PI WebParts 2010 R2

User Guide

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PI Web Parts 2010 User Guide

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Chapter 1

Introduction to PI WebParts

PI WebParts is a web-based server product that allows users to create, customize and deploy continuously updated views of PI and non-PI data using the Internet Explorer web browser.

PI WebParts is comprised of single-purpose visual components that can be customized and added to web pages. You can:

- Add and remove web parts from pages
- Rearrange web parts on a page
- Modify web part look-and-feel and the display of data
- Link web parts to PI and other data sources
- Connect web parts and pass data among them

PI WebParts are deployed within a framework that includes PI Data Services and SharePoint.

- PI Data Services provide data to web parts from a variety of data sources, including PI, relational databases, and web services.
- *Microsoft SharePoint technologies* (page 7) provide user and directory services, web part pages, and connectivity between web parts.

About PI

PI WebParts retrieves and displays data from PI Data Services, which supports connections to many different data sources. These data sources will include data from your PI System infrastructure and other systems that support different business functions and provide access to diverse information.

You will likely work with PI data stored in:

AF Server

An AF Server is a repository of PI System data. It includes at least one logical PI Server or collective. An AF Server can contain AF and PI Notifications databases. AF provides a rich metadata reference for PI Server data that uses AF Elements and AF Attributes to reference tags from a PI Server or data from other non-PI sources.

PI Module Database objects must be migrated to an AF 2.0 or higher database in order to use web part pages containing asset references.

PI WebParts automatically converts modules, module contexts, aliases and properties to their AF equivalent elements and attributes.

Note: As of version 3.0, PI WebParts supports AF databases and references, but not PI Notifications.

PI Server

The PI Server version 3.4.380 and higher introduces a new security scheme and integration with AF Servers, which provide a rich metadata layer for PI Server data. AF Elements and Attributes can reference PI points as well as data from relational, web service and other sources.

You can reference PI point data directly from the PI Server using tags.

For individual web parts to display data from PI, you will typically use these items to specify the information you want to see:

AF Attributes

An AF Attribute is a reference to a data source or stream that is stored in an AF database. An attribute can reference a PI Server tag or data from a relational database or other source, including non-PI data.

Only AF Attributes defined as constant values or PI point references are supported in PI WebParts.

Conceptually, an AF Attribute replaces the PI Aliases and PI Properties formerly used in the PI Module Database. You can add PI Attributes as **Selected Data** to a web part along with tags, datasets, web part connections or query parameters.

AF Attributes are children of AF Elements. A key component of an AF Attribute is its context path. You can change a context path to allow data from multiple elements to be viewed in the same context. See *AF 2010 User's Guide* for more information about AF.

A web part treats an attribute as a parameter. The web part resolves the attribute as a value only through a query containing the full context path to the attribute. Attribute names are displayed in the legend of a web part, while tooltips contain the full path to the attribute in the AF database.

PI Tags

A PI Server tag is a name reference to a PI point data stream stored in a PI Server archive. A PI point represents a single measurement or calculation thereof, and consists of value/timestamp pairs and associated attributes.

Tags may be added as Selected Data to a web part along with attributes, dataset columns, web part connections or query parameters.

In the larger picture, you can think of the functions different types of data perform. In PI WebParts, you work with different types of data:

Time Series Data

PI Server data is collected and stored in the form of points, each of which represents a time-series data stream from a particular source, such as a temperature or pressure sensor. A tag is a reference name for a PI point.

Calculated Data

Statistical calculations provide another way to view time series data. Averages, High and Low values and measures of variance all provide critical information about data events over a period of time.

Contextual Data

Contextual data is metadata that describes PI points, their properties, and their business use. When linked to certain PI WebParts, this information can make data and its presentation more logical and accessible to the user community. A PI point tag name is contextual data.

PI points also have various configurable properties associated with the data stream, called point attributes. However, this information is presented largely in language relevant to data processing, not in measurements or standard business terms that are easily accessible to users outside the IT department.

Most contextual data for PI resides in AF databases, which can provide a contextual representation of all data used in your PI System. AF Attributes can reference PI points and attributes or data in other systems, including relational databases and web services.

Client System Requirements

PI WebParts pages are designed to function as thin clients in a browser window. Most processing occurs on the web server to allow minimal client-side system requirements.

The only absolute requirement for viewing a PI WebParts page is Microsoft Internet Explorer (IE) 6 or later with the latest Service Packs. However, certain Web Parts require the following additional software installation on client computers:

Web Part	Requires	Reason
PI ActiveView	PI ActiveView	PI ActiveView 2.2 or higher is required to render all features of PI ProcessBook display (.pdi) files. Version 3.2 or higher is required to display ERDs created in PI ProcessBook 3.2
PI Gauge PI Graphic PI Trend PI XYPlot	Adobe SVG Viewer	Adobe SVG Viewer version 3.0 is required to render web part content in Scalable Vector Graphics (SVG) format. You can download the viewer from the *Adobe SVG Viewer* (*http://www.adobe.com/svg/viewer/install*) site. Note that you must be an Administrator on the client machine to successfully install the viewer.
PI ActiveView PI Graphic	PI ProcessBook	▪ PI ProcessBook 3.0 or greater is required to use the Launch in PI ProcessBook command. ▪ PI ProcessBook 3.2 is required to create and save element-relative displays using PI Attributes.

Web Part	Requires	Reason
PI Messenger	▪ Microsoft Office 2003 or higher ▪ Outlook XP, or 2003 Address Book Control ▪ Windows Messenger, Windows Live Messenger, MSN Messenger, or MS Office Communicator	Office components are required to access presence information and select contacts from the Outlook Address Book. Either Outlook XP or the separately-installed Outlook 2003 Address Book Control is required. One of the specified IM clients is required to enable instant messaging from PI Messenger.
PI BatchTable PI Table PI TimeSeries PI Trend PI Values	Microsoft Excel	Microsoft Excel XP or higher is required for the Export to Excel > Open function, which launches a separate Excel process on the client. **Note** that Excel is not required to export web part data and save to an .xml file.

Internet Explorer Security Settings

Internet Explorer security settings prevent the browser from accessing potentially insecure sites and applets.

To set a browser security level in Internet Explorer:

- Choose **Tools** > **Internet Options** and click the **Security** tab. Then select a web content Zone and use the slider to set a security level.

In general, a **Medium** browser security setting applied to the Zone associated with your PI WebParts server is sufficient.

If the Medium setting is not permitted for the zone associated with PI WebParts server, you can click **Custom Level** and set each of the following individual settings to **Enabled**:

- Run ActiveX controls and plug-ins
- Script ActiveX controls marked safe for scripting
- Active Scripting
- Binary and script behaviors
- Automatic Prompting for file downloads
- File download
- Allow script-initiated windows without size or position constraints (Internet Explorer)
- Drag and drop or copy and paste files (Internet Explorer 7 and later)

and the following to **Disabled**:

- Use Pop-up Blocker (Internet Explorer 7 and later)

If necessary, the SharePoint site can be added to the **Trusted Sites** zone so that custom security settings are not applied to other web sites in the same zone.

About this Document

The *PI WebParts User Guide* is structured in two parts. The initial chapters focus on the Windows SharePoint environment used to create web part pages, and general functions that apply to all web parts, including web part configuration and SharePoint connections. Later chapters cover each of the PI WebParts in turn, and describe the individual functionality and features specific to the web part.

The following are key sections:

- *About PI* (page 1) provides an overview of the PI System infrastructure and data used with PI Web Parts.
- *PI WebParts Requirements* (page 3) describes additional software that may be required on client systems using PI WebParts.
- *Working in SharePoint* (page 7) explains the basics of creating and navigating web part pages in Microsoft SharePoint.
- *Working with Web Parts* (page 9) explains how to add web parts to pages.
- *Configure a Web Part* (page 17) explains how to customize a web part for use in a page.
- *Connect Web Parts* (page 33) explains how to connect web parts to share information.
- Individual web part sections describe each web part in detail.

Note: This guide does not include installation or administration information for PI WebParts. For installation and administration information, refer to the *PI WebParts Administrator Guide*. For information about configuring data sources for PI WebParts, refer to the *PI Data Services Administrator Guide*.

Chapter 2

Working in SharePoint

PI WebParts uses the Microsoft SharePoint technologies as a framework for building portal sites and web pages with embedded web parts.

SharePoint is a web-based collaborative architecture that allows users to create customized sites and pages that include web parts, documents, links, feeds and other related content.

Refer to the Release Notes for the specific versions of SharePoint supported.

Visit the *Microsoft SharePoint Products and Technologies* (*http://www.microsoft.com/sharepoint*) website for more information about SharePoint.

Configure Your Locale

The SharePoint locale setting determines the default Windows Short Date and Time formats used for SharePoint pages, including web part pages. For example, European locales typically use `dd-mm-yy` short date formats, and Asian locales use `yy-mm-dd`, while the United States uses `mm-dd-yy` format.

Generally you can accept and use the default *SharePoint Locale* (page 8) setting. If necessary, you can set a locale for your own user account. Whenever you log on and view SharePoint pages, your personal locale is then used to determine appropriate formats.

To set or verify SharePoint default date and time formats:

1. In the upper-right corner of the page select **My Settings** from the menu.

   Your User Information page appears.

2. Click **My Regional Settings** to display your **Regional Settings** page.

3. Clear the **Follow Web Settings** checkbox.

   If you leave the box checked, default settings inherited from SharePoint are used to determine the locale.

4. Adjust the **Locale**, or customize **Time Zone**, **Time Format** and other settings on this page to match your locale, and click **OK**.

Note: If SharePoint Regional Settings conflict with web server or client settings, SharePoint's formats override the other formats. The exception is PI ActiveView, which interprets time strings (displayed in trend symbols or input through PI TimeRange) according to the client time zone setting. If the time zone differs on the client computer, PI ActiveView displays a different time context from other web parts.

SharePoint Regional Settings do not display the Short Date format in use, based on the locale. You can look up the same locale in Windows Regional Settings to see the associated Short Date format:

1. If you are unsure of the Short Date format SharePoint is using, choose **Start > Control Panel > Regional and Language Options**. The **Windows Regional and Language Options** dialog appears.

   Note: on Windows Server 2008, the menu path is **Start > Control Panel > Clock, Language and Region > Change the date, time or number format**.

2. Choose the locale that matches your SharePoint server from the drop menu. The sample fields are updated to reflect formats used by Windows for the locale.
3. Note the **Time** and **Short Date** formats.
4. Click **Cancel** to exit the dialog box without changing the locale setting.

Configure the Default Locale for a SharePoint Site

To set the default locale for Microsoft SharePoint:

1. In SharePoint, choose **Site Actions > Site Settings**.
2. Under **Site Administration**, click **Regional Settings** to verify or change locale settings.

   You can change the **Locale**, or customize **Time Zone**, **Time Format** and other settings on this page, dependent on the locale you select.

Chapter 3

Working with Web Parts

This section discusses tasks that are *common* to most PI WebParts. For example, the process of adding a web part to a page is the same for all web parts, as is configuring certain format and display properties. Similarly, the tool for selecting web part data and the process for connecting web parts are the same for all web parts.

Some tasks and tools that you need when you work with PI WebParts are specific to a particular web part. Web part-specific information is covered in corresponding web part sections.

Select and Add a Web Part

A web part page is created by adding web parts to zones on a web part page. You can browse available web parts, search for a specific part, or import an existing, saved web part when adding web parts to a page.

To add a web part to a page:

1. Open a web part page in your web browser.
2. Click **Site Actions > Edit Page**.
3. Click **Add a Web Part** in the page zone where you want to add a web part.
4. Scroll through the list of available web parts to find the web parts you want to add to the zone.
5. Select the desired web part.
6. Click **Add** to add it to the web part page.

   You can only add one instance of each part at a time.

Export and Import a Web Part

You can export a customized web part for re-use. Exported web parts are saved in .dwp format.

When you want to use an exported web part on a page, just import the saved .dwp file directly to the page. The web part retains any customization made on the original, and you can make any additional changes you like.

Note: A web part may rely on connections from other web parts that are not present on the new web part instance. You may need to change or reconnect these items before an imported web part works properly.

To export a web part:

1. Click **Site Actions > Edit Page**.
2. On the web part that you want to export, click t**he Edit button > Export...**. A **File Download** dialog prompts you to save the exported web part file.
3. Click **Save**, specify a directory location, and save the file.

Minimize or Remove a Web Part

You can close or remove a web part from the page. A closed web part is removed from its page zone but remains available as configured. A deleted web part is permanently removed from the page zone.

First enter page edit mode:

- Click **Site Actions > Edit Page**.

To minimize a web part:

- Click the **Edit button > Minimize**. Repeat the procedure and choose **Restore** to return to the full-size display.

To close a web part:

- Click the **Edit button > Close**. You can add the configured web part from the **Add Web Parts** dialog box to return it to the display.

To remove a web part:

- While in **Edit** mode, click the **Edit button > Delete**. The web part is removed from the page zone. To restore the web part to the page, you must add it again.

Print Web Parts

You can print the contents of PI Batch Table, PI Gauge, PI Graphic, PI Table, PI TimeSeries, PI Values, PI Trend and PI XYPlot web parts without printing other web part page content. To print a web part:

- Click the arrow at the upper right corner of the web part and choose **Print**.

Printing in PI WebParts otherwise relies on Internet Explorer's print functions. You can print an entire page, or print content selected within a web part using the **Page Range > Selected** function in Internet Explorer's Print dialog box.

You can print trends and SVG views easily from the windows used to display them. The Internet Explorer printing add-ins mentioned below are helpful to fit these images to page size, but you can also resize the browser window to approximate page dimensions for similar

quality. When you are ready to print, press Ctrl-P to set print options (landscape is recommended for trends and SVG views) and print the trend or SVG.

Add-ins

Fitted/fixed width printing add-ins can improve Internet Explorer printing functionality by scaling the image in the browser window to fit the printed page. Add-ins are available on the web, and allow you to print directly from the Internet Explorer toolbar.

Print Screen

Another option is to use the Print Screen function on your keyboard to save the screen display to the clipboard, and then paste the clipboard image into a graphics program that can be used to edit, crop or resize the image before printing. You can also copy an ad hoc SVG view launched from a web part in the same manner.

Extensions and Related Applications

You can view and output data using other tools and formats supported by PI WebParts.

Ad Hoc Trends

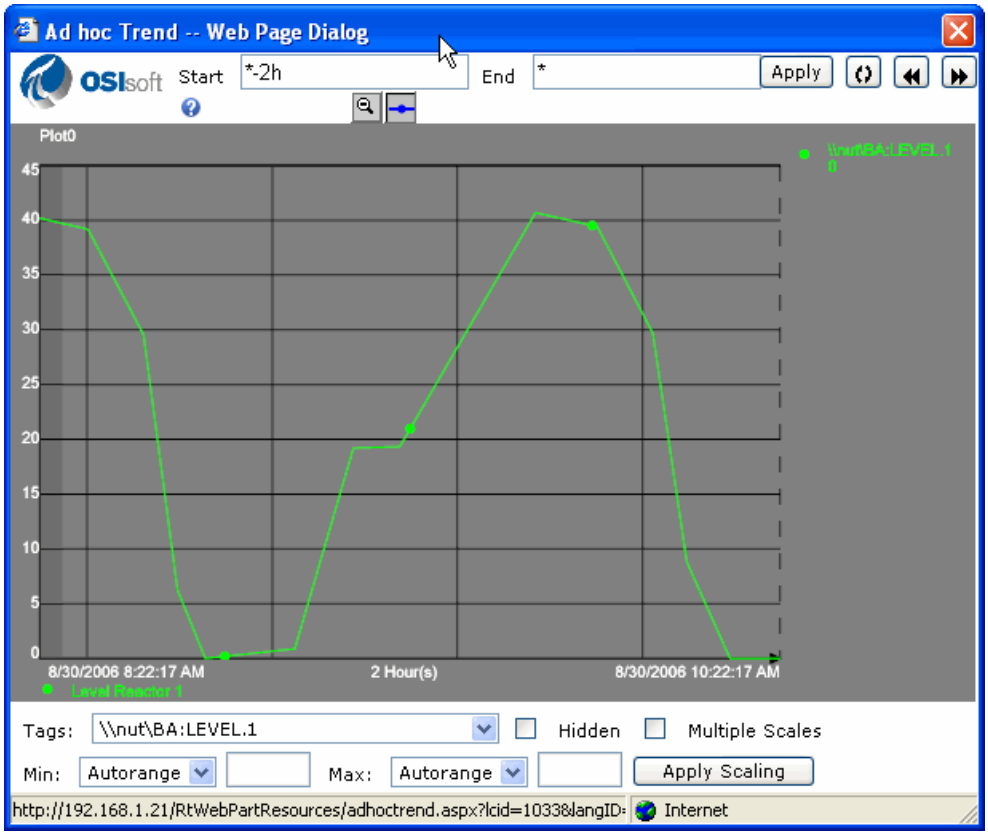
Trends help you visualize and provide context to individual data values by tracking the behavior of a point value over a period of time. You can create ad hoc trends of data from most web parts. Ad hoc Trends update in real time and support many of the same features as the *PI Trend* (page 81) web part.

You can view trends using menu commands, by clicking in a column with Ad hoc Trend behavior in a PI Table web part, or by clicking a data-driven element embedded in a web part, such as a value, bar or trend symbol within a PI Graphic display. You can also launch a trend in a *browser window* (page 13) using URL parameters.

Use one of two methods to display a trend:

- Click the **Edit button > Ad hoc Trend**.
- Right-click inside a web part, and then choose **Ad hoc Trend** from the context menu.

Note: Ad hoc Trends can be generated at any time, but are temporary and cannot be saved. Use the PI Trend web part to create an embedded trend in a web part page.



The trend appears in a new window with controls that allow you to scroll the time range and scale the trend plot. The time range of the parent web part is used to determine the initial time range of the trend plot.

Use the following controls to customize the trend:

Time Controls

Use the following tools to set or adjust the time range:

- Enter a value in the Start field to specify the start of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Enter a value in the End field to specify the end of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Click **Apply** to apply updated time values.
- Click the **Revert** button to restore default start and end time values.
- Click the **Scroll Back/Scroll Forward** buttons to adjust **Start** and **End** times backward or forward by the amount of the current interval duration. If the Start and End values are relative times in PI format, scrolling converts the values to absolute times.

Display Controls

Use the following tools to set display options:

- You can click and drag the mouse in the trend display to zoom in on an area. Click the Revert  icon to restore the original view, or right-click and select **Undo Zoom** from the context menu.
- Click the Data Markers  icon to add plot point data markers to traces.
- Right-click and select Add Cursor to add a trend cursor, or click the Y axis and drag a new cursor into the display. Select Remove All Cursors to clear cursors from the trend. Use arrow keys to move a selected cursor left or right in the display.

Note: Data updates are suspended while cursors appear, or the display is zoomed.

Data Controls

Use the following tools to control the data used and how it is displayed:

- Choose a tag or dataset column from the **Tags** menu to apply scaling options.
- Click **Hidden** to remove a trace selected in the Tags drop-down list from the display, cursors, tooltips, and the legend. Restore the trace by clearing the check box.
- Use Min and Max Scale Range tools to constrain the values scale.
- Check **Multiple Scales** to display separate value scales for each trace.
- Click **Apply Scaling** to apply scaling changes to the trend.

Open a Trend in a Browser Window

You can also open an ad hoc trend in a browser window using a URL and parameters that specify the Start Time, End Time, and one or more PI tags.

A single trend is displayed in a separate window with specified PI tags. The trend includes the same time, display and data controls that appear in the *Ad Hoc Trend Window* (page 11).

A predefined URL is required to launch the trend browser window:

```
http://<webserver>/RtWebPartResources/adhoctrendUrl.aspx
```

The specific querystring parameters supported are:

- **StartTime** - the start time of the trend.
- **EndTime** - the end time of the trend.
- **Data** - a list of one or more concatenated PI tags or AF Attribute paths in the form:
  `\\<PI Server Name>\<Tag Name> or \\<AF Server Name>\<AF Database>\<AF Element1-n>|<AF Attribute1-n>`

Note: Both Start and End Times can be in UTC seconds format, or any of the other time formats supported by PI WebParts.

A PI server must be specified for each tag (relative tag names are not accepted). An AF Server and AF Database must be specified for each attribute. Each double backslash represents the start of a new tag or Attribute path string.

All parameter values must be URL-encoded to prevent ambiguity when special characters appear in PI tag names or in timestamp values.

Some examples of valid URL querystrings are:

```
http://piwpservername/RtWebPartResources/adhoctrendUrl.aspx?Start
Time=1171852036.9999&EndTime=1171859205&Data=\\piserver\cdt158\\p
iserver\sinusoid
http://piwpservername/RtWebPartResources/adhoctrendUrl.aspx?Start
Time=02/18/2007%2011:35:44am&EndTime=02/18/2007%201:50pm&Data=\\p
iserver\test%23pound\\piserver2\sinusoid\\Sea%20Temperature
http://piwpservername/RtWebPartResources/adhoctrendUrl.aspx?Start
Time=Monday&EndTime=Monday%2B1d&Data=\\piserver\test%23pound\\sin
usoid\\piserverw\Sea%20Temperature
```

In the above examples, the actual names of two PI Tags are `\\piserver\test#pound` and `\\piserver2\Sea Temperature`. The tag names are URL-encoded to produce parameter values `test%23pound` and `Sea%20Temperature`. An end time string containing the plus sign (+) is also URL-encoded, resulting in `Monday%2B1d`.

Browser-based trends are loaded outside of the context of a SharePoint site, and use local web server time zone settings instead of the SharePoint time zone when interpreting and formatting Start and End Time values. If invalid parameter values are passed in the querystring (for example, unsupported time formats or PI Server or Tag names that are not accessible to the web server), an error message is displayed in the resulting trend. If an End Time is not provided in the querystring, the present time (*) is assumed.

PI ProcessBook Displays

You can use either *PI ActiveView* (page 39) or *PI Graphic* (page 55) web parts to add PI ProcessBook displays to a web part page. There are advantages to each approach:

- PI ActiveView web parts support ProcessBook displays in native (.pdi) format. ProcessBook displays are fully functional in PI ActiveView, but installation of PI ActiveView is required on all client computers that view the page.
- PI Graphic web parts support ProcessBook displays saved in Scalable Vector Graphics format as .svg files. This method supports all ProcessBook symbols, but does not support ActiveX or VBA components, including symbols such as PI BatchView or the PI SQC add-in that may be used in an active ProcessBook display. The *Adobe SVG viewer* (*http://www.adobe.com/svg/viewer/install/main.html*) must be installed on the client as well.

Generally speaking, the PI ActiveView web part requires more resources on your client computer, but allows you to see fully-animated ActiveX controls, Batch symbols, SQC symbols, or VBA script components.

Note: You can also open ProcessBook display (.pdi) or graphic (.svg) files *directly in PI ProcessBook* (page 15) if the application is installed on the local client computer.

PI ProcessBook Storage

PI ProcessBook files for PI Graphic and PI ActiveView can be stored in any network location accessible to the SharePoint server. This includes a SharePoint document library, a file directory on the SharePoint server, or a network file share users are authorized to access.

You may want to save .pdi and .svg versions of PI ProcessBook displays where they are directly accessible to web part pages, such as a Document Library on the SharePoint server. Be sure to copy all graphic files associated with these documents to the same location. See the Microsoft SharePoint web site for information on creating and managing Collaborative File Stores.

Launch in PI ProcessBook

PI ProcessBook files can be incorporated into web part pages using *PI Graphic and PI ActiveView* (page 14) web parts. You can also open and edit ProcessBook display (.pdi) or graphic (.svg) files directly in PI ProcessBook if ProcessBook is installed on the local client computer. If the user has permissions to *SharePoint directories* (page 15), edits can be saved directly to the location where display files are stored, such as SharePoint document libraries.

To open a display in ProcessBook:

- When viewing a display in PI ActiveView or PI Graphic, click the **Edit button > Launch in PI ProcessBook**.

Note: A display file must already be open in the web part in order to launch that file in PI ProcessBook.

Export Data to Excel

Use the Export to Excel command to send data from a web part to a file that can be opened in Microsoft Excel.

You can export data from PI BatchTable, PI Table, PI TimeSeries, PI Trend and PI Values web parts to Microsoft Excel. If PI DataLink is installed on the client computer, the results of the export can easily be used in DataLink formulas.

Note: Microsoft Excel is not required on the client computer to save data to Excel file format, but is required to open export files in Excel.

To export data to Microsoft Excel:

1. Click **Site Actions > Edit Page**.
2. Click the **Edit button > Export to Excel**, and then choose **Open** to open Excel and display the data, or **Save** to save the data to an .xml file on your computer.

Chapter 4

Configure a Web Part

When you configure PI WebParts, you supply information used by each web part to acquire data. You also determine the time range of data that should be displayed, and how the web part behaves and interacts with other web parts. You can also specify custom formatting to change the appearance of a web part to better reflect your needs and business purposes.

To configure a web part:

1. Click **Site Actions > Edit Page**.
2. Click the **Edit button > Edit Web Part**. The tool pane opens on the right side of the web part page.

To save your changes:

- Click **Apply** to apply any changes and reload the web part page, leaving the tool pane open.

  Applied changes allow you to review the appearance of the web part in the page and make additional changes without closing the tool pane. The changes are saved when you click Apply, so using Cancel does not discard them.
- Click **OK** to apply any changes and reload the web part page, closing the tool pane.

Note: You cannot undo changes once they are applied, except by going back to reverse each change.

Web Part Tool Panes

Web parts are configured using the tool pane, which differs depending on the web part. A web part tool pane is divided into several tool parts, each representing a category of customization settings for the web part.

Standard tool parts govern the basic display properties of the web part. These tool parts are the same for all web parts, even those that are not PI WebParts:

- Appearance
- Layout
- Advanced

Note: See your Microsoft SharePoint documentation for more information on these standard tool parts.

The following tool parts are usually the same or very similar for all PI WebParts that use them:

- *Time Range* (page 18)
- *Selected Data* (page 19)
- *Table Columns* (page 27)

Some web parts also have specific tool parts that are not used for other web parts. These sections are described under the configuration settings for each individual web part in later chapters.

You can easily modify configuration settings for a web part at any time, and even save your changes for re-use in different pages by *exporting* (page 9) web parts.

Time Range Properties

The **Time Range** tool part is common to most PI WebParts, and controls the default time range and update frequency for data supplied to the web part.

If you use *PI TimeRange* (page 65) to set time ranges implicitly or explicitly for web parts on the page, the Start and End Time tool part settings for the web part have no effect.

Times can be expressed using PI time or the Windows Short Date and Time formats associated with your SharePoint Web site locale.

Use the following tools to set the time range:

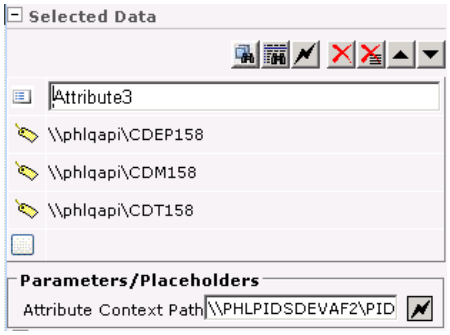
- In the Start Time field, enter the start of the time range used by the web part, expressed in PI time format or the Windows Short Date and Time format associated with the SharePoint Web site locale. The default value is *-2h, or two hours before the present time.
- In the End Time field, enter the end of the time range used by the web part, expressed in PI time format or the Windows Short Date and Time format Associated with SharePoint Web site locale. The default value is *, or the present time.
- Click the Connections button next to a field to create an *explicit connection* (page 66) to another web part, such as a PI TimeRange web part, in order to receive or send time range values.

  When an explicit connection is made, the consuming web part no longer receives implicit time range changes from the PI TimeRange web parts on the page. Only the explicitly-connected provider web part affects the time range for the consuming web part.
- Select **update every ## seconds** to feed updated data to the web part. Enter a value for the number of seconds between requests for updated data. The default value is 15.

Note: If you set or scroll a time range using PI TimeRange, data updates may stop. Only web parts with an effective End Time of * or *+n (where n is a time increment) receive updated data automatically.

Selected Data Properties

The **Selected Data** tool part enables you to choose and configure the sources of data used by a web part, most commonly AF Attributes, PI tags or datasets.



The Selected Data tool part is common to most PI WebParts, with the following exceptions:

- The PI Table and PI Messenger web parts provide access to datasets, but not PI tags or attributes in the Selected Data tool part.
- The PI ActiveView, PI Graphic, PI BatchTable, PI TimeRange, and PI TreeView web parts do not have Selected Data tool parts.

You can Add Data Items and specify other properties using the following elements in the Selected Data tool part:

- *Selected Data Table* (page 24)
- *Replace Ad Hoc Traces* (page 25)
- *Parameters and Placeholders* (page 25)

Add Data Items

For most web parts, you can add one or more data items. A data item can be an AF Attribute or PI point, specified by name. A data item can also be a relational or web service dataset column from a dataset defined in PI Data Services.

A web part may also receive data items dynamically through a SharePoint connection (or *querystring* (page 35)). Once two web parts are connected, you can add parameters from a provider web part as selected data items in the consuming web part.

Use the controls at the top of the **Selected Data** tool part to add a new data item:

- Click inside a row in the Selected Data table and type the *context path* (page 26) and name of an AF Attribute, or the name of a tag or dataset column. For example, you can use the following syntax to specify an attribute  :

  `\\<AF Server Name>\<AF Database Name>\<Element1-n>|<Attribute1-n>`

  a tag  :

  `\\<PI Server Name>\<Tag Name>` (or simply `<TagName>`, if from the default server)

  or a dataset column  :

  `<DatasetName>.<ColumnName>`

Press **Enter** or **Tab** to validate and add another row. If you click a row and the field is not activated for editing, click the corresponding **Row Select** button  to make the row editable. When you select a row containing an AF Attribute name, the context path to the attribute appears in the **Context Path** text box in the *Parameters/Placeholders* (page 25) section.

- Click the **Select PI Data**  button to search for *AF Attributes* (page 20) or *PI tags* (page 21).
- Click the *Dataset Search* (page 23)  button to search for available datasets from PI calculation, relational or web service sources.
- Click the *Connections* (page 34)  button to draw a data item from a connected web part on the page, or from a *querystring* (page 35) in the URL.

The options available to select data items vary by web part. For example, web parts that do not support PI data do not allow you to search for tags. If a data item option does not appear in the Selected Data area, it is not applicable to the web part.

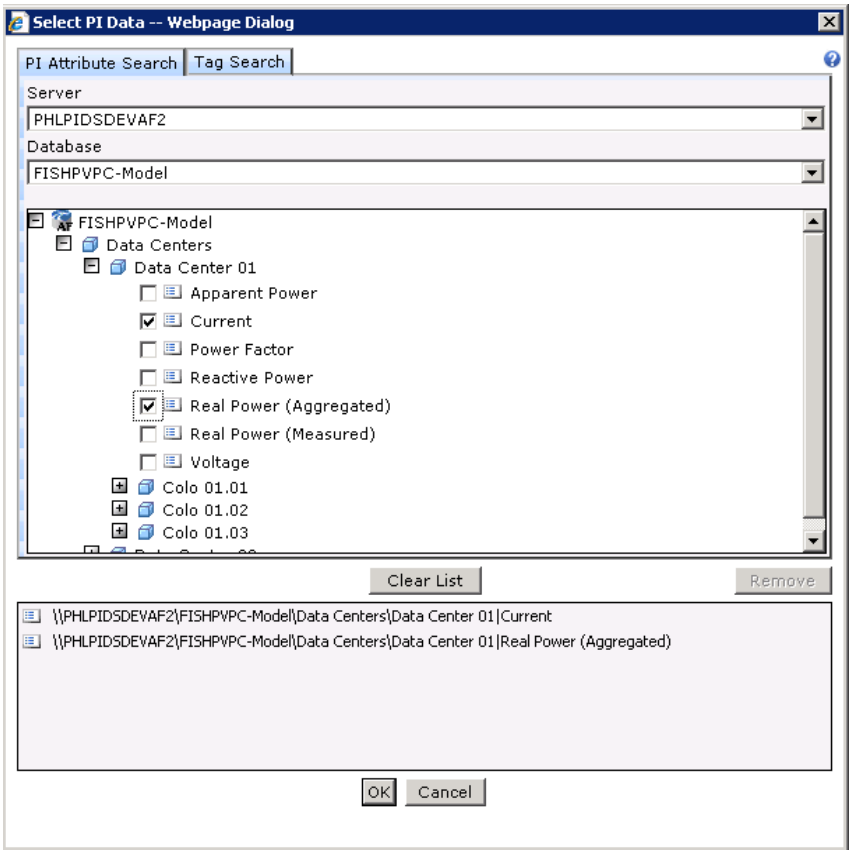
Note: You can use a data item only one time within a single web part, except for the PI XYPlot web part, which allows the same data item to serve as both the **X** tag and a **Y** tag.

Attribute Search

Most PI WebParts can display data from the PI Server or other sources by referencing AF Attributes. An attribute search allows you to pick an AF Server and database, search for attributes, and add those you need to the Selected Data list.

To add attributes to a web part:

1. In the Selected Data tool part, click the **Select PI Data**  button. The **Select PI Data** dialog opens.
2. On the **Attribute Search** tab, choose an AF Server from the list of available **Servers**.
3. Choose an AF database from the list of **Databases** within the selected AF Server.



4. Navigate through the tree by clicking to expand nodes.

   AF Element nodes are parents to AF Attributes in the server.

5. Select attributes to add them as Selected Data sources.

   The paths to and names of selected attributes appear in the Attribute panel below the tree.

6. Click **OK** to save the attribute selection to your Selected Data list.

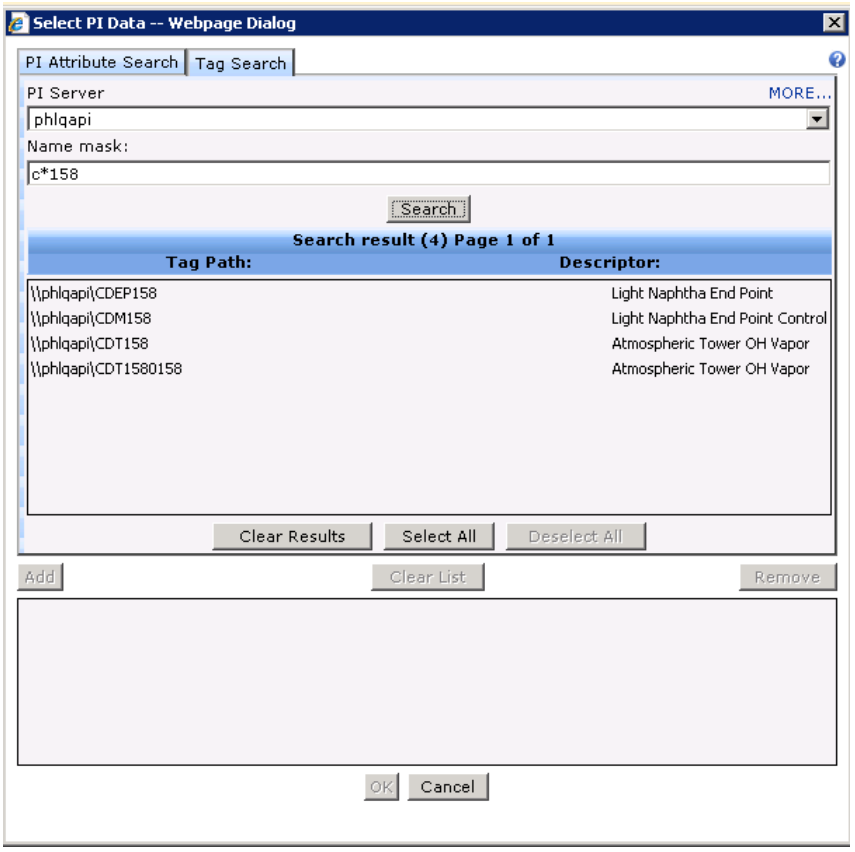
Tag Search

Most PI WebParts can display data from the PI Server in the form of tags. A tag search allows you to pick a PI Server, search its list of tags, and add those you need to the Selected Data list.

To add tags to a web part:

1. In the Selected Data tool part, click the **Select PI Data** button. The **Tag Search** dialog opens.
2. On the **Tag Search** tab, choose a server from the **PI Server** list.
3. Type the name of the tag into the **Name mask** field.

4. If you don't know the exact name, you can use a wildcard character in a name mask. Use an asterisk (*) for multiple characters, or a question mark (?) for a single character. For example, to find tag names that start with the letter "C" you can type in: `C*`.



5. Click the **Search** button. The Tag Search dialog box queries the specified server for tags that match the name mask, and displays them in a list.
6. Click a tag to select it in the **Search Results** list, and click **Add** to add it to the selected tags panel. Select and add multiple tags by holding down the Ctrl or Shift key while you click to select.

   Select a tag and click Remove to remove it from the selected tags panel. Click Clear List to remove all selected tags.
7. Click **OK** to add the tags to your **Selected Data** list.

You can also search for tags based on criteria other than tag name. Click the **More…** link at the top of the Tag Search dialog to search using different tag attributes. You can specify as many criteria as you want, with each selection narrowing the search to the list of tags that meet all the search criteria. Use the paging buttons at bottom to move through search results.

Dataset Search

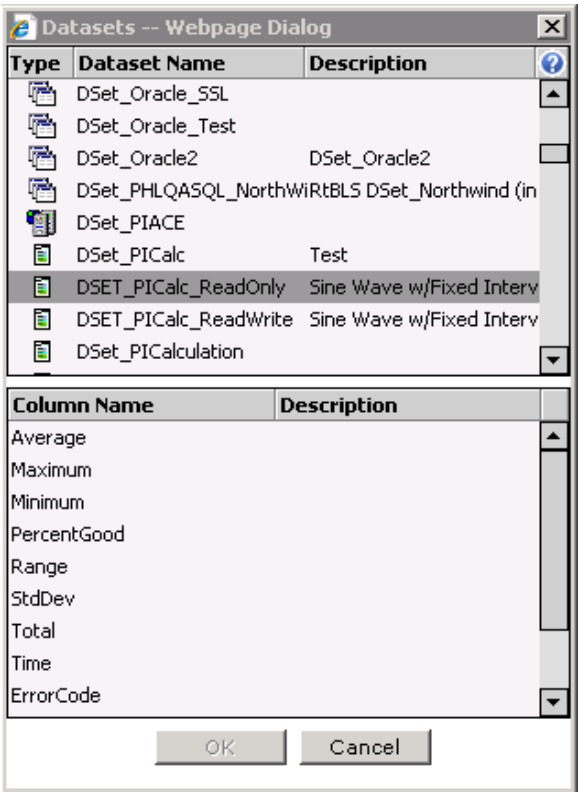
Many PI WebParts can also display data from datasets configured in PI Data Services. Examples of a dataset are a PI Calculation dataset, a query to a relational database, a web service method, or a Microsoft Excel spreadsheet.

Generally, you use a single dataset column as a web part data item. A column is analogous to PI point values in the sense that one dimension of data is represented. Additional columns can be added as **Selected Data** items. The PI Table web part is an *exception* (page 24) in that you add all the columns in a dataset at once.

If you want to use a dataset with web parts that typically display current or historical PI data, your dataset should include both data and a date or timestamp column that forms a *time series* (page 99). Datasets are the only type of data item available to PI Messenger and PI Table web parts.

To add a dataset column to a web part:

1. In the Selected Data tool part, click the **Dataset Search** button. The **Datasets** dialog opens.
2. Click to select a dataset you want to use. A list of available columns for the dataset appears in the column pane below.

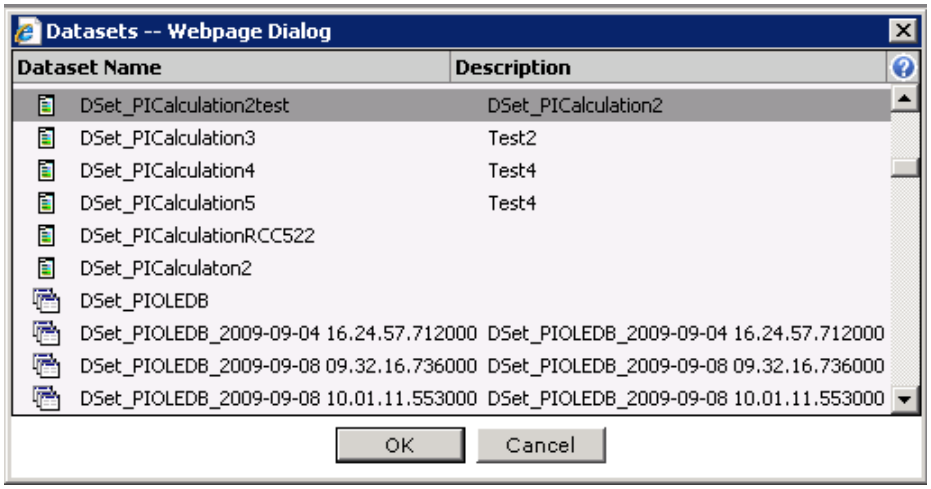


3. Select the column you want to add. Hold down the CTRL or SHIFT key while clicking to select multiple columns.
4. Click **OK** to add the selected column or columns to the **Selected Data** list.

5. If applicable, enter *parameters and placeholders* (page 25) to configure additional information for the dataset column.

PI Table and PI Messenger Dataset Search

For the PI Table and PI Messenger web parts, the dataset search dialog does not prompt you to choose a column associated with a selected dataset. Instead, you choose a dataset, and then *configure PI Table* (page 63) or *configure PI Messenger* (page 71) to display only the columns you want to appear in the table.



Each PI Table web part displays columns from a single dataset. If you add another dataset, it replaces the first. Add additional PI Table web parts to show columns from different datasets.

Selected Data Table

The **Selected Data** table lists all data items assigned to the web part. You can use the table to manage the data items. You can also select a data item to format corresponding data in the web part using other sections in the tool pane.

Manage the list of data items using these tools:

- Click the attribute icon to the left of an attribute name to select it.

  When selected, the path to the selected attribute appears in the **Context Path** text box in the Parameters/Placeholders section.

- Click the tag icon to the left of a tag to select it.
- Remove the selected item using the Delete button.
- Remove all items, including web part connections, using the Clear button.

Data items appear in the Selected Data list in the order they are added, and this same order is preserved within the web part display. You can change the position of the selected item in the list using the Up or Down buttons.

Replace Ad Hoc Traces

The **Replace Ad Hoc Traces** check box appears for PI Trend and PI XYPlot web parts.

Keep this box checked to enforce the default substitutive behavior of web part connections, where data sent from connected web parts replaces data traces previously sent to a trend or XY plot. A trace drawn from a new connection event replaces the trace drawn from the previous connection event.

When deselected, behavior becomes cumulative, and new traces are added to those sent by previous web part connection events.

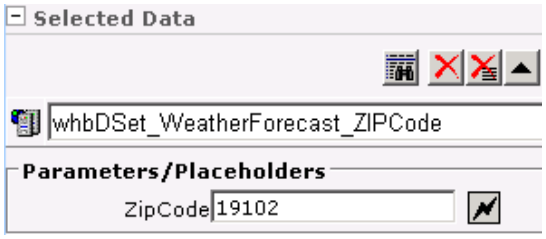
Ad hoc traces are lost if you navigate away from the page, enter or exit Design mode, or close the browser window.

Note: Additive behavior works only when the web part page is fully in Run mode. In **Edit** mode, ad hoc traces are replaced regardless of the setting.

Parameters/Placeholders

The **Parameters/Placeholders** group appears when an AF Attribute or a relational or web service dataset with parameters or placeholders is selected within the Selected Data list.

For AF Attributes, a parameter/placeholder is a *context path* (page 26) that relates the attribute to a parent AF Element in an AF database. For datasets, a parameter/placeholder represents a placeholder in a SQL query or a parameter passed to a web service method.



Note: Parameters and placeholders are not available for PI tag data items.

Each parameter or placeholder item configured for a selected dataset appears, paired with a value field. If a display name has been configured by the dataset designer, the display name is shown instead of the default name.

To specify placeholder or parameter values:

- The initial value for each parameter or placeholder is a default value specified by the dataset creator. You can accept the default value or enter a new value for any item.
- Click the Connections button to accept parameter and placeholder values from a connected web part on the page.

Context Paths

A context path relates an AF Attribute to a parent element within an AF database. An AF Attribute added as a web part data item can point to different underlying PI points, depending on its context path.

Context paths can be used to drive displays created in PI WebParts and other PI client applications. Displays that utilize context paths in this manner are referred to as element-relative because the data displayed for the attribute at any time depends on the context path that links the attribute to a parent element.

Context Path Example

Context paths are used most frequently to change the data displayed by a web part based on user selection. For example, based on the selection of AF Elements or attributes that represent assets in a plant, a display may present data from parallel assets in a single plant or in different locations. A provider web part can pass a context path to a consumer web part through a SharePoint connection, allowing one web part to dictate the data displayed in another.

For example, assume Tanks 1-5 in a plant are all described by the same measurement attributes of temperature and pressure. Each tank is represented as an element in the AF database with corresponding temperature and pressure attributes. A web part display (or any other PI client display) that references the temperature attribute could display data for each tank in turn by allowing the user to specify the context path to any particular tank element.

In PI WebParts, context paths are sent most frequently from the PI TreeView web part, which provides hierarchical browsing of AF database. PI TreeView can act as a context path selection tool in a web part page. When you click a node in the tree, the corresponding path is sent to connected web parts. Context paths are most commonly sent to PI ActiveView and PI Graphic parts to override a *default context path* (page 59) stored in a display.

To use context paths with PI Attributes selected as data:

1. In Design mode, *create a SharePoint connection* (page 33) between the provider and consumer web parts.
2. *Modify* (page 17) the consumer web part and display the tool panel.
3. In the **Selected Data** tool part, use an *attribute search* (page 20) to locate and add the desired attributes as data items.

   When an attribute is selected in the Selected Data table, a **Context Path** field appears in the *Parameters/Placeholders* (page 25) area.
4. Click the Connections  button next to the **Context Path** field and choose the **ContextPath** *connection field* (page 34) from the provider web part to establish a SharePoint connection, and then click OK.

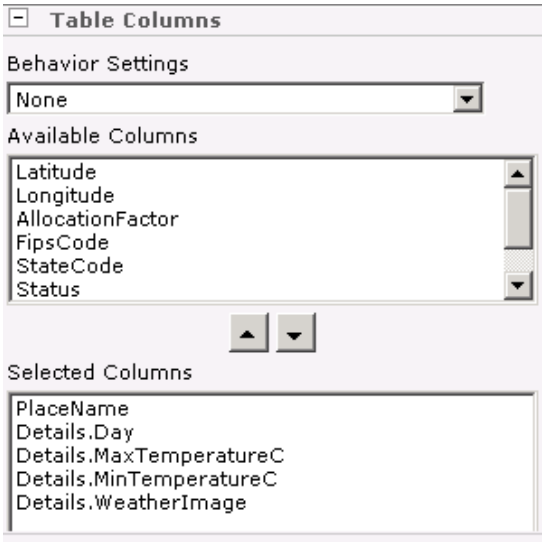
   Note: Each attribute selected has its own separately configured context path.

   The **Connections** icon turns green  to indicate a live connection. The consumer web part updates to reflect attribute data associated with the selected context.

5. In the provider web part, choose a new element or attribute to test the connection. The consumer web part is updated with new data based on the context path if an attribute with the same name is a selected data item.

Table Column Properties

The **Table Columns** tool part is used to specify data and formatting for web parts that use a tabular display format, including PI Table, PI TimeSeries, and PI Values.



Several features in the table columns tool part are used to format the display:

Available Columns

A list of dataset columns that can be added to the table. Select columns and use the down arrow button (right) to move them to the **Selected Columns** box to display them in the table.

Columns configured in the dataset as **Hidden** appear in the available columns list by default. All other columns appear in the Selected Columns list by default.

Selected Columns

A list of dataset columns selected for display in the table. You can remove selected columns from the table by clicking the up arrow button (left) to move them into the Available Columns list.

Any columns not configured as **Hidden** in the dataset are selected by default.

The Up and Down arrow buttons at the bottom right of the Selected Columns list are used to control the order of the columns in the list. The order from top to bottom in the list determines the order of appearance, left to right, in the web part.

Rows to Display

The maximum number of rows visible at any one time in the table. If more rows of data are available, paging buttons  on the table allow the user scroll through additional rows.

Automatically Provide First Row

Select Automatically Provide First Row to specify that a PI BatchTable web part automatically provide the first result row returned by a batch search to connected web parts. This appears for PI BatchView web parts only.

Behavior Settings

While most dataset column values may appear as simple data points, others may provide graphic, descriptive, or linking features. For example, you can click on hyperlinked data values to send data through a web part connection, launch pages in a browser, or show a trend.

You can format PI Table, PI TimeSeries and PI Values columns using table format configurations. A configuration determines the appearance and click-actions of cell data by mapping tags or dataset columns to specific behaviors.

Apply table configurations as Behavior settings:

- Select a table configuration from the **Behavior Settings** list.

  Two table configurations are included with PI WebParts. The `RtSnapshot Table` configuration is applied automatically to PI Values web parts, and `RtArchive Table` to PI TimeSeries web parts.

  Configurations are listed in alphabetical order, with the first applicable configuration applied to a PI Table dataset by default. If no configuration is associated with the selected dataset, Behavior Settings is set to *None* (which may also be selected to revert to the default configuration).

- If you are a PI WebParts Administrator, click the **Configure**  button to edit or add new configurations. A PI WebParts Configuration page opens in a new browser window.

  See the *PI WebParts Administrator Guide* for more information about table configurations.

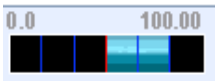
The following column behaviors may appear in table configurations:

Trend

Columns with **Ad hoc Trend** behavior display column data as hyperlinks; when clicked, each link opens a **Trend** graph in a separate browser window using the tag name configured for that row.

Current State

A column set to **Current State** behavior compares the column value to reference values with a deviation indicator.



The indicator shows how far the column value lies above (to the right) or below (to the left) a typical reference value. If a column value exceeds or drops below the maximum or minimum reference values, the indicator blinks.

Minimum, maximum, and typical values can be determined by the zero, zero + span, and typical value attributes of the underlying tag, or drawn from other columns in the dataset.

Current State behavior can be used only for numeric or digital state data points with good status. An indicator is not displayed for a row with bad status or incorrect configuration, and the table cell displays a Warning icon. Place the cursor over the icon to see a brief error message, or click the icon to view full information about the problem.

Hidden

Columns set to **Hidden** behavior can be used to provide data to other web parts through a connection, but are not displayed in the table by default.

Hidden configuration sets the default position of the column (placing it in the Available rather than the Selected columns list). Hidden columns can still be displayed, but by default they are not.

Hyperlink

A column set to **Hyperlink** behavior appears as a hyperlink to a web page, web image file (for example, GIF or JPEG), or other file (for example, SVG or PDI). The hyperlink URL can be fixed, or can consist in whole or in part of the value in another column in the dataset, regardless of whether or not that other column is displayed.

Hyperlink behavior columns include an icon in the column heading, or replace individual column values with icons, depending on the configuration. When an icon or link is clicked, the target URL may be opened in the current window, a new browser window, or a modal dialog box window. Row data may also be sent to connected web parts, instead of navigating to a URL.

When a cursor hovers over a column hyperlink, a ToolTip appears to indicate the link destination. The ToolTip text is also configurable by an administrator under PI Table Behavior Configuration settings.

Conditional Formatting

Tables may also have both default and conditional formatting applied to cells based on format behaviors configured by an administrator.

Conditional formatting highlights extreme or suspect values on a conditional basis. Each cell can be evaluated on an individual basis and new formatting applied if the value satisfies a preset condition expression. Multiple conditional formats can be specified for each column, and are evaluated in the order in which they are defined until an applicable condition is found.

Filter Data

A **Filter Value** specifies a data element associated with a web part, whose corresponding data values may be sent to another web part in order to filter or select data results.

For example, a filter value would commonly specify a parameter or data column in a web part. When a web part connection is made, corresponding data values are sent to the consumer web part. The consumer may receive a PI tag name, a Start Time, a module context or another type of parameter used to query or delimit a dataset.

In PI WebParts, filter values are used mainly for connections with the *Microsoft Excel Web Access web part* (page 36). The resulting values can be used to resolve PI DataLink functions and retrieve data from PI. Filter values can also be sent to any SharePoint web parts that support filter values connections.

The **Filter Value** tool part appears in the tool pane for these web parts:

PI BatchTable Filter Values

In PI BatchTable, use **Filter Values** to specify a batch table column. A data value from the specified column is sent when a corresponding table row is selected.

PI Table Filter Values

In PI Table, use **Filter Values** to specify a table column. A data value from the specified column is sent when a corresponding table row is clicked. Underlying column data is sent if the column displays something other than the data value, such as a link or graphic.

PI TimeRange Filter Values

In PI TimeRange, **Filter Values** indicates the type and format of time strings sent through web part connections.

By default, PI TimeRange sends **Time Range**, **Current Time**, **Start Time** and **End Time** parameters in *PI Time* (page 97) format. These values can also be sent in *two alternate formats* (page 67) through web part connections:

- (Localized) versions of time parameters use default Short Date and Time formats specified for the *locale* (page 7) of the SharePoint site.
- UTF versions of time parameters use *Universal Time Format* (page 67) strings.

You can also specify the **IsUpdating** flag as a filter value to indicate when the web parts cache is updating with new data.

These alternate formats are useful for connections to 3rd party web parts that require time strings in Windows-based formats, and those that do not work with localized formats, such as the Excel Web Access web part.

Note: Filter values for PI TimeRange do not necessarily correspond to a click event to send information to another web part. They affect all web part connections associated with a particular instance of PI TimeRange, including implicit connections.

PI TimeSeries Filter Values

In PI TimeSeries, use **Filter Values** to specify a table column. A data value from the specified column is sent when a corresponding table row is clicked.

You can specify date and time-formatted column data be sent in *PI Time* (page 97) format (default), or using locale-specific (**Localized**) and Universal Time Format (**UTF**) versions, as in PI TimeRange web parts.

PI TreeView Filters

In PI TreeView, use **Filter Values** to select a tree element to send through a web part connection. You can send any of the following as a filter value:

- PI tag list
- AF Element name
- AF Element path
- Element-relative *context path* (page 26)
- AF Attributes specified in any attribute parents

PI Values Filters

In PI Values, use **Filter Values** to specify a table column. A data value from the specified column is sent when a corresponding table row is clicked.

You can specify date and time-formatted column data be sent in *PI Time* (page 97) format (default), or using locale-specific (**Localized**) and Universal Time Format (**UTF**) versions, as in PI TimeRange web parts.

Chapter 5

Connect Web Parts

When two web parts on a page are connected through a SharePoint Connection, content displayed in one web part updates based on a selection or click event within the other. One of the most useful features of PI WebParts is the interoperability that allows you to connect web parts to create interactive displays.

For example, you can select an AF Attribute from a PI TreeView web part and add corresponding traces to the display in a PI Trend web part. You can also pass time range parameters from one web part to others.

Note: Data supplied through a web part connection remains when the page is refreshed, but is lost if you navigate away from the page or close the browser window.

In addition, you can define connections not only between PI WebParts, but also between PI WebParts and third-party SharePoint web parts. For example, you can input data for SQL query placeholders in a Microsoft Form web part and use them to update a PI Table web part. You can send parameters from a PI TimeRange web part and use them to update a spreadsheet in the Microsoft Excel Web Access web part.

Each web part connection may be one of three types, and requires a *provider* web part and a *consumer* web part:

- Web parts that send information to others are providers.
- Web parts that receive information from others are consumers.
- Some web parts can be both providers and consumers at the same time.

With the exception of PI TimeRange, which can *automatically connect* (page 66) to other web parts on a page, you must explicitly create SharePoint connections. Connecting one web part to another is a two-step process:

- First, *establish a SharePoint connection* (page 33) between provider and consumer web parts on the page.
- Then modify the consumer web part using the **Connections** dialog box to *configure parameters* (page 34) for each connection.

Establish a SharePoint Connection

To connect web parts, first establish a SharePoint connection that defines a provider and consumer for the exchange of information.

To connect web parts:

1. Open a web part page in your web browser. The page should have two or more web parts in order to support a connection.
2. Click **Site Actions > Edit Page**.
3. On either of the participating web parts, click **Edit > Connections >** *connection type* **>** *web part*.
4. Choose a connection type from the first submenu.

The options available depend on the consumer and provider web parts, and more than one connection type may be available.

Client-side (Parameter) and Server-side (Row) connections pass the same data. To minimize server round-trips (post-backs), use client-side connections when available. Some connections, particularly those between PI WebParts and the Excel Web Access web part, use *filter* (page 36) connections.

If the web part can transmit *filter values* (page 30) as well, you may be prompted to confirm that you are sending a client or server parameter instead of a filter value.

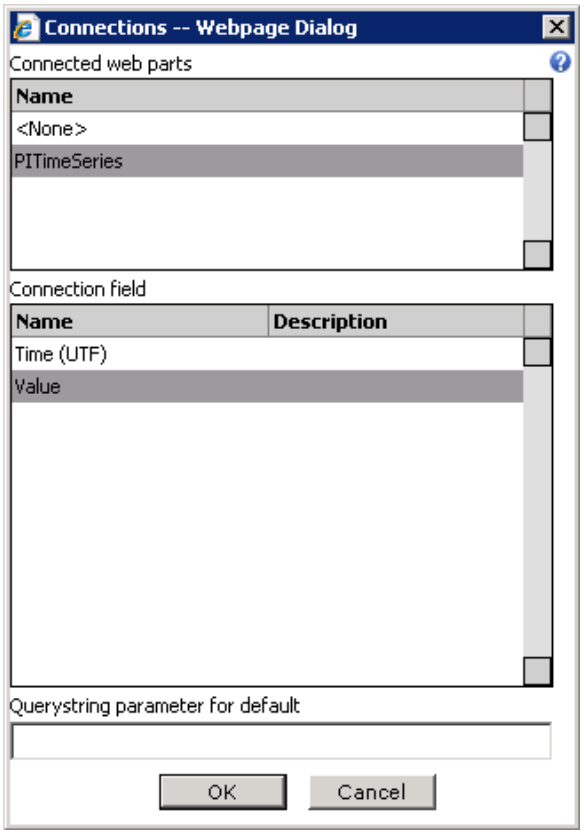
To indicate that the two web parts are connected, a check mark now appears in each web part's **Connections** menu.

With the SharePoint connection established, you can now define which information you want the consumer web part to accept from the provider.

Specify Connection Parameters

If a web part can act as a consumer, the **Connections** button appears next to any data fields in the web part's tool pane that can be populated by another web part via a SharePoint connection.

1. Click a Connections button next to the field that you want to update from a provider web part. The **Connections** dialog box opens.
2. The **Connected Web Parts** list displays web parts connected as providers. If no web parts appear in the list, there are no web parts connected as providers. Click cancel and *establish a SharePoint connection* (page 33) from the provider web part before continuing.
3. Select a provider web part from the **Connected Web Parts** list. The **Connection** field displays a list of all data columns available from the provider.



4. Select a data item and click **OK** to complete the connection.

   You can also select *None* to remove a mapping to a particular data item without breaking the web part connection.

   The Connections button turns green when configuration is complete, indicating that the data field is populated by a provider web part on the page.

Note: Only one data item may be passed through a SharePoint connection to a given field. If a new connection is specified, the previous connection is replaced.

Once a connection is complete, you can trigger the connection from the provider web part in order to view data updates in the consumer web part. For example, click an Attribute in the PI TreeView provider web part to send information to a connected PI Trend web part established as a consumer.

Querystring Parameters

Querystring parameters can be added to a web part page URL to send parameter connection values to consuming web part fields when the page first loads. Querystring parameters may be established for any web part field which accepts a SharePoint connection as a data source.

Note: A querystring parameter overrides the default value of the field, and in turn is overridden by any connection parameter sent from another web part.

For example, consider a page with the URL

```
http://webserver/Shared Documents/mypage.aspx
```

that contains a PI Trend web part. The **Start Time** and **End Time** fields are assigned the querystring parameters *start* and *end*, respectively. The trend is also configured to show the value of an AF Attribute, which exists under various element contexts. The **Context Path** field for the web part is configured to get its value from a querystring parameter `contextpath`.

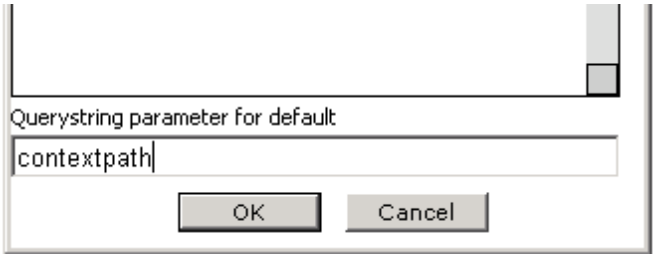
A user who wants the page to initially display a trace of the AF Attribute residing under `\\PISystem\AFDatabase\MyElement` over the past four hours would add the querystring parameters and values to the web part page URL as follows:

```
http://webserver/Shared
Documents/mypage.aspx?contextpath=\\PISystem\AFDataBase\<Element&
start=*-4h&end=*
```

where parameter-value pairs are delimited with the ampersand character (&), or its URL encoding.

To set a querystring parameter for a *consumer* web part:

1. In the Selected Data tool part, click a Connections button next to the field that you want to update through a querystring parameter. The **Connections** dialog box opens.
2. Enter the desired querystring parameter name in the **Querystring parameter for default** field and click **OK**.



Excel Web Access Connections

The Microsoft Excel Web Access (EWA) web part is included with the Enterprise Edition of Microsoft SharePoint Server 2007 (MOSS). You can add this web part to a page and connect it to PI WebParts as a consumer.

Typically, Excel workbooks published in SharePoint for use with PI WebParts include PI DataLink or PI BatchView functions that are supported by PI DataLink for Excel Services, a server version of the PI DataLink Add-in for Excel.

For more information about the EWA web part, PI DataLink for Excel, and integration with PI WebParts, consult the *PI DataLink for Excel Services Guide*.

You can send three types of data from PI WebParts to EWA:

- Workbook names, to display a particular workbook in an EWA web part.
- Named items, such as a range, chart or pivot table name, to view only that element in the EWA web part.
- Cell parameters, to input a value to a spreadsheet cell, which in turn may be referenced by a PI DataLink function.

Note: Workbook names and named items are sent through *client or server-side connections* (page 33). Cell parameters are sent through an IFilterValues connection.

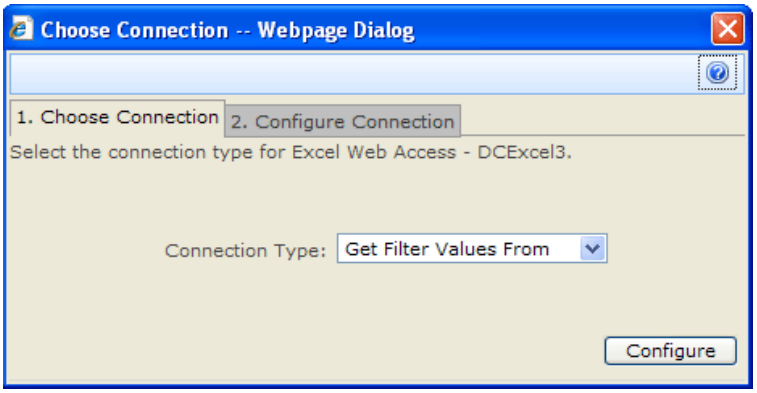
To send filter values through a web part connection:

1. Configure the **Filter Values** (page 30) property of the provider web part.
2. From either of the participating web parts, click **Edit >Connections >** *filter connection* **>** *second webpart for connection*.

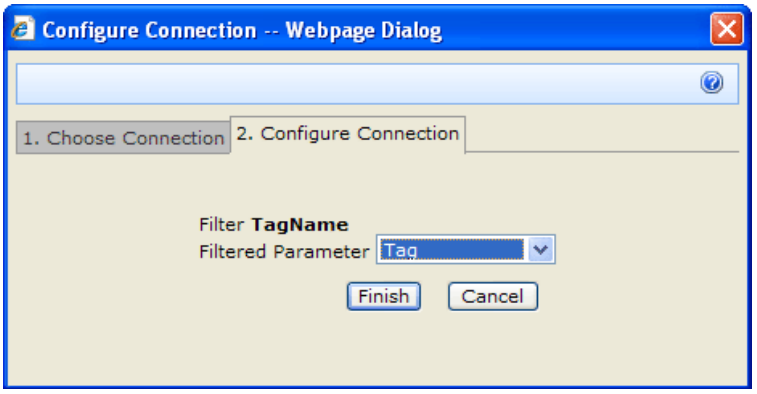
   The connection options available depend on the consumer and provider web parts, and whether you initiate the connection from the provider or the consumer.

   A workbook with named cells must already be loaded in the EWA web part to complete a FilterValues connection. However, you can send a workbook URL name or Named Item to an empty EWA web part.

   To indicate that the two web parts are connected, a check mark now appears in each web part's Connections menu. The **Configure Connection** dialog box appears.
3. If your connection began from the provider web part, specify the **Connection Type** on the **Choose Connection** tab, and then click **Configure**.



4. On the **Configure Connection** tab, select the parameter item in the **Filtered Parameter** menu that you want to specify through the web part connection.



For EWA connections, **Filtered Parameter** values correspond to named cells in the Excel workbook.

5. Click **Finish** to complete the connection.

   If the consumer web part is an EWA web part, the workbook recalculates automatically on receipt of the parameter, allowing PI DataLink functions to access the PI server and refresh cell values in the spreadsheet.

Remove Connections

You can sever connections between web parts if you want to redirect them to new providers or consumers.

To remove connections:

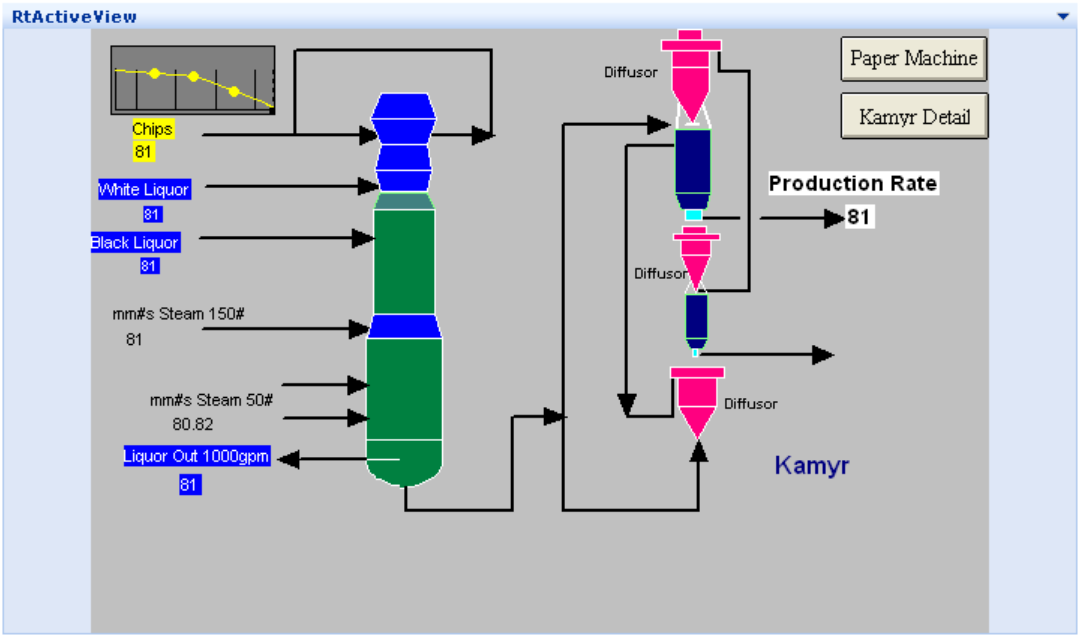
1. Click **Site Actions > Edit Page**.
2. On either web part that you want to disconnect, click **Web Part Menu > Connections**. Check marks appear next to listed web parts to indicate active connections to the current web part.
3. Select the web part you want to disconnect. You are prompted to confirm the removal of the connection.
4. Click OK to disconnect the web parts.

Chapter 6

The PI ActiveView Web Part

The PI ActiveView web part displays PI ProcessBook displays on a web part page. The PI ActiveView web part is closely linked to two other PI client applications:

- PI ProcessBook is used to create ProcessBook display (.pdi) files viewed in PI ActiveView. All the graphic elements in a ProcessBook display are configured in PI ProcessBook.
- ProcessBook displays are rendered in PI ActiveView using the PI ActiveView application. PI ActiveView comprises a client-side executable, an ActiveX control, and other tools for developing and deploying web page applications.



The PI ActiveView web part supports both static and dynamic ProcessBook content. Displays appear as they do in PI ProcessBook, but are view-only. The PI ActiveView web part also supports any configured PI data, PI Calculation dataset and ODBC dataset used by a ProcessBook display, provided connection settings to non-PI data are configured on the client computer to show updated data.

PI ActiveView Refresh Rate

The PI ActiveView web part uses the PI ActiveView application to manage data updates to ProcessBook displays. When dynamic data elements in a display are configured to update, PI ActiveView queries the PI server and receives new values. The new data is used to extend trend traces, update display values, and refresh any other symbols that indicate current values or status.

PI ActiveView has a default polling rate of 5 seconds, meaning that PI ActiveView contacts the PI server every 5 seconds looking for new data to update the display. You can configure this setting to change the polling rate using PI ActiveView settings stored in the `PIPC\dat\Acview.ini` file on the client computer.

- Adjust the **Timer** value in the Data Manager section to reset the polling rate. The default value is 5000 milliseconds, and the maximum value is 60000 milliseconds.

Configure PI ActiveView Web Parts

You can configure a PI ActiveView web part using the web part tool pane and standard configuration tool parts including **Time Range** (page 18), **Appearance**, **Layout**, and **Advanced**.

The PI ActiveView web part also includes three additional tool parts that allow you to specify how the ProcessBook display appears in the web part.

PI ActiveView Configuration

The ActiveView Configuration tool part specifies the display contents for the web part. Use the **Selected File** field to indicate the .pdi file you want to show in the PI ActiveView web part.

You can enter a full path to a file, or enter a partial path and click the downward arrow to **Browse** or **Search** for a file.

The path may use a UNC path to a file share, such as

```
\\servername\directory\file.pdi
```

or an absolute URL such as

```
http://myserver/directory/file.pdi
```

You can also click the Connections  button to receive a file path through a web part connection.

Current Context Path

The **Current Context Path** tool part allows you to manage the *context* (page 26) of PI ProcessBook displays (.pdi or .svg) in PI ActiveView and PI Graphic web parts. Context paths operate as parameters you can use to dynamically present different PI data in the same file display.

Since PI WebParts 3.0, element-relative displays largely replace module-relative displays (that support PI Aliases from the PI Module Database) used in earlier versions.

The PI ActiveView web part loads a ProcessBook .pdi in the PI ActiveView control on your computer. If PI ActiveView 3.2 is installed and the module relative display (MRD) add-in is removed, PI ActiveView converts the MRD to an ERD. If the MRD add-in remains installed for ActiveView, the .pdi is not converted to an ERD.

PI TreeView sends AF context paths and not module contexts. Pre-existing PI TreeView web parts used to supply module paths will not drive displays that rely on module contexts. You can continue to use other web parts (such as PI Table or a third-party WP) to send module paths.

The last context (or module) path selected when the display file was saved in PI ProcessBook becomes the default context. Once a PI ProcessBook display file is referenced by a web part, use the **Override Default Context Path** field to define a new default context when the file is loaded in the web part. You can also send context paths to the web part from provider web parts.

To override a default context path:

- In PI ActiveView, click the **Select Default Context** button to select a new context path from the AF database using the **Select Default Context** dialog.
- You can also use the **Connections**  button to drive the element context for PI ActiveView through other web parts on the page.

  For example, to create a display that allows you to toggle between attributes under Unit 1 and Unit 2 elements (and show corresponding data for each), you can connect a PI TreeView web part to a PI ActiveView web part and send a context path.

  The target web part displays a .pdi display configured to use the same named attributes. Map the relative path parameter from the PI TreeView to the Context Path field on the PI ActiveView web part.

  Once configured, click on the Unit 2 module in PI TreeView when you want to see data from Unit 2 instead of Unit 1, and vice versa.

PI ActiveView Settings

The Settings tool part provides the means for automatic download and update of the PI ActiveView application to client computers using the HTML code-base attribute.

Clients can automatically update the PI ActiveView application when new versions are posted in the code base location, and ensure that the PI ActiveView application is installed when the web part is used.

For PI ActiveView 3.0 or later enter the full path to the setup kit (ActiveView_3.x.x.x_.exe) in the **ActiveViewcodebase** field. For earlier versions, enter the path to the PI ActiveView cab file (acviewinf.cab).

The path may be a UNC path to a file share, such as:

```
\\servername\directory\acviewinf.cab
```

or an absolute URL such as

```
http://myserver/directory/ActiveView_3.1.0.2_.exe
```

PI ActiveView Connections

The PI ActiveView web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

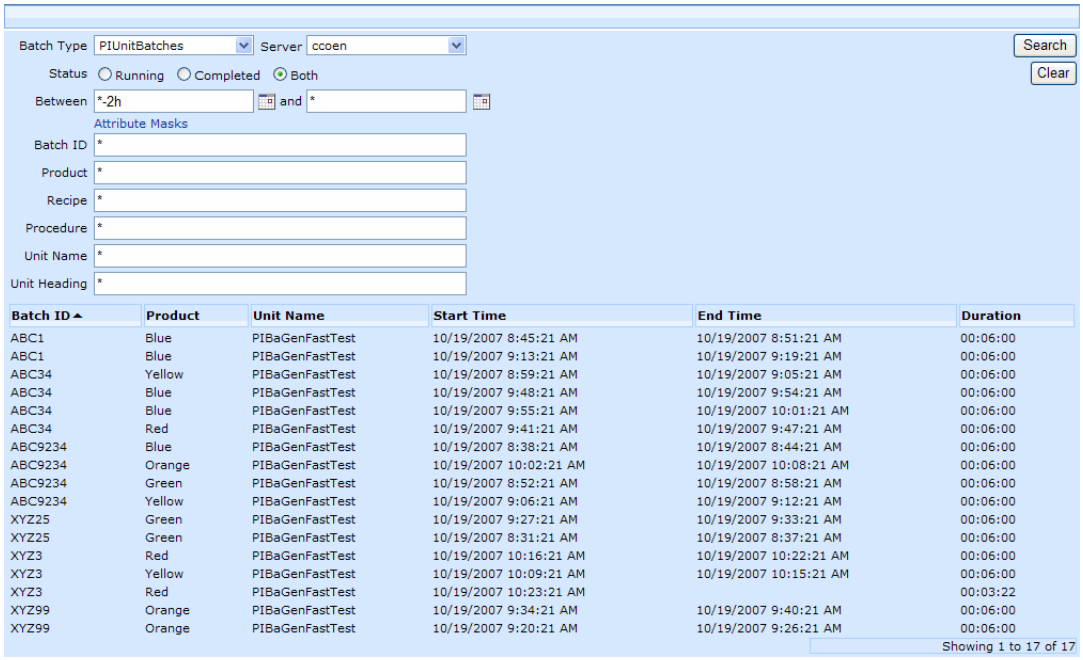
- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts .pdi filenames from any web part that can provide a file path.
- Accepts querystring parameters to set initial values.

Chapter 7

The PI BatchTable Web Part

The PI BatchTable web part provides a means to search for PI batch information and exchange batch data with other web parts.

Batch searches can be configured to execute automatically on loading a page, or run with parameters supplied to the PI BatchTable web part or consumed from other web parts.



Batch ID	Product	Unit Name	Start Time	End Time	Duration
ABC1	Blue	PIBaGenFastTest	10/19/2007 8:45:21 AM	10/19/2007 8:51:21 AM	00:06:00
ABC1	Blue	PIBaGenFastTest	10/19/2007 9:13:21 AM	10/19/2007 9:19:21 AM	00:06:00
ABC34	Yellow	PIBaGenFastTest	10/19/2007 8:59:21 AM	10/19/2007 9:05:21 AM	00:06:00
ABC34	Blue	PIBaGenFastTest	10/19/2007 9:48:21 AM	10/19/2007 9:54:21 AM	00:06:00
ABC34	Blue	PIBaGenFastTest	10/19/2007 9:55:21 AM	10/19/2007 10:01:21 AM	00:06:00
ABC34	Red	PIBaGenFastTest	10/19/2007 9:41:21 AM	10/19/2007 9:47:21 AM	00:06:00
ABC9234	Blue	PIBaGenFastTest	10/19/2007 8:38:21 AM	10/19/2007 8:44:21 AM	00:06:00
ABC9234	Orange	PIBaGenFastTest	10/19/2007 10:02:21 AM	10/19/2007 10:08:21 AM	00:06:00
ABC9234	Green	PIBaGenFastTest	10/19/2007 8:52:21 AM	10/19/2007 8:58:21 AM	00:06:00
ABC9234	Yellow	PIBaGenFastTest	10/19/2007 9:06:21 AM	10/19/2007 9:12:21 AM	00:06:00
XYZ25	Green	PIBaGenFastTest	10/19/2007 9:27:21 AM	10/19/2007 9:33:21 AM	00:06:00
XYZ25	Green	PIBaGenFastTest	10/19/2007 8:31:21 AM	10/19/2007 8:37:21 AM	00:06:00
XYZ3	Red	PIBaGenFastTest	10/19/2007 10:16:21 AM	10/19/2007 10:22:21 AM	00:06:00
XYZ3	Yellow	PIBaGenFastTest	10/19/2007 10:09:21 AM	10/19/2007 10:15:21 AM	00:06:00
XYZ3	Red	PIBaGenFastTest	10/19/2007 10:23:21 AM		00:03:22
XYZ99	Orange	PIBaGenFastTest	10/19/2007 9:34:21 AM	10/19/2007 9:40:21 AM	00:06:00
XYZ99	Orange	PIBaGenFastTest	10/19/2007 9:20:21 AM	10/19/2007 9:26:21 AM	00:06:00

Showing 1 to 17 of 17

A successful batch search returns a list of batches that match the search criteria. Selecting a batch in the table can pass batch data to connected web parts.

Note: The PI BatchTable web part relies on the PI OLEDB provider to retrieve PI Batch data through PI Data Services. The PI OLEDB Provider is provided for use with PI BatchTable only, and is not licensed for any other purpose.

Batch Searches

Define a batch query by building an attribute mask of search criteria to describe the batches you want to see; batches that fit the criteria are displayed in the batch table once the search is run.

To define a batch query:

1. Choose a **Batch Type** to search for in the PI Batch database. Only batches of the specified type are returned by the search.
2. Specify the name of the PI **Server** containing the target PI Batch Database.
3. Specify the **Status** of batches to be returned:
   - Choose **Running** to return only batches that are currently running.
   - Choose **Completed** to return only batches that have an end time.
   - Choose **Both** to return all matching batches, whether running or completed.
4. Enter start and end times to define a time range for the search.

   You can enter relative PI times or use the calendar button to enter fixed times.
5. Specify each batch attribute you want to define to limit your search in the **Attribute Masks** section.

   Only batches matching all *search criteria* (page 45) are returned. This section may contain different attribute mask fields depending on the batch type.

   You can use wildcard characters in masks, including an asterisk (*) for multiple characters, or a question mark (?) for a single character. For example, to find batch IDs that start with the letter "C" you can type in: *C**.
6. Click **Search** to search for batches matching the specified batch information and attribute masks.

   Click **Clear** to clear all fields and reset default options.

Batch Results

Batches matching *search criteria* (page 45) are returned as rows in the batch table. Columns may be *configured* (page 27) to display any available combination of *parameters* (page 46) for each batch.

You can page through the results or sort them by column:

- Click the Move Forward (>) or Move Backward (<) navigation to move forward or backward on page in the list of returned batches.
- Click the Move First (|<) or Move Last (>|) buttons to move to the beginning or end of the list of returned batches.
- Click a column to sort the list of returned batches by parameter.

If a *web part connection* (page 47) is established, select an individual batch row to send selected batch parameters to a connected web part.

Configure PI BatchTable Web Parts

You can configure a PI BatchTable web part using the web part tool pane and standard configuration tool parts including *Time Range* (page 18), *Table Columns* (page 27), *Filter Values* (page 30), Appearance, Layout and Advanced.

The PI BatchTable web part also includes two tool parts that allow you to set display preferences and configure automatic batch searches.

Search Options

By default, all features of the PI BatchTable web part are displayed, allowing the viewer of the web part page to search for any type of batch and specify any search criteria.

Search options provide ways to configure or reduce the search options available:

- Select **Enable Pre-Configured Search** to set default search attributes as configured in the tool pane. The default search is executed automatically when the page containing the web part is loaded.
- Select **Disable Search Interface** to hide batch specification properties and search attributes in the web part display, showing only the batch table results of a search. When this option is selected, search criteria must be pre-configured or supplied externally through a web part connection or querystring parameters.

Search Criteria

The Search Criteria tool part can be used to specify a default attribute mask for PI BatchTable searches. Any values supplied in the tool part appear in web part fields as default search values. If a *pre-configured search* (page 45) is specified, a batch search is executed automatically using these criteria when the PI BatchTable web part is first loaded on the page.

Default search criteria can be specified for any batch specifications or attribute mask values. You can use wildcard characters in masks, including an asterisk (*) for multiple characters, or a question mark (?) for a single character. For example, to find batch IDs that start with the letter "C" you can type in: *C**. Parameters for all values except **Batch Type** can also be received through web part connections.

The following *batch parameters* (page 46) are available as search criteria, depending on the type of batch selected:

- Batch Type
- Server Name
- Status
- Start Time
- End Time
- Batch ID

- Product
- Recipe
- Procedure
- Unit Name
- Unit Heading

Apart from search criteria entered directly in the PI BatchTable web part, parameters may be preconfigured, or received through *querystring parameters* (page 35) or web part connections. If parameters are received from multiple sources, the order of execution is preconfigured, querystring, web part connections and direct entry.

Batch Parameters

PI BatchTable uses PI batch information to search for batches on a selected server. More detailed batch information is returned in results table rows, where selected rows can send batch parameters to connected web parts.

Note: All parameters, including timestamps in UTC format, are entered and sent as strings.

The following batch parameters are used for searches and appear in batch results:

Parameter	Definition
Batch Type	The type of batch, either: ▪ *PIBatch*, the default option, a PIBatch entity. ▪ *PIUnitBatch*, a PIUnitBatch entity typically associated with a piece of equipment. ▪ A PIUnitBatch is by definition associated with a PIModule that has been designated to represent the unit (where the property *IsPIUnit* = *True*). ▪ *PISubBatch*, an entity which is a child of a PIUnitBatch. or of another PISubBatch in a hierarchy beneath a PIUnitBatch. For example, you may have distinct types of sub-batches below a PIUnitBatch (called *Operations*) which are called *Phases*. Note that *PIUnitBatch* replaces the Batch entity in the PI Batch Subsystem. If a particular Unit has been migrated to the Batch Subsystem, its child batches are interpreted as PIUnitBatches.
Server	The name of the PI server containing the target PI Batch Database. Note that batch data is stored only on the Primary server of a PI server collective. If the Primary server is unavailable, you cannot retrieve batch results. Execute the search again once the Primary server has been brought back online.
Status	The current status of a batch, either *Running* or *Completed*. Completed batches have an **End Time** value; running batches do not.
StartTime	The time at which a batch run started, in UTC format.
EndTime	The time at which a batch run completed, in UTC format. No value indicates a batch that is still running.
Product	The name of a product associated with a batch.

Parameter	Definition
Recipe	The Recipe associated with a batch.
Procedure	The procedure associated with a *PIUnitBatch* or a *PISubBatch*.
Unit Name	The name of the unit with which a batch is associated.
Unit Heading	The heading of the PI Module Database unit to which a *PIUnitBatch* or a *PISubBatch* belongs.

The following batch parameters appear only in batch search results:

Parameter	Definition
Batch ID	A user-assigned batch ID.
Duration	The total time elapsed during the most recent batch run. If the batch run is concurrent to a search, the duration is the time elapsed from start to the execution of the search.
Unit Path	The full path to the AF Element that is mapped to the module in the PI Module Database to which a batch belongs. A unit path applies only to *PIUnitBatch* or a *PISubBatch* types.
Unique ID	The unique ID (GUID) of a batch as stored in the PI Batch Database.

PI BatchTable Connections

The PI BatchTable web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts **Server**, **Status** and **Attribute Mask** parameters from any web parts that can provide them, such as PI TreeView and PI Table.

  Note: **Batch Type** parameters cannot be accepted through web part connections.

- Accepts querystring parameters to set initial values.

As a Provider

Column values for rows returned as a result of a PI BatchTable search can be sent to consuming web parts using client or server-side connections. When a row is selected, column values are sent as *parameters* (page 46) to connected web parts.

Note: Null values are provided for parameters that are not applicable to the selected batch type. For example, a null value is sent for the UnitName parameter when a PIBatch row is sent.

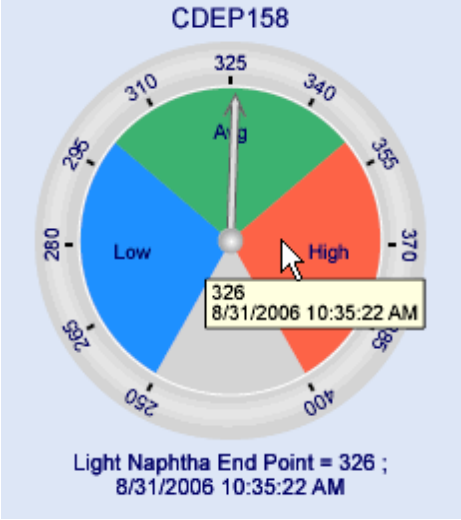
You can also send a row value from a data column to any web part that can consume it as a filter value. A typical use is a connection to the *Excel Web Access (EWA) web part* (page 36), where the column value parameter can be used to resolve a PI DataLink function in a spreadsheet cell.

When selected to launch a web part connection, a batch row displays an active Connection icon  to indicate the data sent to a connected web part.

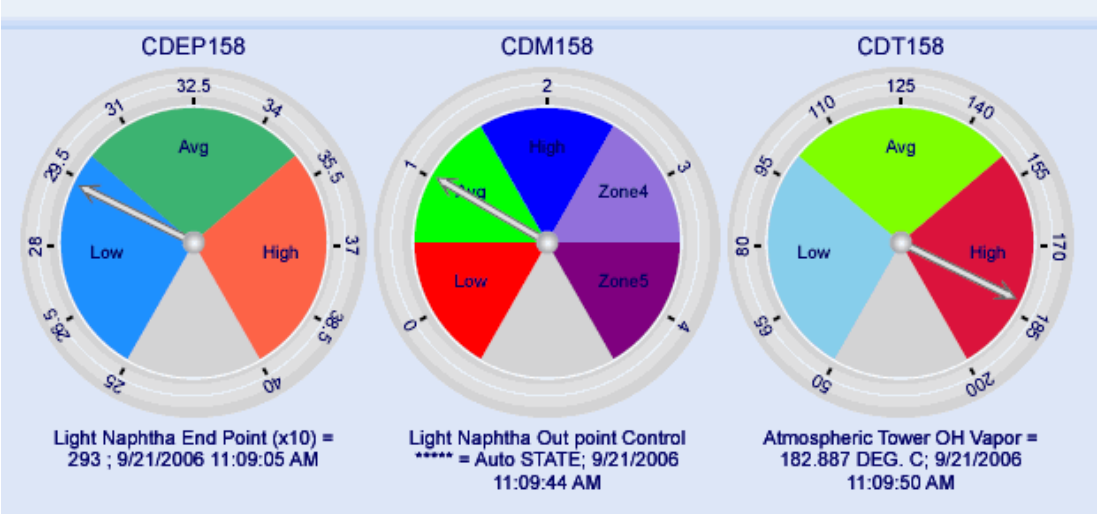
Chapter 8

The PI Gauge Web Part

The PI Gauge web part provides a graphical view of a PI or other data point's current value, and allows you to monitor and determine at a glance whether that value is within an acceptable range.



The analog-style gauge has a pointer (similar to a clock hand) that shows the real-time value with respect to the scale around the perimeter. A separate gauge appears in the web part for each data item configured in the PI Gauge tool pane.



Note: This web part is rendered in Scalable Vector Graphic (SVG) format and requires the Adobe SVG Viewer.

Configure PI Gauge Web Parts

You can configure a PI Gauge web part using the web part tool pane and standard configuration tool parts including *Time Range* (page 18), *Selected Data* (page 19), Appearance, Layout, and Advanced.

PI Gauge also includes additional tool parts that allow you to change the measurements, look and feel of each gauge.

PI Gauge Properties

For PI Gauge web parts, each item in the *Selected Data* (page 19) table is mapped to an individual gauge.

Use the **Multiple gauge orientation** setting to specify whether the gauges within the web part appear in a horizontal or vertical array. The default value is Horizontal.

Format Properties

Format properties determine the scale and appearance of a PI Gauge web part.

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Format** tool part includes these properties:

Scale Factor

The scale factor can be used to modify data point values and the corresponding gauge scale. Data point values are divided by the value entered in this field to determine the location of the gauge pointer and measurement values along the outside of the gauge. The scale factor is displayed at the bottom of the gauge at the end of the legend, if set to a value other than the default value of **1**. This field accepts floating point values.

Base Angle

Enter an integer to describe the angle complementary to the gauge reading arc, represented by the open space at the bottom of the display. The PI Gauge reading arc plus the Base angle arc is equal to 360 degrees. The default value of the Base angle is 60 (degrees), and can be any value between 0 and 359.

Number Format

A *number format* (page 100) is applied to legend and tooltip values in PI Gauge. Choose each item in the **Selected Data** list and apply settings individually.

When the **Database** format is selected for PI tag data, the number of decimal places used for floating point numbers is determined by the *DisplayDigits* (page 101) attribute. This format is disabled for non-PI data, which uses the General number format by default.

Bad Data Color

A color applied to the gauge center point to indicate an error condition, such as questionable, missing or corrupted data point value. The default value is *Red*.

Blink

The gauge center point can be set to blink to indicate an error condition. By default, the check box is cleared.

Text Color

The color used for text in the web part. The default value is *DarkBlue*.

Face Color

The color applied to the outer ring of the gauge containing scale values. The default value is *LightGray*.

Background Color

The color applied to the background of the gauge that is inside the scale ring, and that is excluded from the zones by the Base Angle. The default value is *LightGray*.

Legend Properties

Legend properties determine the format of the gauge legend and tooltips.

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Legend** tool part includes these properties:

Dataset Name

The name of the dataset column, tag or attribute as it appears in the Selected Data tool part.

Description

A description of the selected dataset column, tag or attribute, if available.

Units

The engunits (engineering units) attribute of the PI tag represented on the gauge. Engunits indicates the engineering units of measurement for tag data. This field is not applicable to non-PI data.

Value

The current numeric value represented on the gauge.

Timestamp

The time stamp associated with the current value represented on the gauge.

Title

Select the checkbox and enter a title to appear directly above the gauge.

Zone and Scale Properties

Zone and Scale properties determine the overall scale and appearance of a PI Gauge web part.

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Zone and Scale** tool part includes these properties:

Maximum and Minimum Scale

Minimum Scale and **Maximum Scale** properties determine the range of a values scale for each Selected Data item:

- For floating point or integer PI point values based on a tag or attribute, Database assigns the Zero attribute as the minimum scale value, and the Zero plus the Span attribute as the maximum scale value. For digital state tags, the minimum is always **0**, and the maximum is always one less than the total number of states. This option is disabled for dataset columns and other non-PI data.
- Select **Custom** to enter maximum and minimum values in the accompanying text boxes.
- Click a Connections  button to map parameters from web part connections to maximum and minimum scale values.

Number of Zones

The remaining Zone and Scale options are used to format indicator zones that appear on the gauge face.

- Enter a value in the **Number of Zones** field to specify the number of zones to use.

The zone list box updates to reflect the correct number. You can select zones from the list to define the following for each:

- Enter a text **Label** that appears within the zone on the face of the gauge.

- Pick a **Color** for the zone.
- Select **Percentage Zone Setting** to determine the size of each zone as a percentage of the total scale, as specified by the **Total Scale Percentage**. Clear the check box to specify the zone sizes using a **High Value** (the **Low Value** is calculated automatically).

PI Gauge Connections

The PI Gauge web part supports *SharePoint connections* (page 33) to other PI WebParts:

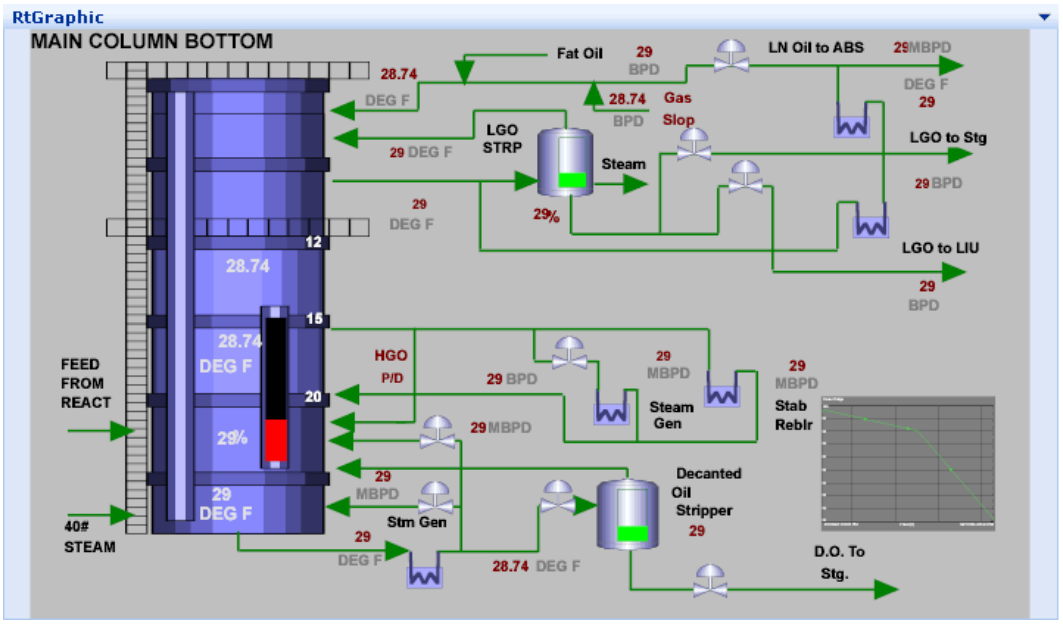
As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts PI tag names from any other web part and adds them to Selected Data as additional gauges.
- Accepts maximum and minimum scale value for a gauge.
- Accepts querystring parameters to set initial values.

Chapter 9

The PI Graphic Web Part

The PI Graphic web part shows PI ProcessBook displays saved in Scalable Vector Graphic (SVG) format. ProcessBook displays allow you to monitor a selected area of a plant in near real-time using schematic diagrams, dynamic graphic elements, multistate symbols, and continuously updating graphs and data point values.



PI Graphic supports displays created in PI ProcessBook 2.35 or higher with the SVG Add-in version 2.25 or higher.

Note: This web part is rendered in Scalable Vector Graphic (SVG) format and requires the Adobe SVG Viewer.

ProcessBook Display Support

PI ProcessBook display graphics are PI ProcessBook displays saved in Scalable Vector Graphic (SVG) format. SVG displays preserve most of the functionality of native ProcessBook displays, but are easier to deploy to users.

SVG format supports both static and dynamic content elements used in PI ProcessBook. Keep the following in mind when creating and saving displays in SVG format for PI Graphic:

- Static content may include rasterized images, photographs, line drawings, or text, as long as the format for these images is viewable on the web. For instance, displays that contain .jpg, .png, or .gif images can be viewed in a PI Graphic web part, but embedded symbols in .bmp format cannot.
- Dynamic elements include values, bars, trends, XY plots and multistate symbols that may be updated when the data on a PI Server or other data source changes. Dynamic elements vary in appearance depending on the type of data displayed and their configuration. Blob tags are not supported for any dynamic symbol.
- ActiveX controls used to build ProcessBook displays are omitted when the display is saved in SVG format.
- Any VBA scripting written to support a ProcessBook display cannot be included when the display is saved in SVG format.
- For more information about ProcessBook elements, see the *PI ProcessBook User Guide*.

Value Attribute Icons

Value attribute icons represent substituted, annotated or questionable data. For example, on trends the icons are displayed on the axis opposite the time scale, at the time the value attribute is indicated. Value attribute icons for the last value in the plot are displayed next to the legend.

- Substituted indicates that the value has been changed from its original value. This value is set only by the PI Archive Subsystem when an existing value is changed.
- Annotated indicates that there is a comment about a value.
- Questionable indicates that there is some reason to doubt the accuracy of the value.

When more than one value attribute applies, the highest priority attribute is rendered. Attribute priorities from highest to lowest are: Error, Questionable, Annotated, and Substituted.

Click the icon to display the value attribute data in a dialog.

Note: While the display of value attribute icons can be disabled in PI ProcessBook as an application-wide setting, value attribute icons that appear in the original ProcessBook display are displayed automatically and cannot be toggled on or off in PI Graphic web parts.
Value attribute icons may not be present on secondary PI servers in a collective.

Value Symbols

A value symbol (usually numeric) displays a spot value for a particular data point. A value may include a tag name or a timestamp. For digital state tags, a state label (rather than index number) is displayed.

By default, the most recent value is retrieved from the snapshot table. If the time range end time is changed to a value other than *, the end time is used to retrieve a value. Integer and floating point data are displayed using *default number formats* (page 100), with decimal and group separator characters specified by the *SharePoint locale* (page 7). Non-PI data is displayed as returned from the data source with formats specified by the web part.

Trend Symbols

Trend symbols in PI Graphic web parts use the same logic as the PI Trend web part, with the exception that interactivity features such as zooming, cursors, and tooltips are not supported in PI Graphic.

XYPlot Symbols

The PI Graphic web part displays any XY Plot symbols found in the selected .svg file as they were configured in PI ProcessBook. Interactivity features, such as zooming, cursors and tooltips are not supported in PI Graphic.

Linked Displays

If a saved PI ProcessBook display file (.svg) has a ProcessBook button with a linked display, you can use it to launch the .svg file directly in PI Graphic. Unless a full URL is specified, PI Graphic assumes a linked file is located in the same path as the current display.

If the button references a .pdi file, the web part assumes that an .svg version is the intended target, and searches for the .svg extension. Hovering the mouse over the button area changes the mouse pointer to a hand to indicate that a hyperlink is active.

Image files may be linked or embedded. Linked files should be referenced with relative paths accessible to the SharePoint server. Embedded files must be located in the same folder as the saved .svg file. To ensure that display elements are preserved in PI Graphic, retain linked or embedded image files in the same folder as the .svg file.

Other ProcessBook button types are not supported, including links to other file types (.piw and .pdi), macros (VBA scripts) or operating system commands.

Dataset Support

PI Graphic supports PI ProcessBook display graphics built with PI data, PI Calculation datasets or ODBC datasets.

Any data source used in the display must be accessible to the SharePoint server in order to update content in PI Graphic. For ODBC datasets, a corresponding **Relational Data Source** with an identical System Data Source Name (DSN) must exist in PI Data Services.

For example, a PI ProcessBook user connects to an ODBC data source on his computer through a System DSN named MySQLData. The user builds a ProcessBook display with the ODBC data and saves it in .svg format. Before using the .svg in PI Graphic, the user must create or verify the existence of a corresponding Relational Data Source called MySQLData for the PI WebParts server through PI Data Services.

Create a ProcessBook Display Graphic (.svg)

ProcessBook displays can be saved in .svg format using the **File > Save As** menu command in PI ProcessBook.

Note: Displays in SVG format are preserved as they appear when saved in ProcessBook. For more information about resizing a display, see the *PI ProcessBook User Guide*.

To save a PI ProcessBook display to an SVG document:

1. Open a PI ProcessBook display in PI ProcessBook.
2. Make any changes to the display that you want to see in PI Graphic.
3. Select the desired default element-relative context or module path.

   Module-relative displays are automatically converted to element-relative displays when loaded into PI Graphic web parts.

   The last path selected when the document is saved to .svg format in PI ProcessBook becomes the default context used when the display is loaded into the PI Graphic web part.
4. Verify that a Data Source *corresponding to the DSN* (page 57) exists in PI Data Services to support any relational datasets used in the display, and that tags for PI servers referenced in the display are accessible from the web server.
5. Go to the **File** menu and select **Save As**.
6. Select the file type Scalable Vector Graphics (SVG).
7. Navigate to the desired *network directory location* (page 15).
8. Name the file appropriately and click **Save**.
9. If the display contains linked or embedded graphics, make sure to locate the correct graphic files and copy them to the same network directory location where you saved the SVG:
   - For a linked graphic, copy the actual linked graphic file.
   - For an embedded graphic, copy the graphics saved with the SVG. ProcessBook creates a new image in the same directory as the saved SVG using a variation of the SVG file name for each embedded graphic.
10. Close PI ProcessBook.

Configure PI Graphic Web Parts

You can configure a PI Graphic web part using the web part tool pane and standard *Time Range* (page 18), Appearance, Layout and Advanced tool parts.

PI Graphic also includes two additional tool parts that allow you to select ProcessBook display graphics in SVG format, and a context path for the display.

PI Graphic Configuration

The PI Graphic Configuration tool part is used to specify the display contents for the web part:

- Use the **Selected File** field to indicate the .svg file you want to show in PI Graphic.
- Use the **XSL Transform File** field to provide an optional XSL transformation (.xslt) file to change or enhance the appearance of the SVG graphic without permanently altering its contents.

  Transformation logic can include pattern-based substitution to change tags or server names, to adjust the visual representation of a display, or to attach JavaScript logic to specific elements, for example.

For each option, you can enter a full path to a file, or enter a partial path and click the downward arrow to **Browse** or **Search** for a file. Paths may use a UNC path to a file share located on the web server, such as

```
\\servername\directory\file.svg
```

or an absolute or relative URL, for example:

```
http://myserver/directory/file.svg
```

You can also click the Connections  button to receive a file path through a web part connection.

Current Context Path

The **Current Context Path** tool part allows you to manage the *context* (page 26) of PI ProcessBook displays (.pdi or .svg) in PI ActiveView and PI Graphic web parts. Context paths operate as parameters you can use to dynamically present different PI data in the same file display.

The PI Graphic web part automatically converts module-relative displays to element-relative displays that can be changed dynamically using AF context paths, provided your asset data has been migrated to an AF Server from the PI Module Database.

PI ProcessBook displays an element-relative attribute path with the **e.** prefix. PI Graphic uses a **.|** prefix rather than **e.**. For example, the specification **e. attribute** displays as **.|attribute** in PI Graphic. If the attribute is defined using the **Full Path** option, the context path is displayed with a **.** prefix. For example **e..\element|attribute** in ProcessBook would appear as **.\element|attribute** in a PI Graphic web part.

The last context (or module) path selected when the display file was saved in PI ProcessBook becomes the default context. Once a PI ProcessBook display file is referenced by a web part, use the **Override Default Context Path** field to define a new default context when the file is loaded in the web part. You can also send context paths to the web part from provider web parts.

To override a default context path, use the **Connections**  button to drive the module context for PI Graphic through other web parts on the page.

For example, to create a display that allows you to toggle between attributes under Unit 1 and Unit 2 elements (and show corresponding data for each), you can connect a PI TreeView web part to a PI Graphic web part and send a context path.

The target web part displays an.svg (PI Graphic) display configured to use the same named attributes. Map the relative path parameter from the PI TreeView to the Context Path field on the PI Graphic web part.

Once configured, click on the Unit 2 module in PI TreeView when you want to see data from Unit 2 instead of Unit 1, and vice versa.

Ad hoc SVG Views

When a PI ProcessBook display graphic appears in a PI Graphic web part, you can open additional views of the graphic as needed:

- In the upper right part of the PI Graphic web part, click the downward arrow 

, and then click **Ad hoc SVG**. The SVG view opens in a new browser window.

  You can also right-click on the PI Graphic web part and choose **Ad hoc SVG** to display the graphic in a new, resizable SVG view window.

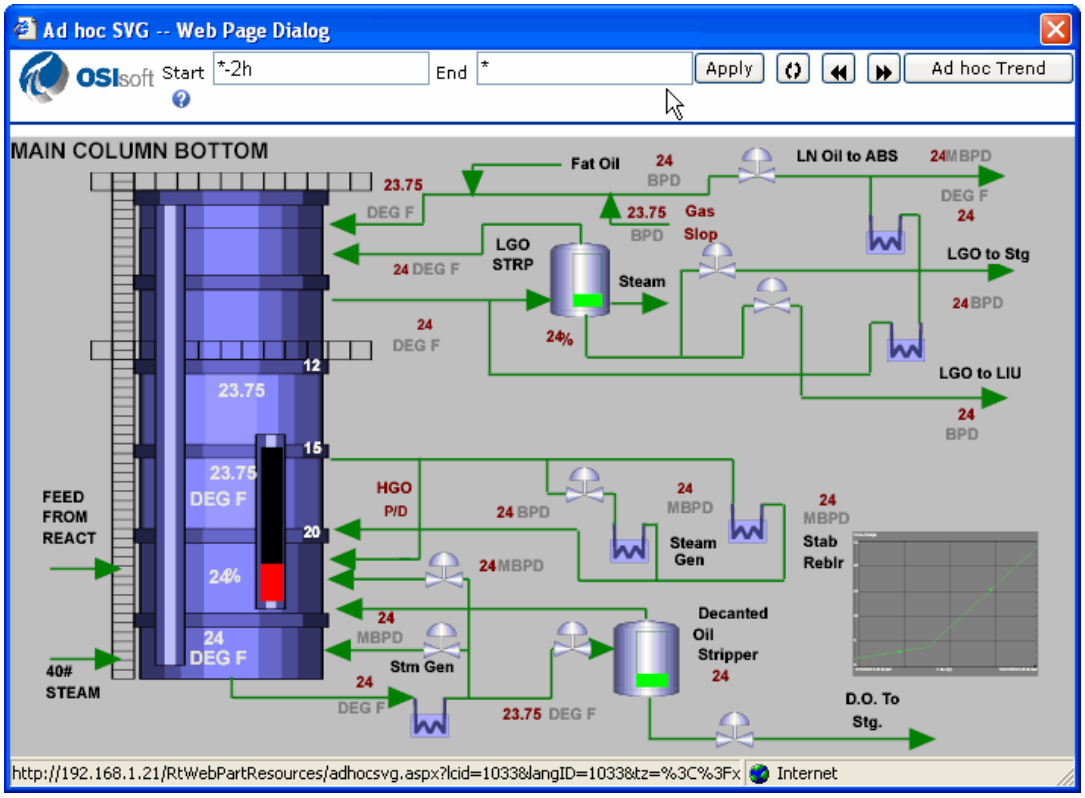
  If a data item appearing in the SVG view can be plotted as a trend, you can right-click and choose **Ad hoc Trend** to display a corresponding *Trend* (page 11).

The time range of the parent web part is used to determine the time range for the SVG view when it is first opened. SVG views are opened in a new window with controls that allow you to scroll the time forward and backward, launch a trend, zoom, or change the time range.

SVG Display Controls

PI Graphic displays and *SVG views* (page 60) support Pan and Zoom capabilities provided by the Adobe SVG Viewer:

- To pan, press the ALT key, then click and drag the image.
- To zoom in, press the CTRL key and click on the image to zoom, or right-click and select Zoom. To zoom out, press SHIFT and CTRL, and click on the image or right-click to show the context menu and select Zoom Out or Original View.



Time Controls

Use the following tools to set or adjust the time range:

- Enter a value in the Start field to specify the start of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Enter a value in the End field to specify the end of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Click **Apply** to apply updated time values.
- Click the **Revert** button to restore default start and end time values.
- Click the **Scroll Back/Scroll Forward** buttons to adjust **Start** and **End** times backward or forward by the amount of the current interval duration. If the Start and End values are relative times in PI format, scrolling converts the values to absolute times.

PI Graphic Connections

The PI Graphic web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts element-relative context paths (from PI Table and PI TreeView web parts, for example) to update dynamic content associated with PI Attributes.
- Accepts querystring parameters to set initial values.

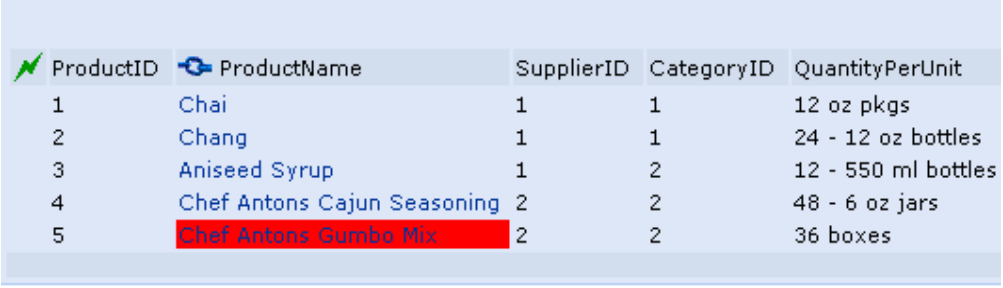
As a Provider

- Provides symbol names and data sources (semicolon delimited) to other web parts.

Chapter 10

The PI Table Web Part

The PI Table web part presents row and column data in tabular format. PI Table also supports formatting configurations you can apply to specify the appearance and attributes of table cell data.



ProductID	ProductName	SupplierID	CategoryID	QuantityPerUnit
1	Chai	1	1	12 oz pkgs
2	Chang	1	1	24 - 12 oz bottles
3	Aniseed Syrup	1	2	12 - 550 ml bottles
4	Chef Antons Cajun Seasoning	2	2	48 - 6 oz jars
5	Chef Antons Gumbo Mix	2	2	36 boxes

PI Table is particularly useful for displaying relational data from ODBC, OLE DB and other sources, and from PI Calculation and web services datasets.

Note: PI WebParts data sources and datasets are configured in PI Data Services by an administrator. For more information, see the *PI Data Services Administrator Guide*.

Configure PI Table Web Parts

You can configure a PI Table web part using the web part tool pane and standard configuration tool parts including *Time Range* (page 18), *Table Columns* (page 27), *Filter Values* (page 30), Appearance, Layout and Advanced.

The modified *Selected Data* (page 19) tool part provides access to configured relational, web service and PI Calculation datasets only.

PI Table Connections

The PI Table web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts SQL query parameters and placeholder values from any web parts that can provide them, such as PI TreeView and PI Table.
- Accepts querystring parameters to set initial values.

As a Provider

- Column values can be sent to consuming web parts as parameters when a row is selected. Examples include columns of tag names, context paths, timestamps, numeric values used to resolve numeric placeholders, or PI Unit names used to resolve Text placeholders.
- PI Table column values can also be formatted as hyperlinks using table configuration formats. These hyperlinks can be configured to navigate to a different page, open a new page or launch a row connection.
- You can also send a column value from a selected row to any web part that can consume it as a filter value. A typical use is a connection to the *Excel Web Access (EWA) web part* (page 36), where the column value parameter can be used to resolve a PI DataLink function in a spreadsheet cell.

PI Table rows can be configured to provide the following:

- PI tag names to PI Trend, PI XYPlot, and PI Gauge web parts.
- SQL query parameters to PI Trend, PI XYPlot, and PI Table web parts.
- File URLs to PI Graphic and PI ActiveView web parts.
- Contact information datasets to PI Messenger web parts.

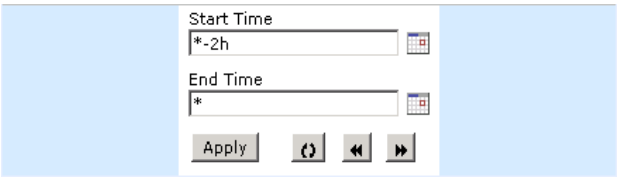
When a column value is clicked to launch a web part connection, a row displays an active Connection icon  to indicate the data sent to a connected web part.

	ProductID	ProductName	SupplierID
	1	Chai	1
	2	Chang	1
	3	Aniseed Syrup	1
	4	Chef Antons Cajun Seasoning	2
	5	Chef Antons Gumbo Mix	2

Chapter 11

The PI TimeRange Web Part

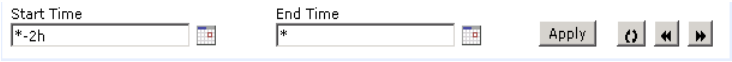
The PI TimeRange web part allows you to set time ranges for all web parts on a page, and scroll the time range backward and forward by interval.



PI TimeRange features are identical to the time range tools available to most web parts through the tool pane. However, PI TimeRange allows you to enter time ranges directly on a web part page in run mode, without modifying individual web part tool panes.

An *implicit connection* (page 66) is created between the PI TimeRange web part and all other OSI web parts on that page that can consume time ranges, when the PI TimeRange web part is added to a page. This connection allows you to set or change time ranges for other PI WebParts simultaneously. You can override this behavior by mapping explicit time range connections between web parts, to allow individual time settings.

Set a Time Range



Use the following tools to set or adjust the time range:

- Enter a value in the Start field to specify the start of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Enter a value in the End field to specify the end of the time range. Time can be expressed in PI time format or the default Windows Short Date and Time format configured for SharePoint.
- Click **Apply** to apply updated time values.
- Click the **Revert** button to restore default start and end time values.
- Click the **Scroll Back/Scroll Forward** buttons to adjust **Start** and **End** times backward or forward by the amount of the current interval duration. If the Start and End values are relative times in PI format, scrolling converts the values to absolute times.

- Click a Calendar  button to display a calendar picker. Enter a time and click a date to set a Start or End time. Scroll through months using the arrow buttons at top.

Implicit Time Range Connections

A PI TimeRange web part can supply Start and End Times to all other PI WebParts on a page that are designed to consume time ranges, without being explicitly connected to them. This implicit connection allows web parts on a page to display data over the same time range through a single point of control and without configuration.

In order of precedence, a web part can collect time range parameters from three sources:

- An explicit SharePoint connection to another web part, where the Connections button  appears green in the Time Range tool part.
- An implicit connection to an instance of PI TimeRange.
- Start and End time values specified directly in the Time Range portion of a tool part.

Implicit connections are created when a PI TimeRange web part is added to a page. All applicable web parts automatically collect Start and End Times from PI TimeRange regardless of their configuration, unless they are specifically configured to receive a time range from another provider web part.

If you want to use different time ranges for web parts on a page, you can add additional PI TimeRange web parts, and create explicit connections to each. Any remaining web parts maintain an implicit connection to the first instance of PI TimeRange added to the page, and react automatically to time changes made in that provider web part.

Configure PI TimeRange Web Parts

You can configure a PI TimeRange web part using the web part tool pane and the standard tool parts including *Time Range* (page 18), *Filter Values* (page 30), Appearance, Layout and Advanced, and an additional Display Properties tool part used to change the orientation of the web part. The Time Range tool part determines the default time range for the PI TimeRange web part.

PI TimeRange web parts can be displayed in horizontal or vertical orientation.

To change the orientation:

- Choose **Horizontal** to display time range controls as a single row across the width of the page zone, with buttons to the right.
- Choose **Vertical** to display time range controls centered and aligned top to bottom, with buttons centered at the bottom.

PI TimeRange Connections

The PI TimeRange web part supports *SharePoint connections* (page 33) to other web parts.

As a Consumer

- Accepts querystring parameters to set initial values.

As a Provider

- Provides initial time range and updates through implicit or explicit connections.
- Provides *time and status parameters* (page 67) to third-party web parts.
- Provides parameters as filter values to consumer web parts, such as the *Excel Web Access (EWA)* (page 36) web part. In the EWA web part, the parameter value can be used to resolve a PI DataLink function in a spreadsheet cell.

Third-Party Web Part Connections

You can connect PI TimeRange to third-party web parts to send date and time information. Two alternate time forms are available to facilitate PI TimeRange connections to third-party web parts.

The values

```
Start Time (Localized)
End Time (Localized)
Current Time (Localized)
Time Range (Localized)
```

provide values expressed as Windows-based timestamps formatted according to the site's *locale* (page 7) setting. Time Range includes both start time and end time, delimited by a semicolon.

The values

```
Start Time (UTF)
End Time (UTF)
Time Range (UTF)
```

provide values in Universal Time Format (UTF), which matches the string format specified by ISO-8601 Section 4.3.2 (Date and Time of Day – Extended Format):

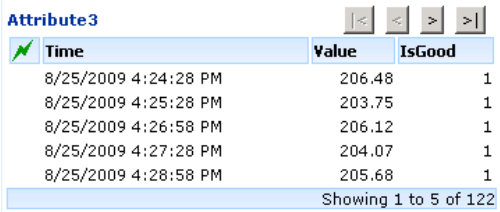
```
YYYY-MM-DDThh:mm:ss
```

An additional parameter, the **IsUpdating** flag, indicates whether a time range is an updating time range. PI WebParts use this flag to determine if they need to poll PI Data Services for updates.

Chapter 12

The PI TimeSeries Web Part

The PI TimeSeries web part displays time series data, usually from the PI Data Archive, in tabular format along with many other PI tag attributes.



PI TimeSeries web parts can also display PI calculation, relational and web service datasets in time series format. To use a dataset, select the dataset column that contains the values you want to display in PI TimeSeries. Columns configured in the web part for PI tags, and that do not have corresponding column names in the dataset, show blank data.

PI Table configuration formats can be created for time series datasets and applied to PI TimeSeries web parts to add custom formatting.

Configure PI TimeSeries Web Parts

You can configure a PI TimeSeries web part using the web part tool pane and standard configuration tool parts including *Time Range* (page 18), *Selected Data* (page 19), *Table Columns* (page 27), *Filter Values* (page 30), Appearance, Layout and Advanced.

Note: PI TimeSeries automatically includes the first time column in a dataset to provide timestamp data.

PI TimeSeries Connections

The PI TimeSeries web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts PI tag data sources from any other web part and adds them to the list of configured data.

- Accepts querystring parameters to set initial values.

As a Provider

- Column values can be sent to consuming web parts as parameters when a row is selected.
- Provides a column value from a selected row as a filter value, through an ITransformableFilterValues connection. For example, the column value can be consumed by the Excel Web Access web part and used to resolve a PI DataLink function in a spreadsheet cell.

Chapter 13

The PI Messenger Web Part

The PI Messenger web part displays the online status of a list of instant messaging (IM) contacts provided through Windows or MSN Messenger services.

Note: PI Messenger requires Microsoft Office 2003 or higher, and either Windows Messenger, Windows Live Messenger, MSN Messenger, or MS Office Communicator IM clients installed on the client computer.

To retrieve addresses from Outlook Address Book, Outlook XP or the Outlook 2003 Address Book Control must also be installed.

Configure PI Messenger Web Parts

You can configure a PI Messenger web part using the web part tool pane and standard Appearance, Layout and Advanced tool parts. The modified *Selected Data* (page 19) tool part for PI Messenger web parts provides access to configured datasets only. For example, an administrator can create a contact list with IM addresses and save it as a data source in PI Data Services.

PI Messenger also includes two additional tool parts that allow you to manage a list of contacts and how they are displayed in PI Messenger.

Contact List Properties

The Contact List tool part allows you to build and maintain a list of contacts available to the PI Messenger web part.

- Enter contacts manually using the entry fields at the top of the Contact List table. Each row in the list below represents a single contact, including an **Instant Messaging (IM) Address**, **Display Name**, and display **Group**. The **IM Address** is the only required field.
- Click the **Add** (+) button to add contact information in the fields to the contact list.
- You can import contacts or groups directly from Microsoft Outlook by clicking the **Address Book**  button. Select the contacts you want to add and click OK to import the list.

Note: The *Outlook 2003 Address Book Control* (page 72) must be installed on the client computer to use the Address Book feature.

- Use the up  and down  arrow buttons to reorder contacts in the list.
- Click the selection button to the left of a contact to edit contact information.
- Click check boxes next to contacts and then the delete  button to delete selected contacts. Click the clear  button to remove all contacts from the list.

Outlook Address Book Control

The Outlook 2003 Address Book Control must be installed on the client computer to use the Address Book feature. Otherwise, PI Messenger displays an error message indicating that the client computer is not properly configured when the user clicks the Outlook Address Book button.

The Outlook Address Book Control is not selected by default in a typical installation of Microsoft Outlook XP or 2003. To enable this feature, perform the following steps.

1. Run the Microsoft Office Setup program.
2. Choose **Add or Remove Features**.
3. Check the box labeled **Choose Advanced Customization of Applications**.
4. Expand the tree node for Microsoft Office Outlook.
5. Select **Address Book Control** and choose **Run From My Computer**.
6. Click **Update**.

To get the **Outlook Address Book Control** from an Office XP installation, follow the Office 2003 steps, but ignore step 3.

Settings Properties

The **Settings** tool part provides access to pre-defined configurations for the dataset selected in the Selected Data section. Saved configurations allow you to:

- define the names of selected dataset columns to use for the **Group Name**, **Display Name**, and **IM Address** fields.
- define an Active Directory address that can be used to browse for predefined groups of users, and that also defines the names of the **Display Name** and **IM Address** fields.

If you select a pre-defined configuration that defines a valid Active Directory address, the Active Directory Group configuration in Settings is enabled. You can then search the Active Directory for groups:

- Enter group names using the **Active Directory Groups** field. Members of a referenced group are included in the PI Messenger contact list. Multiple group names can be specified, separated by semicolons.

  You can also click **Browse** to display a tree of organizational unit objects found at the Active Directory location. Select nodes in the tree and click **Apply** to add associated groups or names to the contact list. Click **OK** to add the name of the selected node.

You can also use the Connection  button to pass an Active Directory path and group name from another web part.

- Select a configuration from the **Saved Configurations** menu, or the blank configuration to use system defaults.

  The Configure  button opens the **PI Messenger Configuration** page where you can create or edit contact configurations.

Note: PI WebParts data sources and datasets are configured in PI Data Services by an administrator. For more information, see the *PI Data Services Administrator Guide*.

- Choose an **Arrange Contacts By** option to sort contacts in the PI Messenger contact list by Group or by Online/Offline Status.

PI Messenger Connections

The PI Messenger web part supports *SharePoint connections* (page 33) to other PI WebParts:

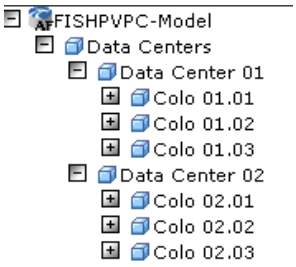
As a Consumer

- Accepts LDAP Active Directory paths from other web parts to update IM contact lists.

Chapter 14

The PI TreeView Web Part

The PI TreeView web part is a navigational control most typically used to browse assets in an AF database and set context paths for other web parts. By providing AF Element and Attribute data to other web parts through web part connections, PI TreeView can drive the view of assets provided by web parts in the page.



PI TreeView web parts can pass AF Attributes and context paths to both PI WebParts and third-party or custom web parts.

Note: PI TreeView respects access restrictions applied within the AF Server. Users must have Read access to an element or attribute to see it in the web part.

Configure PI TreeView Web Parts

You can configure a PI TreeView web part using the web part tool pane and standard *Filter Values* (page 30), Appearance, Layout and Advanced configuration tool parts.

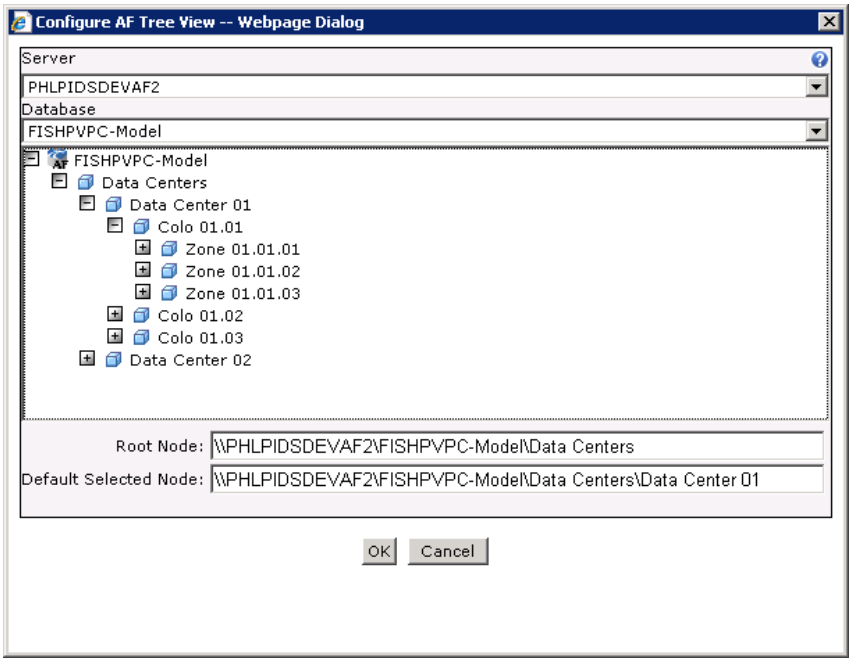
Browse PI TreeView

You can browse and configure hierarchical AF database trees for use in PI TreeView web parts. PI TreeView allows you to drive other web parts in the web part page. By selecting individual nodes in the tree, you can send attributes and their context paths to connected web parts.

To browse or configure a tree:

1. Click the **Browse** button in the PI TreeView tool pane to display the Configure AF TreeView dialog.
2. Choose an AF Server from the list of available **Servers**.
3. Choose an AF database from the list of **Databases** within the selected AF Server.

Note: The top level of the tree is specified by the **Root Node** until you select a different **Server** and **Database**, or specify a different root node.



Expand the tree to find the desired elements and then drag them into the settings fields at bottom to set paths. You can also right-click an element and use the context menu to save it to a field.

Root Node

A path to the root node of a tree that appears in the PI TreeView web part, such as:

```
\\<AF Server Name>\<AF Database Name>
```

The root node should specify a parent that includes all descendent elements and attributes desired for use. This parameter is required to configure the web part.

Default Selected Node

An optional path to an element used as the default selected node for the web part. The path uses the following format:

```
\\<AF Server Name>\<AF Database Name>\<Element>
```

Attributes of the specified element path are sent to connected web parts automatically when the page is loaded.

Choose Attribute Parents

When using the PI TreeView web part to drive other web parts, you may need to specify which AF Attributes are available for web part connections. Attribute parents are AF Elements or Attributes whose child attributes are available for connection.

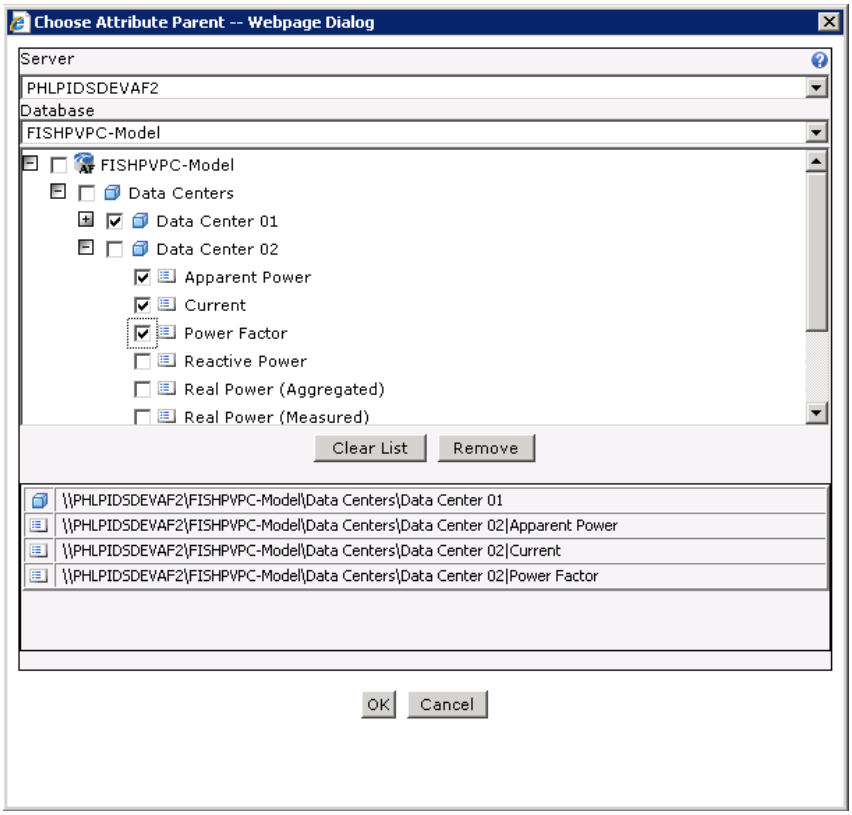
Attribute parent objects can reside anywhere in the PI System AF hierarchy. You can specify multiple attribute parents. At run-time a context path is set by selecting an element from the tree. Attributes are matched by name, based on the connection details.

You can also send a comma-separated list of attribute parents at page load time using a *querystring parameter* (page 35).

Note: Attribute parent lists cannot be sent from a provider web part.

To choose attribute parents:

1. Click **Choose Attribute Parent** .
2. Browse through the tree and select AF objects to add them to the list of parents.
3. Click **OK**.



Display Properties

Number of Levels Initially Loaded

The number of node levels to be read initially from the AF database relative to the root node. The default value is 2. If the **Maximum Number of Levels to Display** is greater than this value, additional nodes are loaded when the tree view is expanded in the web part.

Number of Levels Initially Displayed

The number of node levels initially shown expanded relative to the root node. The default value is 2. Any additional levels loaded appear collapsed, but can be expanded up to the **Maximum Number of Levels to Display**.

Maximum Number of Levels to Display

The maximum number of node levels to display at any time relative to the root node. Nodes beyond the maximum level do not appear even if all visible nodes are fully expanded. The default value is 8.

URL to Icons

An absolute or site-relative location for stored image files used as descriptive icons for tree nodes. This can be a fully-qualified URL to an image file or only a graphic file name, in which case a URL property of an attribute is used to resolve the icon location.

The default value is read from the `imagedirectory` setting in the `PIPC\RtWebParts\web.config` file on the web server.

Note: If this value is changed, the default icons may not be found by the web part. Be sure to copy those icons needed for the proper display of the tree.

PI TreeView Connections

The PI TreeView web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Provider

Data associated with an AF Attribute can be sent to connected web parts. This data can be in the form of PI point values or stored directly in AF.

PI TreeView can provide the following AF data through a web part connection:

- The name, relative context path or fully-qualified path to an element
- A list of tags associated with the attributes that are an immediate children of the element as references
- The value of an attribute

The data sent for a selected attribute depends on the data referenced by the attribute. Attributes that reference non-PI data sources send the value associated with that attribute on the specified **Query Date**. Attributes that reference a single PI point send a tag name.

Note: For most web parts, data is displayed using the AF Attribute's default unit of measure, regardless of whether an underlying PI point has different units. For PI TreeView, which passes on an underlying PI point tag name, a consuming web part shows data using the default units for the PI tag, not the units defined for the AF Attribute.

These items may be consumed by other web parts as follows:

- As a *filter value* (page 30). For example, the item can be consumed by the Excel Web Access web part and used to resolve a PI DataLink function in a spreadsheet cell.

As a Consumer

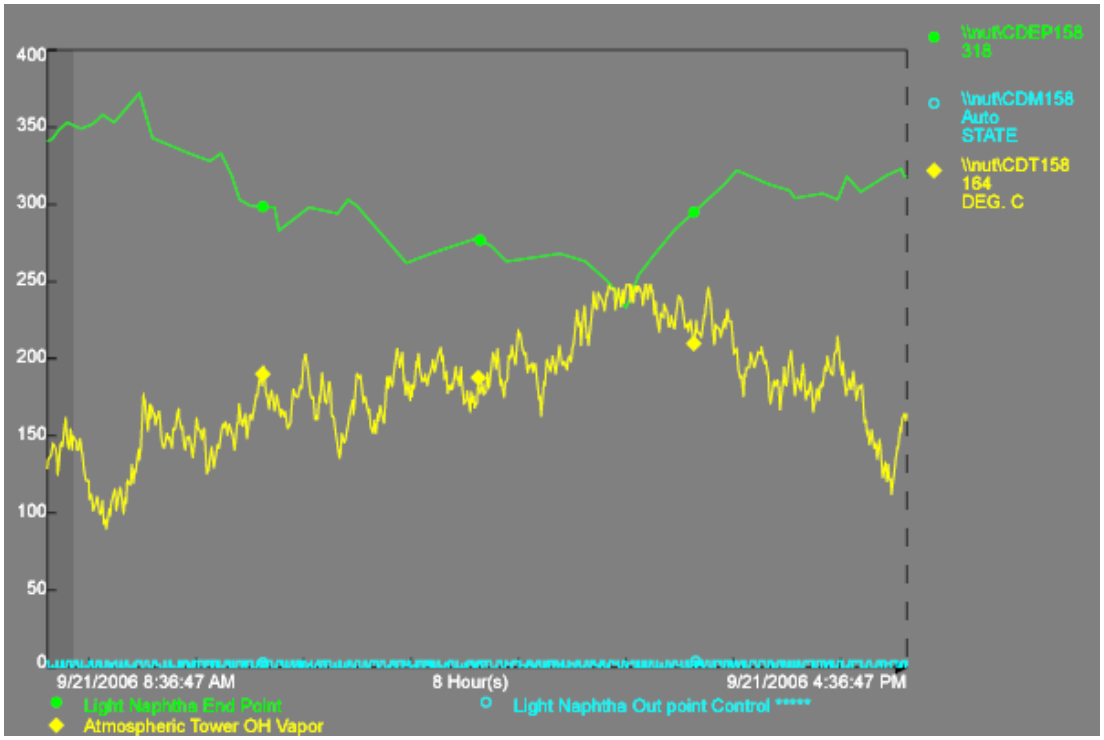
- Accepts a **Query Date** value from a web part connection.
- Accepts querystring parameters to set initial values.

Chapter 15

The PI Trend Web Part

The PI Trend web part presents data in an interactive format that can update with new data to display data trends in real-time.

PI Trend allows you to track PI point values over time, show the results of an ODBC or OLE DB query, or combine data from PI, relational and web service data sources. You can contrast trends among different tags or attributes, or plot them against a PI calculation dataset such as a moving average of the same underlying PI point.



Each trace drawn in the plot area of the trend represents a single stream of time series data in an X-Y coordinate system. The X-coordinate represents a time stamp (date and time) and the Y-coordinate represents a numeric value.

Trends (page 11) can also be generated and viewed as needed from other PI WebParts, and share most of the same display options and controls.

Note: This web part is rendered in Scalable Vector Graphic (SVG) format and requires the Adobe SVG Viewer.

Configure PI Trend Web Parts

You can configure a PI Trend web part using the web part tool pane and standard configuration tool parts including *Time Range* (page 18), *Selected Data* (page 19), Appearance, Layout and Advanced.

PI Trend also includes an additional Trend Properties tool part that allows you to set scales for trend traces and form the display of legends and other data items.

Value Scale Properties

A PI Trend web part has a time scale and at least one value scale. Most trends display time along the horizontal (x) axis, but you can change the display orientation so that the time scale appears on the vertical (y) axis.

Note: These settings apply only to the currently-selected data item when **Multiple value scales** is selected. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Value Scale** tool part includes these properties:

Scale Range

Minimum Scale and **Maximum Scale** properties set the range of additional Y Value scales, if enabled, for each Selected Data item. The following options provide different means to determine minimum and maximum scale values:

Autorange

Autorange calibrates the scale automatically using actual data values whenever updates are received. The calibration depends on the **Multiple Y Value Scales** setting:

- If Multiple Value Scales is selected, each trace has its own values scale. The lowest and highest values for each trace determine the minimum and maximum values for the corresponding scale.
- If Multiple Value Scales is not selected, a single scale is used for all traces. The lowest minimum and highest maximum values currently plotted for all traces are used as minimum and maximum values for the combined scale.

Database

For floating point or integer PI point values based on a PI Point, or an AF Attribute that refers to a PI Point, Database assigns the Zero attribute as the minimum scale value, and the Zero attribute plus the Span attribute as the maximum scale value. For digital state tags, the minimum is always **0**, and the maximum is always one less than the total number of states. This option is disabled for dataset columns and other non-PI data.

Custom

Custom applies user-specified minimum and maximum scale values entered in the accompanying text boxes.

Number Format

A *number format* (page 100) is applied to scale, legend, tooltip and cursor values per each additional Y Values Scale, if enabled, in PI Trend. Choose each item in the Selected Data list and apply settings individually. Choose each item in the Selected Data list and apply settings individually.

When the **Database** format is selected for PI point data, the number of decimal places used for floating point numbers is determined by the *DisplayDigits* (page 101) attribute. This format is disabled for non-PI data, which uses the General number format by default.

Invert Scale

Inverts minimum and maximum scale values such that values decrease moving away from the origin along the value scale. The default value (unchecked) places the minimum scale value at the origin.

Logarithmic

Displays scale and trace values on a base-10 logarithmic scale. This property is not applicable to string, digital or integer data. The default value (unchecked) uses a linear scale.

Data Markers

Displays distinguishable data markers for each value stored in the data source. Data markers provide a visual reference other than trace color, and are used to reference traces in legends, tooltips and cursors.

Stepped

Determines how to plot traces on a trend. By default, traces are drawn according to the tag, attribute or dataset definition. When set to **On**, traces are forced to draw in stepped format. When set to **Off**, traces are forced to draw as continuous lines.

Display Properties

Trend display properties determine how visual elements of a PI Trend web part are displayed.

Time Scale

Default time scale values use a full timestamp format, but other timestamp formats are available:

- **Full timestamp** displays start time at the origin and end time at the far end of the time scale.
- **Partial timestamp** displays evenly spaced date or time units along the time scale axis, as space permits.

For example, an eight-hour plot may display individual hourly time values along the time scale. The current date and time appear in the upper right corner.

- **Relative timestamp** displays time unit offsets from the End Time.

  Using the previous example, the scale would be labeled -1 to -7 moving from the end to the beginning of the time scale axis. The units are displayed in the middle of the scale, with current date and time displayed in the upper right corner of the trend.

Time Label

The label used for the scale:

- The default value **Duration** expresses units appropriate to the actual time range duration of the plot.
- **Units** displays time units represented by trend gridlines used in the plot.
- **None** displays no time axis label.

Legend

Use the legend group to determine the information that appears in the trend legend. A marker for each trace is shown to the left of selected items. If no options are selected, the legend does not appear. By default, all checkboxes in the Legend group are checked. If space is limited, the legend may not appear on the trend.

- **Dataset Name** displays the name of each trace in the order it appears on the Selected Data list in the tool part.
- **Description** displays the descriptor attribute of a PI tag or the description for a dataset column at the bottom of the plot.
- **Last Value** displays the most recent or last value for each trace shown on the plot.
- **Units** shows the engunits attribute for PI tag traces.

Display Options

Display options control the display of certain trend plot items. With the exception of gridlines, display options are not enabled as default settings:

- **Title** displays the contents of the text field in the top left corner of the plot if the checkbox is enabled. The default title text is *Plot0*. If no title text is entered, a title does not appear in the plot.
- **Scales inside axis** toggles the display of value scales inside or outside the value axis of the plot.
- **Multiple value scales** displays individual values scales for each trace. When cleared, a common scale is calculated for all traces.
- **Show Grids** displays horizontal and vertical grid lines corresponding to scale markers within the trend plot.
- **Show Value Attributes** toggles the display of value attribute icons applicable to trend data.
  - Substituted ⇩ indicates that the value has been changed from its original value. This value is set only by the PI Archive Subsystem when an existing value is changed.

- Annotated indicates that there is a comment about a value.
- Questionable indicates that there is some reason to doubt the accuracy of the value.

When more than one value attribute applies, the highest priority attribute is rendered. Attribute priorities from highest to lowest are: Error, Questionable, Annotated, and Substituted.

Trend Orientation

Trend Orientation settings allow you to configure the orientation of the trend and axes:

- The Horizontal icon sets the trend to the default horizontal display, with time plotted on the X axis and Start Time to the left.
- The Descending Vertical icon sets the trend to display vertically with time plotted on the Y axis and Start time in the top left corner. The value scale is shown horizontally at the top of the plot.
- The Ascending Vertical icon sets the trend to display vertically with time plotted on the Y axis and Start time in the bottom left corner. The value scale is shown horizontally at the bottom of the plot.

Trend Formatting Properties

If specific formats are defined for your site under PI Data Services, you can select and apply one to PI Trend web parts:

- Select and apply a named format from the **Trend Formatting** list. The default value is **System Default**.
- If you are a PI WebParts administrator, you can use click the **Configure** button to edit or add new formats. A configuration page opens in a new browser window with specific formatting tools.

  See the *PI WebParts Administrator Guide* for more information about defining named formats.

PI Trend Connections

The PI Trend web part supports *SharePoint connections* (page 33) to other PI WebParts:

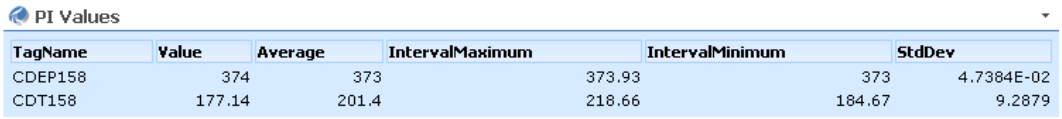
As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts PI tag or attribute data sources from any other web part and adds them as additional trend traces.
- Accepts querystring parameters to set initial values.

Chapter 16

The PI Values Web Part

The PI Values web part presents single point events from a time series, such as a current tag value and related information, in tabular form.



TagName	Value	Average	IntervalMaximum	IntervalMinimum	StdDev
CDEP158	374	373	373.93	373	4.7384E-02
CDT158	177.14	201.4	218.66	184.67	9.2879

PI Values is particularly useful for calculating and displaying statistical summary values (including average, minimum, maximum, or standard deviation) for selected PI points, and can be updated automatically at a preset frequency.

In addition to PI data, PI Values also supports relational and web service data sources. To use a dataset, select the dataset column that contains the values you want to display in PI Values. Columns configured for the web part that do not have a matching column (by name) in the dataset show blank values in those columns for the dataset rows.

PI Values Data Display

These standard PI summary calculations are supported in PI Values web parts:

Calculation	Definition
Average	The average of all events that take place during a given time period.
IntervalMinimum	Minimum event value encountered during a given period.
IntervalMaximum	Maximum event value encountered during a given period.
Range	Difference between the minimum and maximum values returned for a given period.
StdDev (Standard Deviation)	Time weighted Standard Deviation of all event values during a given period.
Total	Total over the given time range.
PercentGood	The percentage of good events during a given period.
IntervalMinimumTime	The time the Minimum event value occurred within a given period.
IntervalMaximumTime	The time the Maximum event value occurred within a given period.
StartOfIntervalTime	The start time for a given period.

Calculation	Definition
EndOfIntervalTime	The end time for a given period.

You can also use a PI Values web part to display data from a PI Calculation dataset. Datasets provide the means to present more complex computations in any desired combination. For example, you can use PI Data Services to create a dataset that displays time, value and running or moving average columns to track a PI point and its average value over a selected time range.

Configure PI Values Web Parts

You can configure a PI Values web part using the web part tool pane and standard tool parts including *Time Range* (page 18), *Selected Data* (page 19), *Table Columns* (page 27), *Filter Values* (page 30), Appearance, Layout and Advanced.

Note: The default `RtSnapShot` table configuration used for PI Values web parts applies Trend behavior to the Dataset column; apply a different table configuration to set a different behavior.

PI Values tools also include an additional tool part that allows you to define Summary Parameters for calculations.

Summary Parameters

The Summary Parameters determine how summary data is calculated for PI tags in the Selected Data list.

Note: If some values received over the Calculation Interval are bad, summary values are divided by the fraction of the interval for which there were good values.

Use Web Part Time Range

Check to indicate that the web part time range should be used to determine the calculation interval.

The check box is cleared by default. When the check box is selected the Calculation Interval, Sync Time and Interval Type fields are disabled.

Calculation Interval

The length of time used to sample the PI events being summarized, expressed as a numeric value followed by a PI time interval or abbreviation. Fractional values are allowed when the interval is hours, minutes, or seconds (for example *90m* or *1.5 hours*). The default value is *60m*.

Interval Type

Specify the type of interval period used to collect data for the summary calculation:

- Choose **Fixed** to use data collected during the most recent closed interval, based on clock time. The last full interval completed prior to the End time of the table is used as the calculation period.
- Choose **Running** to use data collected during the current open interval, based on clock time. The fractional period following the last full interval completed is used as the calculation period.
- Choose **Moving** to use data collected during the most recent closed interval, based on the End time of the table. The full interval defined by the End time minus the Calculation Interval is used as the calculation period.

Sync Time

A time on the twenty-four hour clock synchronized with the Calculation Interval to determine calculation times. Sync Time is required for Fixed and Running summary calculations.

For example, if a Calculation Interval is one hour and the Sync Time is 00:00:00, fixed summaries are calculated every hour on the hour (or upon the first update that occurs thereafter) based on all events occurring from the beginning of the previous hour to the beginning of the current hour.

Running summaries are calculated at each update interval, and show the summary of all events from the beginning of the current hour to the current time.

For a Sync Time of 00:30:00, fixed calculations occur every hour on the half hour, while running summaries are calculated at each update interval for all events occurring since the last half hour.

Sync Time is ignored for moving summaries, which are recalculated at each update interval. For a Calculation Interval of one hour, the summary of all events occurring between one hour ago and the current time is displayed.

Conversion Factor

Enter the time unit of flow for the source tag used in a *Total* calculation. By default, the PI server assumes source tag values are expressed in units per day. If a tag is measured at a rate other than units per day, a conversion factor must be supplied to convert input values and calculate totals correctly.

For example, apply a factor of *1h* to indicate the source tag is measured in units per hour, or *15m* to indicate a rate of flow in units per quarter hour. Conversion factors may be expressed in day *d*, hour *h*, minute *m*, and second *s* increments.

Note: A conversion factor is not required for other calculation modes.

Display Summary Settings

Displays start and end times for the current summary interval in the table footer if enabled, with summary columns included in the table.

PI Values Connections

The PI Values web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts PI tag data sources from any other web part and adds them to the list of configured data.
- Accepts querystring parameters to set initial values.

As a Provider

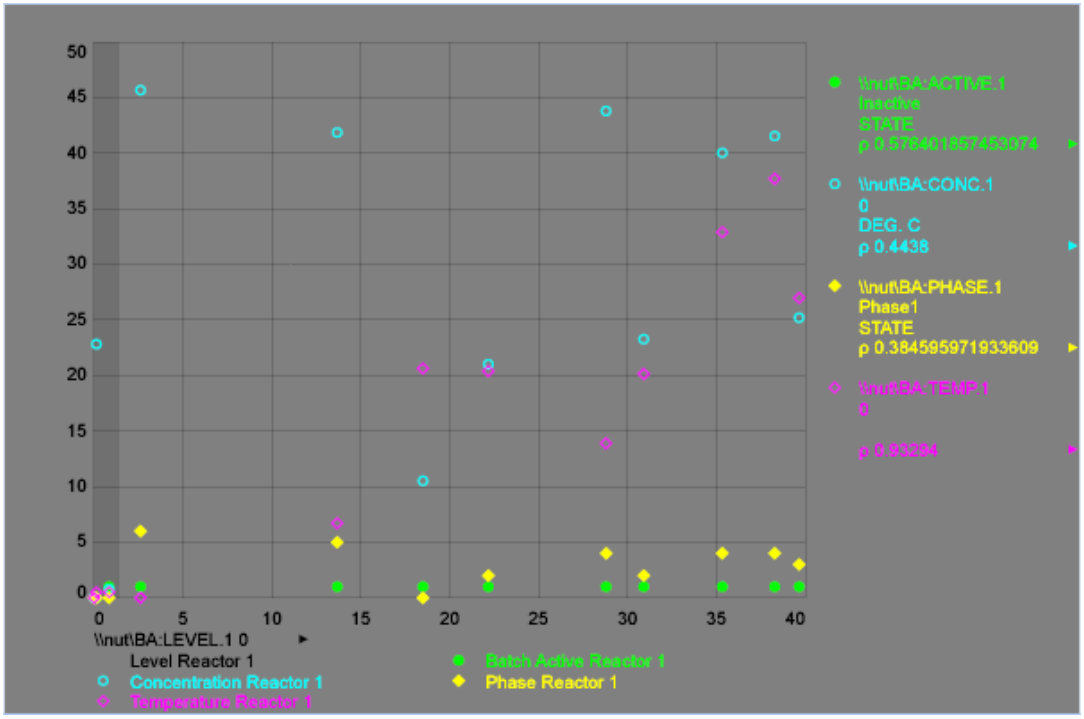
- Column values can be sent to consuming web parts as parameters when a row is selected.
- Provides a column value from a selected row from a data column as a filter value, through an ITransformableFilterValues connection. The column value can be consumed, for example, by the Excel Web Access web part and used to resolve a PI DataLink function in a spreadsheet cell.

Chapter 17

The PI XYPlot Web Part

The PI XYPlot web part compares two or more selected data items against each other in a scatter plot. For example, you can use PI XYPlot to measure the efficiency or quality of a process, by comparing sampled data to well-known or validated data.

PI XYPlot includes an X Tag selection mechanism that allows you to choose between interpolated and recorded values, and the ability to show a linear correlation line and correlation coefficient.



PI XYPlot web parts can plot data from relational and web service datasets, as well as recorded or interpolated attribute and tag values and calculated summaries. Tools enable you to zoom and scroll the display and view cursors and tooltips.

Note: This web part is rendered in Scalable Vector Graphic (SVG) format and requires the Adobe SVG Viewer.

Configure PI XYPlot Web Parts

You can configure a PI XYPlot web part using the web part tool pane and standard tool parts including *Time Range* (page 18), *Selected Data* (page 19), Appearance, Layout and Advanced.

PI XYPlot tools also include an additional XYPlot Properties tool part that allows you to customize the formatting of a plot.

Data Retrieval Properties

These properties determine how data items are acquired and paired for plotting.

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Data Retrieval** tool part includes these properties:

X Tag

Choose a data item to use as the X source for the plot. The X axis scale for the plot is based on this item.

X Query Type

Choose an acquisition method for the X Tag data item query:

- Recorded data are actual recorded values from the PI server or selected dataset column.
- Interpolated data are points taken from regular time intervals by sampling a full dataset. Only PI tag data can be interpolated. If you choose to interpolate X tag data, you can also enter a sample interval to govern the rate of interpolation.

  Note: This field is disabled if the X Tag item is not selected in the Selected Data list.

Y Query Type

Choose an acquisition method for the Y tag data item query:

- Recorded data are values from the PI server or selected dataset. Y values are indexed to correspond with X values, and may be time-shifted.

  Note: PI XYPlot supports columns from datasets without timestamps only if the Recorded retrieval method is used.

- Interpolated data are points taken from regular time intervals by sampling a full dataset. Only PI tag data can be interpolated. Y values are indexed to correspond with X values, and may be time-shifted.

- Synchronized data queries the Y data array using the time array returned with X data. Provided the Y data is interpolated over the same time range, a value should be determined and paired with each respective X event.
- Matched queries can be used in cases where interpolated data are not desirable. If X and Y data have matching timestamps over the desired interval, matching effectively pairs X and Y values by timestamp. Similarly, if X and Y timestamps are rough, but not necessarily exact matches, then it may be appropriate to match Y events to X events using the *Match or Previous* or *Match or Next* options.

Note: This field is disabled if the X Tag item is currently selected in the Selected Data list. Select a Y Tag item to choose the Y Query Type.

Use for all Y tags

Choose to apply the Y Query Type to all Y tags used in the plot.

Note: PI Calculation, relational and web service dataset columns cannot be interpolated. Non-PI items set to Interpolated are automatically reset to Recorded.

Plot Time Properties

For the Y Query Types *Synchronize* and *Match*, the Plot Time is automatically made the same as the Plot Time of the X Tag. For *Recorded* query types, the **Sample Interval** is disabled.

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

- Enter the **Start Time** for the selected data item. The default is *-2h, or two hours prior to the present time.
- Enter the **End Time** for the selected data item. The default is *, or the current time.
- Enter a **Sample Interval** if the data is interpolated.

Value Scale Properties

Each PI XYPlot web part has an X scale and one or more Y scales. Value Scale properties configure the appearance of the Y scale for each plotted Y data item:

Note: These settings apply only to the currently-selected data item. Choose each item in the Selected Data list and apply settings individually to customize the entire web part display.

The **Value Scale** tool part includes these properties:

Multiple Y Values Scales

Check **Multiple Y Value Scales** to display separate scales along the vertical values axis for each data item plotted along the Y axis. When cleared, the Y axis is scaled to fit all values data for data items identified as Y tags.

Number Format

A *number format* (page 100) is applied to scale, legend, tooltip and cursor values per each additional Y Values Scale, if enabled, in PI XYPlot. Choose each item in the Selected Data list and apply settings individually. Choose each item in the Selected Data list and apply settings individually.

When the **Database** format is selected for PI tag data, the number of decimal places used for floating point numbers is determined by the *DisplayDigits* (page 101) attribute. This format is disabled for non-PI data, which uses the General number format by default.

XYPlot Scale Range

Minimum Scale and **Maximum Scale** properties set the range of additional Y Value scales, if enabled, for each Selected Data item. The following options provide different means to determine minimum and maximum scale values:

Autorange

Autorange calibrates the scale automatically using actual data values whenever updates are received. The calibration depends on the **Multiple Y Value Scales** setting:

- If Multiple Value Scales is selected, each trace has its own values scale. The lowest and highest values for each trace determine the minimum and maximum values for the corresponding scale.
- If Multiple Value Scales is not selected, a single scale is used for all traces. The lowest minimum and highest maximum values currently plotted for all traces are used as minimum and maximum values for the combined scale.

Database

For floating point or integer PI point values based on a PI Point, or an AF Attribute that refers to a PI Point, Database assigns the Zero attribute as the minimum scale value, and the Zero attribute plus the Span attribute as the maximum scale value. For digital state tags, the minimum is always **0**, and the maximum is always one less than the total number of states. This option is disabled for dataset columns and other non-PI data.

Custom

Custom applies user-specified minimum and maximum scale values entered in the accompanying text boxes.

Display Properties

Use the Legend and Options groups to set visual display options.

Legend Properties

Legend properties apply to all selected X and Y data items, except as noted:

- Legend information (with the exception of Description) for the X Tag is shown below the plot.
- Legend information (with the exception of Description) for the Y Tags is shown to the right of the plot.
- When the Description box is checked in the Legend group, all Descriptions for all traces are shown below the plot, and below any other Legend information for the X Tag.

Select check boxes in the Legend area to include specific information in the legend. All options except for Correlation Coefficient are enabled by default:

- Choose **Dataset Name** to display the dataset or attribute name.
- Choose **Description** to display the dataset description.
- Choose **Last Value** to display the most recent value of the plotted dataset. For digital and string tags, a string value is shown.
- Choose **Units** to display engineering units for PI tags.
- Choose **Correlation Coefficient** to calculate and display a correlation coefficient for Y scale data items.

Options Properties

Use the Options area to specify optional visual elements for the entire plot. All items are enabled by default with the exception of Title:

- Choose **Title** to display the title that appears in the adjacent text box.
- Choose **Scales Inside Axis** to display vertical scales to the right of the Vertical Axis, inside the plot area.
- Choose **Show Gridlines** to display vertical and horizontal gridlines.
- Choose **Linear Correlation Lines** to display a linear correlation line through plot points.
- Choose **Connecting Lines** to display connecting lines between plot points in the order they are plotted, as opposed to a scatter plot with no lines.
- Choose **Show Value Attributes** to display value attribute icons to indicate flagged data points.
  - Substituted indicates that the value has been changed from its original value. This value is set only by the PI Archive Subsystem when an existing value is changed.
  - Annotated indicates that there is a comment about a value.
  - Questionable indicates that there is some reason to doubt the accuracy of the value.

When more than one value attribute applies, the highest priority attribute is rendered. Attribute priorities from highest to lowest are: Error, Questionable, Annotated, and Substituted.

XYPlot Formatting Properties

If specific formats are defined for your site under PI Data Services, you can select and apply one to PI XYPlot web parts:

- Select and apply a named format from the **Trend Formatting** list. The default value is **System Default**.
- If you are a PI WebParts administrator, you can use click the **Configure**  button to edit or add new formats. A configuration page opens in a new browser window with specific formatting tools.

  See the *PI WebParts Administrator Guide* for more information about defining named formats.

PI XYPlot Connections

The PI XYPlot web part supports *SharePoint connections* (page 33) to other PI WebParts:

As a Consumer

- Accepts time range changes from the PI TimeRange web part, or any other web part that provides Start and End timestamps.
- Accepts PI tag data items from any other web part and adds them as additional Y plot tags. The X Tag may not be changed through a web part connection.
- Accepts querystring parameters to set initial values.

Appendix A

Supplementary Information

The following appendices describe time format, data source, and data display details common to PI WebParts.

PI Time

PI Time abbreviations and PI Time expressions allow you to specify times and time ranges for data using constants, variables, and short expressions.

PI Time Abbreviations

An interval is a unit of time that can be used in time entries. Intervals that support fractional values are listed below. For intervals where the Fractions column indicates No, fractional amounts cannot be used in time strings.

Name	Short name	Plural name	Member names	Fractions
second	s	seconds	no	yes
minute	m	minutes	no	yes
hour	h	hours	no	yes
day	d	days	no	no
month	mo	months	yes (for example, December)	no
year	y	years	no	no
week	w	weeks	no	no
weekday	wd	weekdays	yes (for example, Tuesday)	no
yearday	yd	yeardays	no	no

You can spell out month and weekday names, or enter the first three letters (for example, Dec, Tue).

PI Times can also be expressed using certain constants:

Constant	Result
*	The current time.
Today or t	12:00 am of the current day.
Yesterday or y	12:00 am of the previous day.
Sunday or sun	00:00:00 (midnight) on the most recent past Sunday (in reference to the PI Server).

PI Time Expressions

PI allows three types of time expressions: relative time, combined time, and absolute time. These time expression types are defined in the following table.

Expression	Description	Examples

Relative Time	Relative time expressions specify a number of days, hours, minutes, or seconds with either a leading plus sign or a leading minus sign.
	In the absence of a reference time (such as `*` or an absolute time) in either the start or end time strings, the end time is calculated relative to current clock time and the start time is calculated relative to the end time.
		`+1d`
		`-24h`
		`-3m`
		`+24s`

Combined Time	A combined time expression is a specific reference time followed by a relative time expression.	`*+8h`
		`18-dec-02 -3m`
		`t+32s`

Absolute Time	An absolute time expression is any time expression that is neither a relative nor a combined time expression.	`*`
		`14-Dec-97`
		`11-Nov-96 2:00:00.000 1`
		`t`
		`y`

When using PI times, follow these guidelines:

- Use absolute or combined time expressions. Avoid using relative time expressions. Multiple relative time expressions in a time range may cause an incorrect start time or an error message, depending on the context of the expression.
- Relative and combined time expressions contain only a single operator: either a single plus sign (+) or a single minus sign (-). Additional operators can lead to unpredictable results. For example, the following are not valid time expressions:
  `*+1d+4h`
  `T-1d+12h`
- The name or short name for an interval used to denote PI time is not case-sensitive.

PI Data Type Support

Values from PI tags and AF Attribute data sources may appear differently in PI WebParts that support them. The following table describes web part support for PI data types and display variances:

Data Type	Support	Display Notes
Digital (defined states)	PI Gauge PI Graphic PI TimeSeries PI Trend PI Values PI XYPlot	In PI Gauge, PI Trend and PI XYPlot, the digital integer code is used to plot the data and scale values, and the digital state string value appears in the tooltip and legend. They may be plotted as Stepped trends in PI Trend. In PI TimeSeries and PI Values, the digital state string value is used in the table.
Int (16 and 32) Float (16, 32 and 64)	PI Gauge PI Graphic PI TimeSeries PI Trend PI Values PI XYPlot	Scale values appear in corresponding number format, and may be plotted as Stepped or Continuous in PI Trend.
String (text)	PI Graphic PI TimeSeries PI Trend PI Values	Appear in text format.
Timestamp	PI Gauge PI Graphic PI TimeSeries PI Trend PI Values PI XYPlot	Timestamps are displayed using default short date and time formats according to SharePoint locale settings.
Blob	Not supported	

Other Supported Data Types

PI server data is recorded in time series format; a date or timestamp is associated with every data point value. Data from relational sources or an ERP system may or may not include corresponding timestamps for each data point value.

For example, a relational database column might store temperature values. If this column is joined to a timestamp column in a dataset query, the columns form a time series, and you can plot the trend of temperatures over time. Without the link between the columns however, the temperature value column is simply a set of numbers. Relational columns could also store lists of customers, addresses and other information which does not correspond to time values.

Non-PI datasets that form a time series can be used with PI Gauge, PI TimeSeries, PI Trend, PI Values and PI XYPlot. If the dataset has parameters or placeholders for Start and End times, you can use the PI TimeRange or the web part's Time Range tools to resolve these parameter values. A time range limits the dataset query to display data only for a particular time interval.

If non-PI data does not represent a time series, dataset column values are treated simply as point values. Time Range settings and data updates directed to the web part do not affect the data display. Numeric points are plotted as straight lines across trend graphs and null values are displayed as a *No Data* condition.

The following .NET data types from relational or web services sources are supported:

- Boolean
- Byte
- Char
- DateTime
- Decimal
- Double (floating point)
- Int16
- Int32
- Int64
- SByte
- Single (floating point)
- String
- UInt16
- UInt32
- UInt64

The following .NET data types are not supported:

- Blob
- TimeSpan

Number Formats

PI WebParts uses standard number formats. When the Database number format is in effect, the presentation of a formatted value depends on *display digits* (page 101) attributes and whether it appears as a point value or scale value, as described in the table below:

Format	Point Behavior	Scale Behavior
General (default)	Displays all significant digits as space allows, switching to scientific notation at 1e+7 and 1e-5. Precision for scientific notation is 6 digits (0.00000E+00).	Displays all significant digits as space allows, switching to scientific notation at 1e+7 and 1e-5. Precision for scientific notation is 3 digits (0.00E+00).
Database (tag attribute displaydigits < 0)	Displays a number of significant digits (for example, -3 displays up to 3 significant digits). The algorithm attempts to produce abs(displaydigits) digits first in decimal format, then in exponential format.	
Database (tag attribute displaydigits >= 0)	Displays significant digits and a number of decimal places specified by the display digits. For example, displaydigits 2 results in a format of "0.00". A displaydigits value of 0 does not include a decimal symbol.	
Scientific	Uses 6-digit precision (0.00000E+00). For example: 1234567 displays the same; 12345678 displays as 1.23457e7.	Use 3-digit precision (0.00E+00).
0.00 (and related explicit formats)	Applies the user-specified format, which may result in values displayed as 0. Pound (#) characters show a digit if there is one while zero (0) prints a zero even if there is no data value.	

Display Digits

Integer and floating point data are displayed using *default number formats* (page 100), with decimal and group separator characters specified by the *SharePoint locale* (page 7). Non-PI data is displayed as returned from the data source with formats specified by the web part.

For PI data, the number of decimal places displayed for floating point tags is determined by the DisplayDigits attribute of the tag when the Database number format is applied (the default). Negative displaydigits values indicate the number of significant digits to display. Positive values indicate the number of decimal places to show.

For example, the following values would appear depending on the DisplayDigits setting:

-5 DisplayDigits Setting	+5 DisplayDigits Setting
▪ .0123456, shows 1.2346E-02 ▪ .123456, shows .12346 ▪ 1.23456, shows 1.2346 ▪ 12.3456, shows 12.346 ▪ 123.456, shows 123.46 ▪ 1234.56, shows 1,234.6 ▪ 123456., shows 1.2346E+05 ▪ 1234567, shows 1.2346E+06	▪ .0123456, shows .01235 ▪ .123456, shows .12346 ▪ 1.23456, shows 1.23456 ▪ 12.3456, shows 12.34560 ▪ 123.456, shows 123.45600 ▪ 1234.56, shows 1,234.56000 ▪ 12345.6, shows 12345.60000 ▪ 123456, shows 123456.00000 ▪ 1234567 shows 1234567.00000

URL Querystring Encoding

All querystring parameter values must be URL-encoded to prevent ambiguity when special or invalid characters are included. The following is a list of special characters and their URL encoded substitutes.

Character	Substitute	Character	Substitute
;	%3B	>	%3E
?	%3F	~	%7E
/	%2F	%	%25
:	%3A	@	%40
#	%23	"	%22
&	%24	^	%5E
=	%3D	`	%60
+	%2B	[	%5B
$	%26	]	%5D
,	%2C	{	%7B
<SPACE>	%20	}	%7D
%	%25	|	%7C
<	%3C		

Connection Parameters

The following table summarizes the connections available between individual PI web parts and the parameters each web part may consume and provide. Note that all web parts can consume querystring parameters and that all parameters available to a provider web part may be consumed, even if they are not displayed.

	Consumes	Provides
PI ActiveView	Start Time End Time Selected File Override Default Context Path	
PI BatchTable	Start Time End Time Status Server Batch ID Product Recipe Procedure Unit Name Unit Heading	Start Time End Time Unique ID Batch ID Unit Name Duration Server Unit Path Batch Type Status Unit Heading Procedure Recipe Product
PI Gauge	Start Time End Time Selected Data Context Path Maximum Scale Minimum Scale Parameters/Placeholders	
PI Graphic	Start Time End Time Selected File XSL Transform File Override Default Context Path	Start Time End Time Symbol Name Data Source
PI Messenger	Active Directory Groups Parameters/Placeholders	
PI Table	Start Time End Time Context Path Parameters/Placeholders	Column Values
PI TimeRange	Start Time End Time	Start Time End Time Current Time Time Range `Is Updating` flag

	Consumes	Provides
PI TimeSeries	Start Time End Time Selected Data Context Path Parameters/Placeholders	Column Values
PI TreeView	Query Date	Element Name Element Path Element Relative Path PI Tag Lists AF Attributes
PI Trend	Start Time End Time Selected Data Context Path Parameters/Placeholders	
PI Values	Start Time End Time Selected Data Context Path Parameters/Placeholders	Column Values
PI XYPlot	Start Time End Time Selected Data Context Path Parameters/Placeholders	

SharePoint Connection Types

PI WebParts use standard SharePoint interfaces to establish connections, allowing a wide range of potential providers and consumers.

The choices available in a web part's Connections menu depend on the types of web parts you are connecting:

- Parameter-based IParametersOutProvider and IParametersOutConsumer connections exchange data on the client or server side. They do not require a page reload for each update unless the page is set to Design mode.
- Row-based IRowProvider and IRowConsumer connections exchange data through a server-side connection only. Row values require a page reload for each update.
- Generally speaking, if both Parameter and Row connections are available, Parameter connections are preferable because they do not require the web part to post back to the server, thereby improving response time.
- ITransformableFilterValues connections pass one or more related values from a provider to a consumer web part, which uses the values to filter data results. ITransformableFilterValues connections are used most commonly as parameters sent to an Excel Web Access (EWA) web part.

The types of connections available to each web part are summarized below:

	IRow		IParametersOut		
Web Part	**Provider**	**Consumer**	**Provider**	**Consumer**	**ITransformableFilterValues**
PI ActiveView		X		X	
PI Gauge		X		X	
PI Graphic	X	X	X	X	
PI Messenger		X		X	
PI Table	X	X	X	X	X
PI TimeRange	X		X		X
PI TimeSeries	X	X	X	X	X
PI TreeView	X		X		X
PI Trend		X		X	
PI Values	X	X	X	X	X
PI XYPlot		X		X	

Appendix B

Technical Support and Resources

You can read complete information about technical support options, and access all of the following resources at the OSIsoft Technical Support Web site:

http://techsupport.osisoft.com

Before You Call or Write for Help

When you contact OSIsoft Technical Support, please provide:

- Product name, version, and/or build numbers
- Computer platform (CPU type, operating system, and version number)
- The time that the difficulty started
- The log files at that time

Help Desk and Telephone Support

You can contact OSIsoft Technical Support 24 hours a day. Use the numbers in the table below to find the most appropriate number for your area. Dialing any of these numbers will route your call into our global support queue to be answered by engineers stationed around the world.

Office Location	Access Number	Local Language Options
San Leandro, CA, USA	1 510 297 5828	English
Philadelphia, PA, USA	1 215 606 0705	English
Johnson City, TN, USA	1 423 610 3800	English
Montreal, QC, Canada	1 514 493 0663	English, French
Sao Paulo, Brazil	55 11 3053 5040	English, Portuguese
Frankfurt, Germany	49 6047 989 333	English, German
Manama, Bahrain	973 1758 4429	English, Arabic
Singapore	65 6391 1811 86 021 2327 8686	English, Mandarin Mandarin
Perth, WA, Australia	61 8 9282 9220	English

Support may be provided in languages other than English in certain centers (listed above) based on availability of attendants. If you select a local language option, we will make best efforts to connect you with an available Technical Support Engineer (TSE) with that language skill. If no local language TSE is available to assist you, you will be routed to the first available attendant.

If all available TSEs are busy assisting other customers when you call, you will be prompted to remain on the line to wait for the next available TSE or else leave a voicemail message. If you choose to leave a message, you will not lose your place in the queue. Your voicemail will be treated as a regular phone call and will be directed to the first TSE who becomes available.

If you are calling about an ongoing case, be sure to reference your case number when you call so we can connect you to the engineer currently assigned to your case. If that engineer is not available, another engineer will attempt to assist you.

Search Support

From the OSIsoft Technical Support Web site, click Search Support.

Quickly and easily search the OSIsoft Technical Support Web site's support solutions, documentation, and support bulletins using the advanced MS SharePoint search engine.

E-Mail–Based Technical Support

techsupport@osisoft.com

When contacting OSIsoft Technical Support by e-mail, it is helpful to send the following information:

- Description of issue: Short description of issue, symptoms, informational or error messages, history of issue.
- Log files: See the product documentation for information on obtaining logs pertinent to the situation.

Online Technical Support

From the OSIsoft Technical Support Web site, click My Support > **My Calls**.

Using OSIsoft's Online Technical Support, you can:

- Enter a new call directly into OSIsoft's database (monitored 24 hours a day)
- View or edit existing OSIsoft calls that you entered
- View any of the calls entered by your organization or site, if enabled
- See your licensed software and dates of your Service Reliance Program agreements

Remote Access

From the OSIsoft Technical Support Web site, click Contact Us > **Remote Support Options**.

OSIsoft Support Engineers may remotely access your server in order to provide hands-on troubleshooting and assistance. See the Remote Support Options page for details on the various methods you can use.

On-Site Service

From the OSIsoft Technical Support Web site, click Contact Us > **On-site Field Service Visit**.

OSIsoft provides on-site service for a fee. Visit our On-site Field Service Visit page for more information.

Knowledge Center

From the OSIsoft Technical Support Web site, click Knowledge Center.

The Knowledge Center provides a searchable library of documentation and technical data, as well as a special collection of resources for system managers. For these options, click **Knowledge Center** on the Technical Support Web site.

- The Search Support feature allows you to search Support Solutions, Bulletins, Support Pages, Known Issues, Enhancements, and Documentation (including user manuals, release notes, and white papers).
- System Manager Resources include tools and instructions that help you manage archive sizing, backup scripts, daily health checks, daylight saving time configuration, PI Server security, PI System sizing and configuration, PI trusts for interface nodes, and more.

Upgrades

From the OSIsoft Technical Support Web site, click Contact Us > **Obtaining Upgrades**.

You are eligible to download or order any available version of a product for which you have an active Service Reliance Program (SRP), formerly known as Tech Support Agreement (TSA). To verify or change your SRP status, contact your Sales Representative or *Technical Support* (*http://techsupport.osisoft.com/*) for assistance.

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