fields.** To configure a color for the range set up in Cutoff Values (**D**), click on a color field. The Color dialog box appears from which you can choose a color and then click OK to accept. Repeat this step for each color field you want to change.

**(F) Hysteresis.** Enter a value to be applied to each cutoff value as it moves toward lesser values to determine the actual value at which the color will change to the next color field.

For example, let's say the cutoff values are 1, 10, 20, and 30, and the color fields are red, yellow, green, blue, and black. The hysteresis is 3. A tag with a value of 11 is read, corresponding to the color green. The next tag value read is 9. The graphic object's color remains green because the value read is within the hysteresis value of 3, even though a value of 9 is in the yellow range.

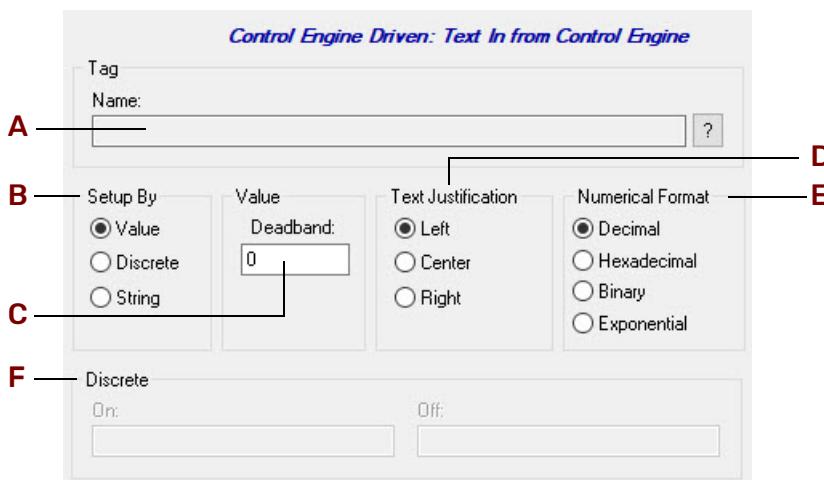
## Text In from Control Engine

Use this attribute to read a tag from a control engine and display various strings to the operator. You can read in a numeric value, a string, or a discrete value, and set up a string that will be displayed based on what was received. This is a control engine-driven attribute and is available for a text object.

A # sign in the text object indicates where the text string should be displayed. Only one # is needed to display an entire string. If there's no # sign within the text object, then the string will be appended to the end of the text object. You can configure how a floating point number is displayed by using a decimal point along with the # signs. For every decimal place you want displayed after a decimal point, use a # sign. For example, your text object could say: "Low level reading: ###.#." Your tag value is 200.55, so your displayed string is: "Low level reading: 200.6."

*NOTE: The extra # signs to the left of the decimal point aren't required, but are useful for determining how much space the text will require in your display.*

Double-click Text In (from control engine) in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object. The tagname you enter is affected by the setting for Setup By (**B**).

**(B) Setup By.** Choose whether the tag you're reading is a numeric value, a discrete value (with ON and OFF values), or a string. If you choose Value, the Deadband and Text Justification fields (**C** and **D**) are activated. If you choose Discrete, the Numerical Format group (**E**) is activated. The choice you make in this selection must match the choice you made in Name (**A**).

If you choose Value, the value read will be converted into a string based on the rules mentioned at the beginning of this "Text In" section.

If you choose Discrete, use Numerical Format group (**E**) to enter the strings that will be displayed for the ON and OFF states. If you choose String, the text string from the control engine is displayed.

**(C) Deadband.** If you selected Value in Setup By (**B**), enter the value to be added and subtracted from the previously read tag value to determine whether the new value is displayed.

**(D) Text Justification.** Select the format in which numeric values will be displayed: decimal, hexadecimal, binary, or exponential. Hexadecimal numbers are prefixed with "0X" and appear in uppercase letters. Float values may not be displayed as hexadecimal or binary.

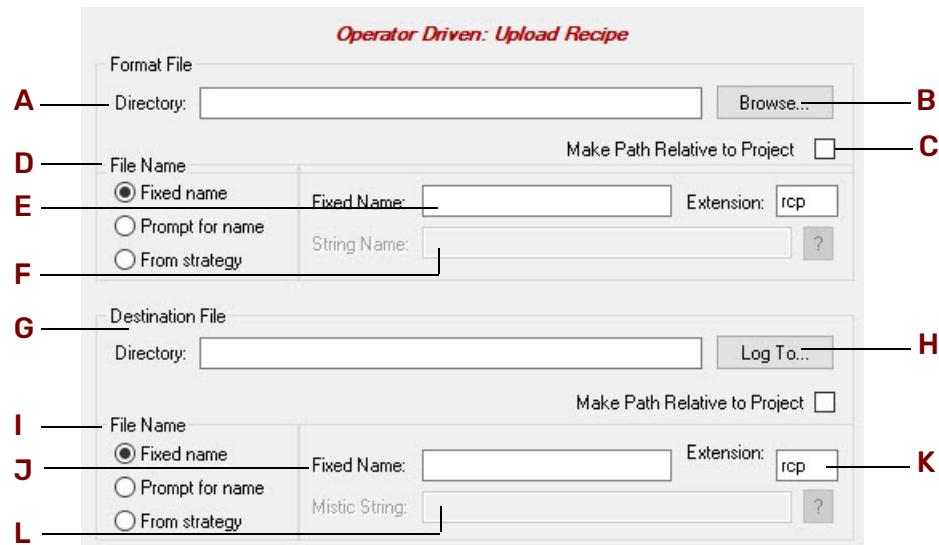
**(E) Numerical Format.** Select the text justification for the string from the control engine.

**(F) Discrete.** This section is highlighted if Discrete was chosen in Setup By **(B)**. Enter the string to be displayed if the tag's discrete value is ON, and enter the string to be displayed if the tag's discrete value is OFF.

### Upload Recipe

Use this attribute to upload a recipe file from a control engine when graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text. For more information about recipes, see ["on page 239](#).

Double-click Upload Recipe in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Enter the directory location of the recipe format file. Use the Browse button **B** to quickly select a directory name. The recipe format file is used to tell the control engine what data to read. Often, it's the original downloaded recipe. For example, the number of lines with data values represents how many values should be read from the control engine.

**(B) Browse.** Click to quickly find the recipe format file directory for **A**. The Select Format File Directory dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(C) Make Path Relative to Project.** When selected, if you copy the project and recipe format files to a different computer, PAC Display will look in the same relative location to find the recipe format files in Configurator and Runtime.

For example, if the project is saved in C:\proj\ and you configure recipes format files to be in C:\proj\recipes\, then the relative path would be this: .\recipes\

If you then saved the project to C:\temp\newproj\, PAC Display would look for recipe format files in the new location's relative path: C:\temp\newproj\recipes\

**(D) File Name.** Choose the source of the recipe format file name:

- If you choose Fixed name, the Fixed Name field (**E**) is highlighted.
- If Prompt for name is selected, the operator is prompted for the recipe format file name.
- If From strategy is selected, the String Name field (**F**) is highlighted.

**(E) Fixed Name.** If Fixed Name was selected in **D**, enter the name of the recipe format file located in directory **A**. Notice the file extension is .rcp.

**(F) String Name.** If From strategy was selected in **D**, use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name of type string that contains the recipe format file name.

**(G) Directory.** Enter the directory location of the recipe file that will receive the information. Use the button **(H)** to quickly enter a directory name.

**(H) (Basic only) Browse.** Click to quickly find the recipe file directory for **G**. The Select Destination File Directory dialog box appears. Use it to navigate to the desired directory and click OK when you're done.

**(H) (Pro only) Log To.** Click to select whether to log to an ASCII recipe file or to a database table. If you click Log File in the pop-up menu:

- Use the Browse for Folder dialog box to navigate to the desired directory, and then click OK.
- Use the Select Database Table dialog box to select the desired table, and then click OK. For more information about logging to a database table, see "[Configuring an ODBC Data Source](#)" on page 55.

**(I) File Name.** Choose the file name for the recipe data that will be read from the control engine.

- **Fixed Name**—Check this if the template file is a file name you want to configure at this time. If this option is selected, the File Name edit box appears, prompting you for a file name. Make sure the file exists in the Directory entry, otherwise an error is posted. The file name may not be changed at Runtime. The "Extension" parameter also appears and prompts for a one to three character long extension that's appended to the "Fixed Name". The extension must not contain a period or a DOS wild card character. The default extension is "rcp".
- **Prompt For Name**—Check this if the template file name is to be prompted at Runtime when the trigger occurs. If this option is selected, the Extension parameter also appears. Enter a one to three character long extension which does not contain a period or a DOS wild card. This extension is used as a filter to select which files are displayed when prompting a user for the recipe name at Runtime, however files with different extensions may be selected.
- **From Strategy**—Check this option if you want to use a string tag name from the control engine strategy to specify the template file name. If this option is selected, the String Name dialog box appears, prompting for the tag name you want to use. Use the "?" button to enter the tag name from the Tag Selection dialog box.

**(J) Fixed Name.** If Fixed Name was selected in **I**, enter the name of the file to receive the information. This file will be located in the Directory field **(G)**.

**(K) Extension.** Specify the file extension for the recipe files available to this dynamic attribute by entering the extension in the File Extension field. The extension must be one to three characters long and must not contain a period or DOS wild card characters.

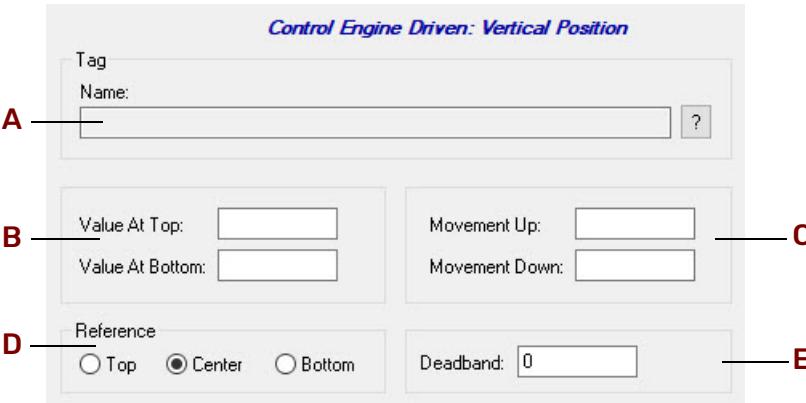
If Fixed Name is checked, this extension will append to the File Name entry to create the name for the recipe file. If Prompt For Name is checked, this extension will be used as a filter to select the files for display in a file selection dialog box when Runtime executes this dynamic attribute. However, you may override this filter if you wish to select a file with a different extension.

**(L) Mystic String.** If From strategy was selected in **I**, use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name of type string that contains the file name.

## Vertical Position

Use this attribute to adjust the vertical position of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons, polylines, curves, bitmaps, and text.

Double-click Vertical Position in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As the tag value changes, the graphic object's horizontal position is changed.

**(B) Value at Top/Bottom.** Enter the top and bottom values for the graphic object. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range such as 0 to 50.

**(C) Movement Up/Down.** Enter the maximum top and bottom movement the object can change. The movement units are in pixels. For example, if your bottom and top values are 0 and 100, your bottom and top movements are 0 and 200, and your point of reference (**D**) is from the bottom when the tag value is 50, the object will be moved 100 pixels from the bottom.

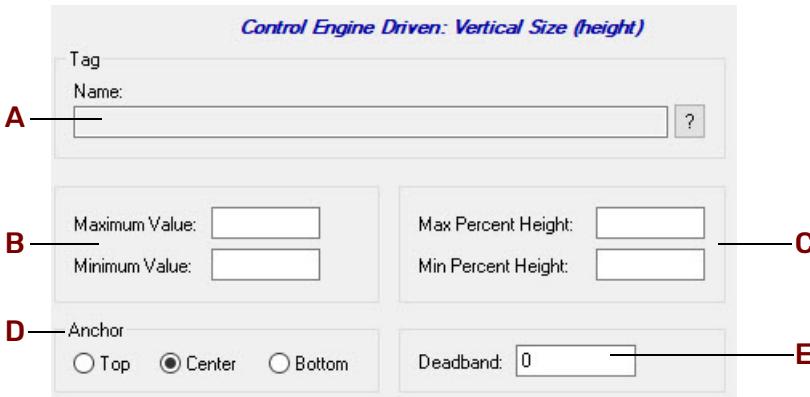
**(D) Reference.** Enter the reference point for the object. This is the reference point from which the object will move. The choices are top, center, and bottom. The Vertical Size (Height) dynamic attribute must also be configured in order for this option to affect the graphic object.

**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's position will actually change. Using our previous example in **C**, let's say the deadband is 5. A tag is read and has a value of 50. The next tag reading must be greater than 55 in order for the graphic object to move.

## Vertical Size (Height)

Use this attribute to change the height of a graphic object based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, and polygons.

Double-click Vertical Size in the Graphics Dynamic Attributes dialog box to display the following:



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object.

**(B) Maximum/Minimum Value.** Enter the maximum and minimum value for the tagname in **A**. For example, if you know your tag values will be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Max/Min Height.** Enter the maximum and minimum percentage the object can change. The percentage range is from 0 to 1,000. Suppose your minimum value is 0 and your maximum value is 10, and the minimum and maximum percentages range from 0 to 200. When the tag value is 10, the object will be twice as big as you've originally drawn it. When the tag value is 5, the object will be the same size you've drawn it, which is 100 percent.

**(D) Anchor.** Enter the anchor point from which the object will "grow." The choices are Top, Center, and Bottom. For example, if you want to create a bar that grows up from the bottom, select Bottom. If you want to create an object that grows both up and down from the center, select Center. An object with a Top anchor grows down from the top.

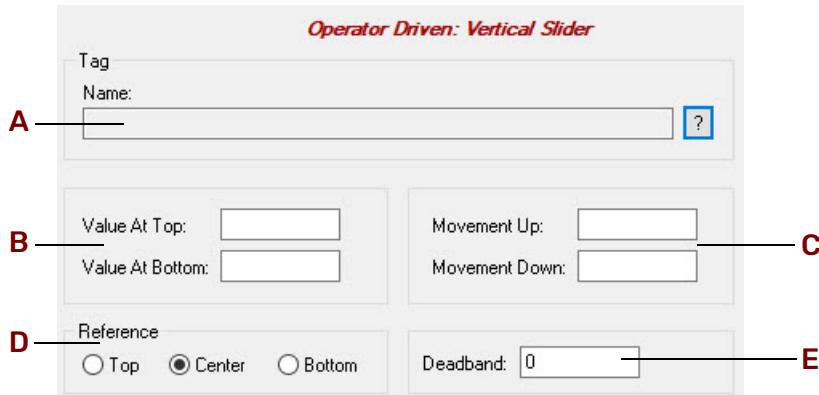
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's height will actually change. For example, let's say the values are 0 to 100, the percentages are 0 to 100, and the deadband is 5. A tag is read and has a value of 10. The next tag reading must be greater than 15 in order for the graphic object to change.

### Vertical Slider

Use this attribute to configure a vertical slider when a graphic object is clicked. This is an operator-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, and bitmaps.

## AVAILABLE DYNAMIC ATTRIBUTES

Double-click Vertical Slider in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. The amount of movement the vertical slider makes affects the value sent to the tag in the control engine.

**(B) Value at Top/Bottom.** Enter the top and bottom values for the tagname in **A**. For example, if you know your tag values can be from 0 to 100, you may wish to enter a range of 0 to 100 or a subset of this range, such as 0 to 50.

**(C) Movement Up/Down.** Enter the maximum top and bottom movement the object can change. The movement units are in pixels. This means if your bottom and top values are 0 and 100, and your bottom and top movements are 0 and 200, if you move the tag 100 pixels toward the bottom, the tag value sent will be 50.

**(D) Reference.** Select the reference point for the object. The choices are top, center, and bottom. Note that you must also separately configure the Vertical Size (Height) dynamic attribute to use this option.

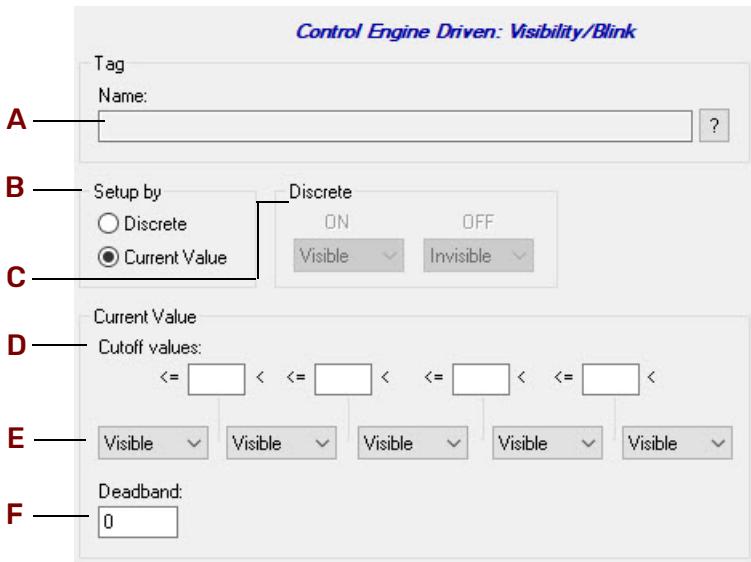
**(E) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the tag value should be changed.

Using our previous example in **C**, let's say the deadband is 5. A tag is written and has a value of 50. The next graphic object movement must be greater than 55 in order for the tag value to change.

## Visibility/Blink

Use this attribute to make a graphic object visible or invisible or to cause it to blink based on a tag value from the control engine. This is a control engine-driven attribute and is available for lines, rectangles, round rectangles, ellipses, polygons, polylines, curves, bitmaps, Windows button controls, and text.

Double-click Visibility/Blink in the Graphics Dynamic Attributes dialog box to display the following.



**(A) Name.** Use either Quick Tag Entry (see [page 74](#)) or the Tag Selection dialog box (see [page 75](#)) to select a PAC Control tag name. As this tag changes value in the PAC Control strategy, its value will determine the effects on the graphic object.

**(B) Setup By.** Choose whether the tag you're configuring is a discrete value (with ON and OFF values), or whether it's a current value you're looking for. If you choose Discrete, the **C** group is highlighted; if you choose Current value, the **D** group is highlighted. The choice you make in this selection must match the tag choices you made in the Name field (**A**).

**(C) Discrete.** Select the visibility state you want for the ON state from the drop-down list options. Your choices are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. In the same manner, choose the visibility state for the OFF state.

**(D) Cutoff Values.** Enter a value in each Cutoff Value field to specify the range of values for each visibility group configured in the visibility fields. Values entered must be in increasing order. Each Cutoff Value field must have a numeric value entered or you will get a warning to enter one. After the warning, the cursor blinks in the first Cutoff Value field requiring a value.

**(E) Visibility.** To configure a visibility state for the ranges set up in Cutoff Values (**D**), click a visibility field's drop-down button. Your choices are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. In the same manner, choose the visibility state for each range of values.

**(F) Deadband.** Enter a value to be added and subtracted from the previously read tag value to determine whether the graphic object's visibility will actually change.

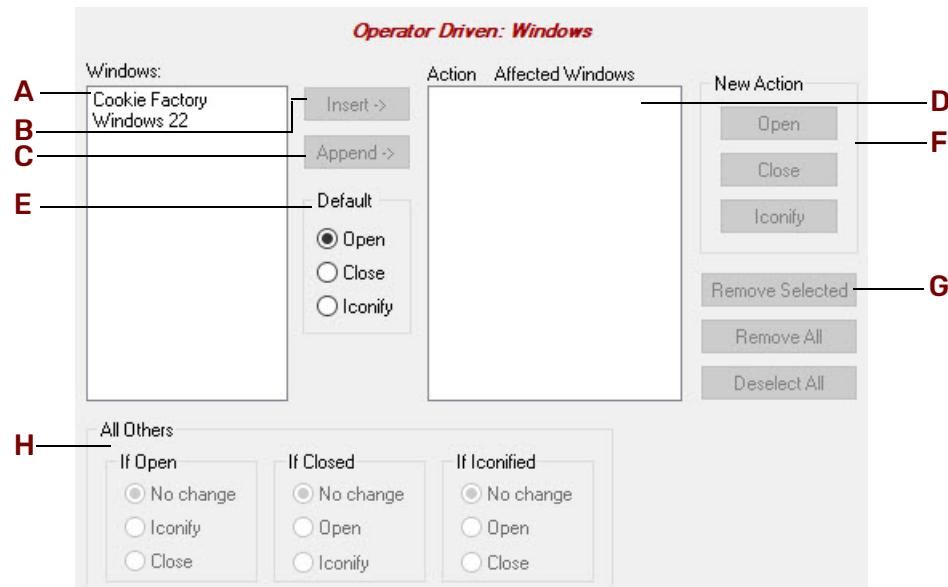
For example, let's say the Cutoff values are 1, 10, 20, and 30, and the visibility fields are Invisible, Visible, Slow Blink, Med. Blink, and Fast Blink. The Deadband is 2. A tag is read with a value of 10. The next value read must be greater than 12 in order for the graphic object to change.

## Windows

Use the Windows attribute to change window states when a graphic object is clicked. This is an operator-driven attribute and is available for rectangles, round rectangles, ellipses, polygons, bitmaps, and text.

## AVAILABLE DYNAMIC ATTRIBUTES

In the Graphic Dynamic Attributes dialog box, click Windows (in the Operator Driven list) to display its features.



**(A) Windows.** Initially, this list shows all the windows available for the project. Select the window that has the window state you want to change. You can also select more than one window by using a couple of key combinations. One way is to select a window, press Shift, and then click on another window name in the list. This selects all the windows in between the two window names. Another way is to select a window name, press the Ctrl key, and click on each window name you want selected.

**(B) Insert.** Use to insert the selected window(s) in Action/Affected Windows (**D**). The window name will be inserted above the highlighted window(s) in (**A**).

**(C) Append.** Use to add the selected window(s) to the bottom of the window list in Action/Affected Windows (**D**). The window name will be inserted after the last window in Action/Affected Windows (**D**).

**(D) Action/Affected Windows.** Lists the windows and what window state they will go to when the graphic object is clicked.

**(E) Default.** Use this group as a handy window state assignment key for the windows you've highlighted in (**A**). When the windows are copied over to Action/Affected Windows (**D**), you will see they all have the default window state you've assigned. The window state choices are Open, Close, and Iconify.

**(F) New Action.** Use this group to change any window states listed in Action/Affected Windows (**D**). Highlight one or more windows and select the new window state action. Your choices are Open, Close, and Iconify.

**(G) Remove/Deselect.** Use this group to modify the window name list in Action/Affected Windows (**D**). The Remove Selected option removes only those windows you've highlighted; the Remove All option removes all windows from the list; and the Deselect All option deselects and quickly unhighlights all window names.

**(H) All Others.** For all windows left in (**A**), use this grouping to affect their window states. For example, if a window state is open and the graphic object is clicked, the window state can stay the same, be iconified, or be closed. Likewise, you can alter the window states of closed and iconified windows.

## COPYING AND DELETING DYNAMIC ATTRIBUTES

Once a dynamic attribute has been added to an on-screen graphic object, you can easily assign those attributes to other objects using copy and paste. You can also quickly delete all dynamic attributes from a graphic object.

### Copying Dynamic Attributes from a Graphic Object

To copy a set of dynamic attributes from one graphic object to another:

1. With the Select tool , click the graphic object whose dynamic attributes you want to copy.
2. Choose Edit > Copy Dynamic Attributes (or use Shift+Ctrl+C) to copy the attributes to the Windows clipboard.

Another way you can do this is to right-click the graphic object and click Dynamic Attributes > Copy.

You can now assign these dynamic attributes to another graphic object using Edit > Paste Dynamic Attributes.

### Pasting Dynamic Attributes to a Graphic Object

To paste dynamic attributes that were copied to the Windows clipboard:

1. With the Select tool , choose one or more graphic objects to which you want to paste the dynamic attributes.
2. Choose Edit > Paste Dynamic Attributes, and then do one of the following:
  - To delete any existing dynamic attributes the graphic object may already have, choose Delete Existing.
  - To add the copied attributes to existing attributes and replace any that might be of the same type, select Replace Duplicates.
  - To add the attribute to existing attributes and not change any attributes that might be of the same type, select Ignore Duplicates.

You can also perform these tasks by right-clicking the graphic object and selecting the paste option from Dynamic Attributes > Paste.

### Deleting Dynamic Attributes from a Graphic Object

To delete all dynamic attributes from a graphic object:

1. With the Select tool , choose one or more graphic objects that have dynamic attributes you want to delete.
2. Choose Edit > Delete Dynamic Attributes.

Another way you can do this is to right-click the graphic object and click Dynamic Attributes > Delete Existing from the pop-up menu.

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