Technical Document

Web Charts Guide

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niagara4

Web Charts Guide

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About this guide

This document provides information on the charting feature that is available in Niagara Workbench or via a web browser connection to a station.

Included in the guide are basic procedures for working with charts, as well as the charting references which describe chart components and component views.

- To begin working with charts, see Using charts.
- For detailed information on configuring chart components, see the Components guide.
- For detailed information on about component views, see the Plugins guide.

Document change log

Updates (changes and additions) to this document are listed below.

- Updated: December 3, 2015

  Added content to the topics titled, "Chart commands", "Chart settings" and "About Sampling" describing the added Stop command and sampling changes for N4.1.

- Updated: September 21, 2015
- Initial release publication: August 31, 2015

Related documentation

Additional information on the Niagara system and Niagara Workbench is available in the following documents.

- *Getting Started with Niagara*

Chapter 1   Using web charts

Topics covered in this chapter

♦ Web charts overview
♦ Viewing a component in "live mode"
♦ Viewing an existing Chart file
♦ Adding data to a chart
♦ Editing a chart title
♦ Hiding/showing chart data
♦ Removing data from a chart
♦ Setting a time range on a chart
♦ Displaying status colors
♦ Displaying sampling optimizations
♦ Configuring sampling settings
♦ Zooming on a chart
♦ Exporting a chart from Workbench
♦ Exporting a chart from a browser

This section provides instructions for commonly used charting tasks.

Web charts overview

The Web Charts feature allows you to create, modify, and render dynamic, interactive web-based charts in Workbench or in a modern HTML5–capable web browser. The HTML5 functionality enables you to create richer reports and more easily monitor and diagnose system problems.

Web Charts provide a consistent experience for creating, editing, and presenting data. with a simplified chart creation process that is the same whether working in a web browser, Workbench Chart view, or in a Px page. Also, the charts render consistently across Workbench, Px, and Hx, as well as in HTML5–capable web browsers.

Enhanced functionality makes it easy to add data, to combine different types of data and data with different units of measure. The Chart settings facilitate customizing a chart for presentation via selectable data colors and chart type per component, axis orientation, data source zooming, as well as permitting you to turn on or off the chart grid, background color, data pop-ups, status colors and sampling.

Additionally, several enhancements facilitate monitoring performance and diagnosing problems. For example, when enabled, charts display the standard Niagara status colors, conveying the status of components at a glance, and the mouse-over value and fixed data pop-ups provide detailed information on data points. You can compare historical data with live data as it comes in. Also, you can hide, show, and remove data from a chart and zoom in to make it easier to examine the activity of remaining components.

Once you have created a chart you can export it as a `.chart` or `.csv` file in the station file space. If working in a web browser, export destination options include the station file space, your operating system user space, or a printer. Also, when you open an existing chart file and make changes you can then save your changes to that chart file or export the data to a new chart file with a different name.

Viewing a component in "live mode"

You can view live data for a component by opening a Chart view. The Chart view displays a continuing live plot that updates according to the configurable sample rate. If a point has a history extension, the history data is charted and live point values are added as they come in. If the point does not have a history extension, the chart contains only live point values.

Prerequisites:

- Connection to a station that contains points

You can open a Chart view on the following types of components to view a continuing live plot:

- a Boolean, Enum or Numeric point (with or without a history extension)
- a record in the History space
- a schedule
- a Chart widget on a Px page
- a chart file that points to any of the above items

NOTE: The system cannot accommodate an unlimited amount of points in a webChart.

Step 1   Expand the station home and right-click on a Boolean, Enum, or Numeric point.

Step 2   Select **Views→Chart**

The Chart view opens and begins plotting live data in the chart according to the component's configuration.

Viewing an existing Chart file

You can open a previously saved or exported `.chart` file to view the historical and live data or to modify the chart.

Prerequisites:

- Connection to a station containing .chart files

Step 1   Navigate to the station home `Files/Charts` file space.

         NOTE: When working in a web browser, `.chart` files also may be located in the operating system User\Downloads folder. For example: `C:\Users\userName\Downloads`

Step 2   Double-click on the desired `.chart` file to launch the Chart view.

Step 3   If desired, make any changes necessary to affect data display, monitor performance or diagnose a problem.

When finished, you can close the chart view without saving, save the chart file with your latest changes, or export the modified chart to save it with a different filename.

NOTE: When you open an existing `.chart` file you have the options to **Save** or **Export** the view. When you open a new Chart view only the **Export** command is available.

Adding data to a chart

You can add one or more control points, histories, or schedules to a Chart view.

Prerequisites:

- Connection to a station.

Using the drag and drop technique you can add data to a Chart view while the chart is rendering. The following types of data can be added:

- control points (Boolean, Enum or Numeric points, with or without history extensions)
- history records
- schedules
- folders containing multiple components
- data from Series Transform

         NOTE: Series Transform data must have a timestamp property and a non-String value in order to resolve into a chart. Also, "live mode" and Delta values are not available.

Step 1   Expand the Station node in the Nav tree.

Step 2   Open a chart view (open either a new chart view or an existing .chart file).

Step 3   Add data using any of the following methods:

Method	Description
Drag and drop a single component	In the Nav tree, click to select a component and then drag and drop onto the Chart view.
Drag and drop multiple components	Using **Ctrl** + **Click**, select multiple components, drag and drop onto the Chart view.
Click Add Series to select multiple components or a container	Click ⊕ (Add Series), in the **Add Series** dialog expand the Nav tree and use **Ctrl** + **Click** to make multiple selections and click **OK**.
Drag and drop data from Series Transform	
In a web browser, drag and drop a bookmark	First, bookmark the source component's ORD, and then drag and drop the bookmark onto your chart.

NOTE: When adding an additional component that has the same unit of measure, the Y-axis scale changes to accommodate the added data.

When adding an additional component that has a different unit of measure, the units display along the opposite Y-axis.

On a chart containing three or more different types of data you can switch the units displayed on the Y-axis by clicking on the dimmed axis label.

Editing a chart title

When you open a Chart view on a component, the default chart title is based on component name. However, the title is an editable text field that you can modify as needed.

Prerequisites:

• Chart view open in Workbench or browser

Step 1   In the Chart view, click anywhere on the chart title text.

An editable text field displays with the current title selected.

Step 2   Type desired text and press `Enter`.

The revised chart title displays.

NOTE: On export, by default the filename that is based on the chart title. The filename can be changed during the export dialog

Hiding/showing chart data

A toggle effect allows you to alternately Hide or Show individual data plots displayed in a Chart view.

Prerequisites:

• Chart view open in Workbench or browser

Step 1   In the Chart view legend (opposite the chart title), click on a colored component icon.

The icon displays a hollow center and the data plot for that component disappears from the Chart view.

Step 2   Click the component icon once more to show the data on the Chart.

Removing data from a chart

You can easily remove data from a Chart view.

Prerequisites:

• Chart view open in Workbench or browser

Step 1   Remove data from the chart by one of the following methods:

> • In the Chart view legend (opposite the chart title), right-click on the component you wish to re-move and select `Remove from chart`.
>
> • Right-click the Y-axis unit label for the component you wish to remove and select `Remove from chart`.

Setting a time range on a chart

You can configure the **Time Range** on a chart using pre-set options or by entering a custom range. The time range configuration is included in a chart file on Export or Save.

Prerequisites:

• Chart view open in Workbench or browser

The following procedure describes how to set a custom time range on a chart.

Step 1   In the Command Bar, click on the **Time Range** dropdown list and select the `Time Range` option.

Step 2   In the **Time Range** dialog **Start time** field, enter a specific start time using this format:

> `yyyy-mm-dd hh:mm:ss:sss`

Step 3   If desired, click the **End** check box and enter a value for the end of the range.

> **NOTE:** Providing an End time is optional. Leaving it blank allows live data to continue plotting.

Step 4   Click **OK.**

The Chart view updates immediately with the new time range.

NOTE: Whenever `Time Range` is the selected option shown in the dropdown list, you can easily make sub-sequent changes to the range by clicking on the time range where it is displayed below the Y-axis at the bottom of the chart, as shown here:
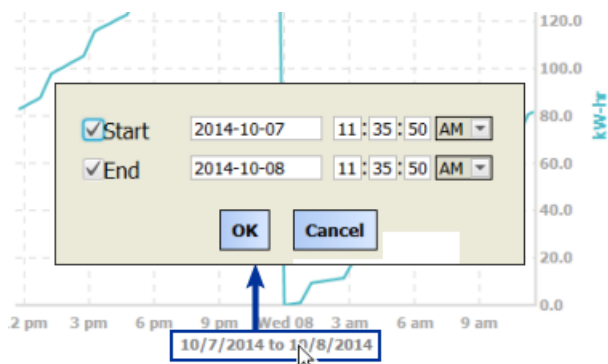
Displaying status colors

Displaying status colors makes it easy to determine the current state of a component. Also, for a component with a history extension, you can use status coloring in a chart to view trends of when the component was in

alarm. A toggle effect in the Command Bar allows you to turn on or off the status coloring display. Alternately, you can configure chart Settings to display status colors and on Save or Export, this configuration is included in the chart file.

Prerequisites:

• Open chart view in Workbench or browser

• Component with a configured alarm extension

When `Status Coloring` is enabled a line chart displays a colored dot for each plot. When the status of the component is "ok," the dot color is the same as the line color. When the current status of the component is other than "ok" the dot color is the appropriate Niagara status color, for example: purple=overridden, red= alarm, yellow=down, etc. Additionally, the mouseover Value popup background color changes to match the status color and the Fixed Data popup displays status coloring.

Shade charts and Bar charts also display status colors via a color band at the top of each shaded area or bar. When the current status of the component is other than "ok" the color band changes to the appropriate Niagara status color.

The following procedure describes configuring chart settings to display status coloring.
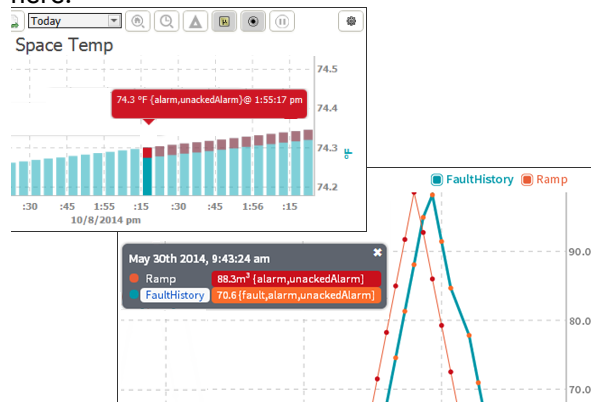
Step 1   Click the **Settings** icon in the upper right corner of the chart view.

Step 2   Click the **Layers** tab.

Step 3   Beside the default value for `Status Coloring`, click the selection icon and select `On`.

Step 4   Click **Ok**

The chart view updates, displaying status colors for any component with an other than "ok" status, as shown here.

Displaying sampling optimizations

Sampling improves chart rendering performance and it smooths out the chart data somewhat which can make it easier to interpret. By default, auto-sampling automatically turns on when the focused data set exceeds 2500 data points, and automatically turns off when a data set is below 2500. Additionally, a toggle effect allows you to alternately turn On or Off the sampling optimizations for any size data set.

Prerequisites:

• Open Chart view (in Workbench or browser) on a component that has a history extension with large amount of data

Step 1   Click ▣ (**Sampling**) to turn on sampling.

The chart is rendered using the optimized data set.

NOTE: When on, the Sampling icon in the command bar appears selected (has a gray background) .

Step 2   Click the **Sampling** button to turn off sampling.

> **NOTE:** In addition to turning off sampling, it no longer turns on and off automatically with the size of the focused data set. It remains disabled until you reload the page.

Configuring sampling settings

Configuring sampling settings can improve chart performance and make the data easier to view and interpret.

Prerequisites:

- Open Chart view (in Workbench or browser) on a component that has a history extension with at least 200 data points. The number of data points in a chart can be determined by viewing the `Available Data Points` as shown in the **Settings→Sampling** tab.

This procedure describes turning on sampling and setting the sample size to reduce the number of data points in the chart. This is useful for devices with a small amount of memory, you can avoid loading a large chart on the device.

Step 1   Click the **Settings** icon

Step 2   In the **Settings** dialog, click the **Sampling** tab.

Step 3   On the Sampling tab, click the checkbox to deselect `Auto Sampling`.

> Value = `false`, auto sampling is disabled.

Step 4   Click the checkbox to turn on `Sampling`

> Value = `true`, sampling is turned on.

Step 5   In `Sample Size` field, change value to less than that shown in the Available Data Points field. For example, if Available Data Points are 200, change Sample Size to `100`.

Step 6   Click **OK**.

> Sampling is turned on, The chart is immediately replotted according to sampling settings. The effect of this change on a line chart, for example, is that the line appears more segmented, you see fewer data points in the chart, which can make it easier to see individual data points and and interpret the data.

> **NOTE:** The whole data set still exists but not all points are shown in the chart.

Step 7   Once sampling has begun, the sampling period is shown adjacent the time range summary at the bottom of the chart. Click on the sampling text to easily reopen the Sampling tab.

> Notice the added property, `Sampling Period`, is now visible. The read only field displays an average of the amount of time between each of the points that have been sampled.

Step 8   Click **OK**.

At this point, you can export or save the chart with the sampling changes or turn sampling off if no longer needed. To turn off sampling, simply click to deselect **Sampling** in the **Command Bar**. The chart is immediately redrawn using the whole data set.

NOTE: Turning Sampling off in this manner also turns off Auto Sampling behavior until the chart is reloaded.
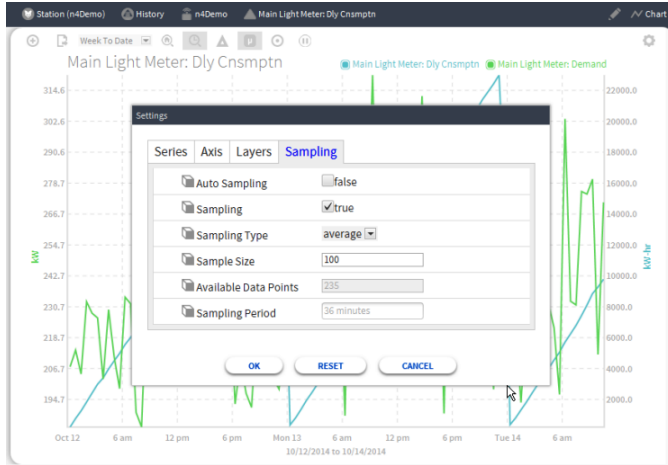
Zooming on a chart

There are many ways to change the zoom level on a chart. You can use options in the Command Bar and Settings dialog, as well as mouse action and keystroke combinations.

Command bar options

Two zooming commands are available in the **Command Bar**:

- **Home Zoom**

    Selected by default, zooms to the X-axis of the primary data set. If you change the zoom level, you can click the **HomeZoom** button in the Command Bar to revert to the original zoom level.

    NOTE: If the primary data set is numeric, the default zoom level focuses on the Y-axis.

- **Time Zoom**

    Zooms on the X-axis to show the time period specified in the **Time Range** dropdown menu.

Settings option — Data Zoom Scope

Located in the **Settings→Axis** tab.

Options	Description
`primary`	Selected by default, zooms to the X-axis of the primary data set only. If the primary data set is numeric it zooms on the Y-axis.
`all`	Changes the X-axis to accommodate all available data, including live data as it comes in.

Mouse and keystroke zooming controls

Numerous zooming actions are possibly using a combination of mouse wheel actions and keystrokes. Roll the mouse pointer over the tick labels on either X- or Y-axis until the pointer changes to a double arrow and do any of the following:

To do this	Use this keystroke + mouse action
Zoom out X and Y	Alt + Roll mouse wheel Down
Zoom in X and Y	Alt + Roll mouse wheel Up

To do this	Use this keystroke + mouse action
Zoom out X axis only	Roll mouse wheel Down
Zoom in X axis only	Roll mouse wheel Up
Zoom in X and Y axis by power of 2	Alt + Double click
Zoom out X and Y axis by power of 2	Alt + Shift + Double click
Zoom in X axis by power of 2	Double Click
Zoom out X axis by power of 2	Shift + Double click
Pan X and Y	Alt + Click and drag
Pan X axis Only	Click and drag
Zoom top Y, lock bottom Y	Drag +Y axis tick label
Zoom bottom Y, lock top Y	Drag -Y axis tick label
Zoom Left time, lock Right Time	Drag X axis tick label

Phone zooming controls

The following typical touch zooming action is available when using a phone or tablet.

To do this	Use this touch action
Zoom in/zoom out	Touch the screen with two fingers and slide them apart (zoom in) and back together (zoom out)
Zoom X-axis	Drag on the X-axis
Zoom Y-axis	Drag on the Y-axis
Pan (left or right)	Drag your finger across the screen

Exporting a chart from Workbench

In Workbench, you can export a Chart view as a chart file (`chartName.chart`) or as a csv file (`chartName.csv`).

Prerequisites:

• Chart view open in Workbench

Step 1   In the Command Bar, click (**Export**).

Step 2   On the **Action** tab, do the following:

Action	Description
Enter a File Name	Type a different file name if desired. Default filename is `chart-Title.chart` or `chartTitle.csv`. You can include a subdirectory by entering a path. For example, typing "`subDir/myChart`" exports the file to the named subdirectory.
Select Destination	Station is the only available option.`station` (default)
Select File Type	`chart` (default) or `csv`

Step 3   On the **Options** tab, do any of the following:

Options	Description
View on Export	`true` or `false` (default)
Status Column	For (.csv exports only.`true` or `false` (default)

Step 4   Click **OK**.
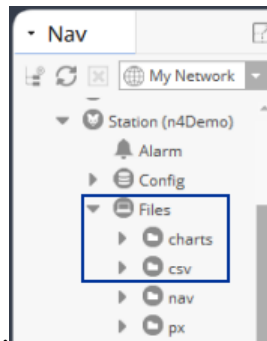
The file is exported to the selected destination.

Exporting a chart from a browser

When exporting a Chart view from a web browser you have three destination options. Export as a `.chart` or `.csv` file to the station file space, download the file to your operating system user space, or send the file to a printer.

Prerequisites: Chart view open in browser

Step 1   In the Chart view **Command Bar**, click (**Export**).

Step 2   On the **Action** tab in the Export dialog, do the following:

Action	Description
Enter File Name or use default	Type a different file name if desired. Default filename is `componentName.chart`

Select Destination	`download` (default)
	
	`station`
	
	`print`

Select File Type	`chart` (default) `csv`

Step 3   On the **Options** tab, if desired select any of the following:

Options	Description
View on Export	On `.chart` and `.csv` exports, displays the exported file `true` or `false (default)`
Status Column	On `.csv` exports only, includes status data in the file `true` or `false` (default)

Step 4   Click **OK**.

The file is exported according to the selected `Destination`:

- `download` — to your operating system user file space. For example: `C:\Users\userName\Downloads \chartName.*`.
- `station` — to the station file space in the `/Files/chart` folder.
- `print` — to a printer via the via the system print dialog.

Chapter 2   Web charts reference

Topics covered in this chapter

♦ webChart-ChartWidget
♦ webChart-CircularGaugeWidget
♦ workbench-WebWidget

Charting views and components are described in detail in the following topics.

webChart-ChartWidget

Located in the `webChart` palette, this bajaux HTML5-based WebWidget component allows you to add a Chart widget to a Px page or Hx page, and to a Dashboard pane, as well. The widget allows you to create, modify, and render dynamic, interactive web-based charts in Workbench or in a late version HTML5-capable web browser.

About the Chart view

The **Chart** view (shown here) is the default view for History records in Workbench and in the HTML5 Hx profile, and a secondary view on schedules, as well as Enum, Numeric, and Boolean points.

NOTE: Legacy charts, those created in earlier releases, are available as secondary **History Chart** views on History records.

Figure 1   Chart view description
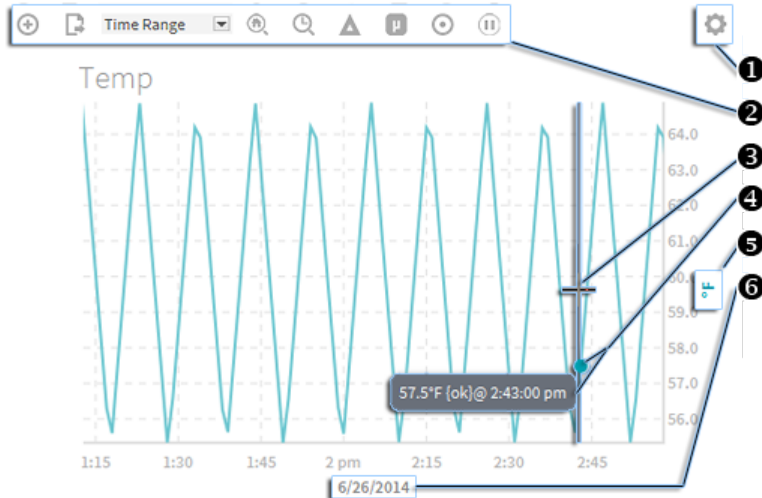
❶ Settings icon — click to access chart Settings dialog

❷ Command bar — click icons to launch chart commands

❸ Cursor position indicator

❹ Data Value popup — displays when cursor is on a point

❺ Y-Axis label — default orientation of Y-axis for primary data

❻ X-Axis label — default orientation of X-axis. Once you have defined a specific `Time Range` for the chart, you can click this label to reopen the **Time Range** dialog to modify the range.

Data that can be rendered in a chart includes historical data, live historical data, live data, as well as schedules.

Although chart type is configurable via the **Settings→Series** tab dialog, the default chart type is determined by the type of data being presented. For example:

Component type	Default chart type
Numeric histories and points	Render as lines with interpolation, display as a line chart.
Numeric schedules	Render as discrete lines with no interpolation, display as a line chart.
Boolean and Enum points	Render as shaded areas referred to as "swim lanes," displayed as a shaded chart. Opacity of the swim lanes fill is based on the ordinal of the Enum.
Boolean and Enum schedules	Render as shaded areas referred to as "swim lanes," displayed as a shaded chart. Opacity of the swim lanes fill is based on the ordinal of the Enum.

Different types of data (Numeric and Boolean or Enum) can be combined on the same chart. In that situation, the swim lanes representing Boolean and Enum data display with a dimmed opacity to allow you to more clearly view the lines representing the numeric data. Also, you can modify the default chart type of one or more components in a chart. For example, you can set a boolean writable point to display bars while the data for another component plots a line.

The interactive Chart view allows you to make modifications while a chart is rendering. For example, while viewing a chart you can add one or more points, history records, schedules, or even containers of data. When adding data to a chart, the Y-axis automatically adjusts the units and can accommodate different units of measure by displaying multiple Y-axes. On a chart containing data with three or more different units of measure, such as that shown below, the display still shows dual Y-axes. You can switch the units displayed on the secondary Y-axis by clicking on the dimmed axis label. For example, on the left-side Y-axis in the figure below, the dimmed % symbol indicates an alternate Y-axis with percent as the unit of measure. Clicking that **%** symbol switches the Y-axis units from displaying degrees to percent.

You can alternately hide or show specific data or even completely remove data from a chart. Additionally, chart settings permit you to customize the appearance of a chart via selectable data colors and chart type per component, axis orientation, data source zooming, as well as permitting you to turn on or off the chart grid, background color, data popups, and status colors.

Figure 2   Multiple Y-axes accommodate data with different units of measure
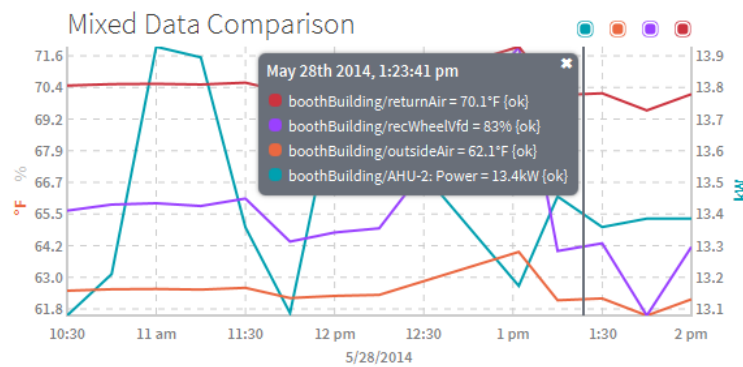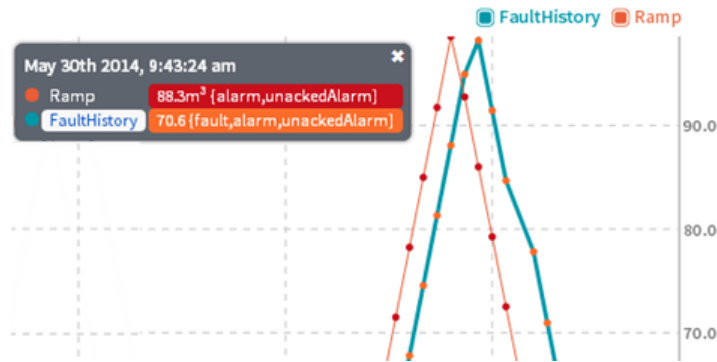

Web charts utilize standard Niagara status colors to indicate current status. As shown in the chart below where the Status Coloring command is invoked, a red dot indicating `Alarm` status marks each plot in the

Ramp line while an orange dot indicating `Fault` status marks each plot in the **FaultHistory** line. Also, status colors shown in the Fixed Data Popup dialog confirm the status of charted data.

Shade and Bar charts also display status colors. When enabled, if there is a non-ok status a color band at the top of the shaded area or bar indicates the status.

Figure 3   Line chart displaying status colors

Configurable properties for the Chart widget

Property	Value	Description
Visible	true (default), false	Enables/disables display of the widget.
Enabled [webCharts]	true (default), false	Enables and disables use of the component.
Layout	Default values: X= 0.00, Y=0.00, Width=000.00, Height=000.00 Fill=on, off (default)	Provides X and Y positioning coordinates for the widget as well as, Width, Height, and Fill. X and Y units can be specified as Absolute or Percent. While Width and Height dimensions can be specified as Absolute, Percent, or Preferred units. The Fill checkbox turns fill on or off.
Js	view:webChart: ChartWidget (default)	Provides ord for the Javascript widget. You can browse to select another widget.
Dashboard	true (default), false	Enables/disables usage in dashboards
wbViewBinding	Binding null —>WebWidget (default)	Provides ord for bound label. You can browse to select the Ord. Also provides selectable options for Degrade Behavior (None, Disable, and Hide).

Chart commands

Options in the Chart view **Command Bar** allow you to fine tune data presentation.

Figure 4   Command Bar

Most options in the **Command Bar** provide fine tuning for viewing purposes. Changes made with those options are of a temporary nature, not included when the chart is saved or exported. For example, if you turn on Time Zoom and Delta via buttons in the command bar and export the chart. When opened, the chart file displays default settings for those options. Exceptions are changes made with the `Time Range`, `Sampling`, and `Status Coloring` options, which are included on export or save.

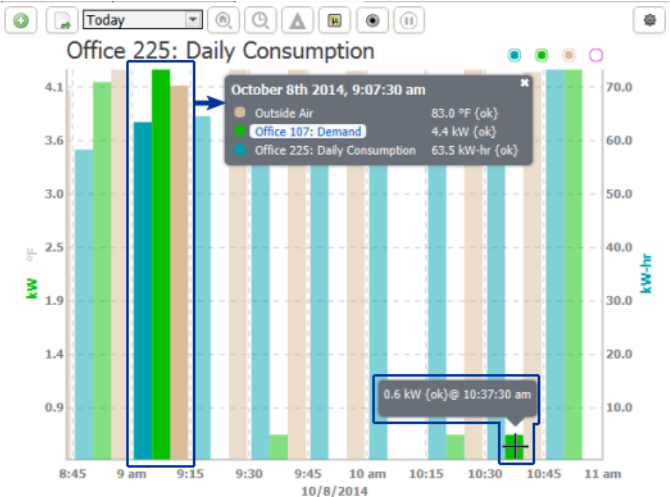| Command Bar	Options	Description
⊕ **Add Series**		Add components to the chart. Select one or more components via File Chooser. Use `Ctrl + Click` to select multiple individual components or select a folder that contains multiple components, as shown here. [Either the href or the keyref attribute should be set on graphic elements]
🖫 **Save**		Available only when you open an existing .chart file and make changes. Save — saves file (chart or csv format) to Station space: `Files/charts/chart-Name.chart` or `Files/csv/chartName.csv`

📄 **Export**	**Actions** tab
	• `File Name`
	• `Destination`
	• `File Type`
	Options tab
	• `View On Export`
	• `Status Column`
		Available in a new chart and when you open an existing chart file.
		
		• `File Name` — componentName (default) or type other name using normal file-naming conventions
		
		• `Destination` (Workbench) — StationExports file to station File space `Files/charts/chartName.chart` or `Files/csv/chartName.csv`
		
		• `Destination` (Web Browser) —
		
		`Download` — exports file to operating system user's file space, for example: `C:\Users\userName\Downloads\chartName.chart`
		
		`Station`— Exports file to station File space. For example, `Files/charts/chartName.chart`
		
		`Print` — launches browser Print dialog. Optionally, you can scroll to the bottom of the print dialog and click the link to "Print using system dialog"
		
		• `File Type` — chart (default) or csv
		
		• `View On Export` — Displays exported file
		
		• `Status Columns` — Available only for csv exports, exported file includes status data

![Time Range dropdown] **Time Range**	• `Auto (default)` • `Time Range` • `Today` • `Last 24 Hours` • `Yesterday` • `Week To Date`	Specifies time range for data display. Selecting the `Time Range` option launches a dialog where you can enter custom **Start** and **End** times for the range. Leave the **End** time field blank for live data to continue plotting on the chart.

Command Bar	Options	Description
	• Last Week • Last 7 Days • Month To Date • Last Month • Year To Date • Last Year	
Home Zoom	• On (default), • Off	Turns On/Off Home Zoom. On — zooms to the X-axis of the primary data set. **NOTE:** If the primary data set is numeric, it zooms on the Y-axis. Off —
Time Zoom	• On, • Off (default)	Turns On/Off Time Zoom. On — zooms X-axis to the time period specified by **Time Range** dropdown list. Off — reverts to Home Zoom.
Delta	• On , • Off (default)	Turns On/Off Delta On — plots the rate of change between points. Off — resumes plotting data points.
Sampling	• On • , Off (default)	Turns On/Off Sampling. On — sampling is enabled Off — turns off sampling and disables auto-sampling behavior.
Status Coloring	• On • Off(default)	Turns On/Off data Status Coloring. On — displays data points with status colors in a line chart and in shade or bar chart displays a status color band at the top of each bar. Off — hides status coloring, data points/color bands.

Command Bar	Options	Description
⏸ **Pause**	• `On` / • `Off` `(default)`	Turns On/Off pause in live data plotting. `On` — pauses live data plotting. No longer in live mode when paused `Off` — resumes live data plotting
◾ **Stop**	• `On` / • `Off` `(default)`	Added in Niagara 4.1, this becomes visible only during data loading. Turns data chunking On/Off. `On` — stops the data chunking process, halts data coming from the server. While stopped, the button displays a red border. `Off` — reloads all of the data.

Chart settings

Options in the Chart view **Settings** dialog allow you to make data presentation changes that are of a persistent nature, meaning the changes are retained when the chart is exported or saved.

Series tab

Settings	Options	Description
`Color`	Color block assigned to each component	Change default data color by clicking color block and selecting different color via Color Picker.
`Chart type`	• `Line`, • `Discrete line`, • `Shade`, • `Bar`	`Line` — plots a smooth line with interpolation. The default chart type for Numeric points and histories. `Discrete line` — plots a "stepped" line without interpolation. `Shade` — plots shaded areas, known as "swim lanes," representing state change. The default chart type for Boolean and Enum points. `Bar` — plots vertical bars. Samples data into common intervals based on available width, When you have more than one component in a chart using bar chart type, they become a Bar Group, where the individual bars are adjacent (no space between). As shown below, clicking on a Bar Group selects the entire group and the values for all components in the group are shown in the Fixed Data Popup. While the mouseover Data Value Popup, shows the value of a single component.

Axis tab

Settings	Options	Description
`Y-Axis Orientation`	• `left` • `right` (default)	Aligns Y-axis of primary data set to the left or right side of the chart.
`Data Zoom Scope`	• `primary` (default) • `all`	Sets the Data Zoom Scope to primary or all. `Primary` — zooms to the X-axis of the primary data set only. If the primary data set is numeric, it zooms on the Y-axis. `All` — changes the X-axis to accommodate all available data, including live data as it is recorded.

Settings	Options	Description
`Show Grid`	• `true` (default) • `false`	Turns on/off the chart grid. `true` — grid displays in chart behind data. `false` — grid does not display.
`Background Area Color`	• `on` • `off` (default)	Turns on/off the Background Area Color for the current theme. `On` — background area color displays in chart behind data. `Off` — background area color does not display.

Layers tab

Settings	Options	Description
`Data Popup`	• On (default)Displays • OffPauses	Enables/disables the **Fixed Data** popup. `On` — clicking on chart data displays the recorded date and time, as well as the name, value and status for each component in the chart at the point where you click. The persistent data popup remains visible until you close it. `Off` — suspends display of fixed data popup.
`Data Mouseover`	• On (default) • Off	Enables/disables the mouseover **Data Value** popup. `On` — mouse position on chart data displays the recorded component value, status, and the time for that mouse position. `Off` — suspends display of mouseover data value popup.
`Status Coloring`	• On • `Off` (default)	Turns On/Off data status coloring. `On` — displays data points with status colors in a line chart and in a bar chart displays a status color band at the top of each bar. `Off` — hides status color data points/color bands.

Sampling tab

Settings	Options	Description
`Auto Sampling`	• `true` (default) • `false`	Enables/disables automatic sampling optimizations. `true` — automatically begins sampling if the focused data set exceeds 2500. `false` — automatically stops sampling if the focused data set is below 2500.
`Sampling`	• `true` • `false` (default)	Enables/disables sampling for any size data set. `true` — turns on sampling `false` — turns off sampling **NOTE:** For performance reasons, sampling cannot be turned off once the focused data set exceeds 50,000. This threshold is configurable in the `system.properties` file. For details, see "About sampling".
`Sampling Type`	• `average` (default) • `min` • `max` • `sum`	`average` - samples average values for the selected rollup period. `min` - samples minimum values for the selected rollup period. `max` - samples maximum values for the selected rollup period. `sum` - samples the total of the values in the selected rollup period.
`Sample Size`	2500 (default)	Specifies the number of points in the data set to sample.

Settings	Options	Description
		NOTE: The default auto sampling size is configurable in the `system.properties` file. For details, see "About sampling".
`Available Data Points`	Read only	Displays the maximum number of points in the data set that are available to sample.
`Sampling Period`	Read only	Visible only once sampling has begun, displays the calculated average of the amount of time between each of the points that have been sampled.

About sampling

Sampling uses a simple roll-up technique to get large data sets down to a manageable number of points. This improves chart rendering performance and it smooths out the chart data somewhat which can make it easier to interpret.

Rollup (or Rollup Interval) is an interval of time that is used to determine what (and how) data is presented in your chart. The effect is that rollup groups the data into auto-configured intervals. Each point displayed, using the rollup, represents a designated time interval before the specified plot time. This interval is a stat that can be seen in the Settings dialog **Sampling Period** field (only visible once sampling has begun).

When the focused point array is larger than 2500, roll-up buckets are created and calculated based on the available time based on total duration/2500. The roll-up amount is rounded up to the next highest time increment. For example, if the calculated roll-up bucket is 2.5 hours, a roll-up bucket of 3 hours is used and the roll up will start at an even increment. So if the first entry is 2:35 am, then the first rollover bucket will be 2:00 and the next bucket will start at 3:00.

Auto-Sampling turns on automatically if the focused data set exceeds 2500 and turns off automatically once the focused data set is below the 2500 threshold.

Sampling is on if the Chart view **Sampling** command is selected. Alternately, in the settings **Sampling** tab, you can turn on sampling by disabling Auto Sampling and setting `Sampling` to `true`.

Changes in sampling for Niagara 4.1

Starting in Niagara 4.1, enhancements in sampling protect against an unlimited number of points in a web chart consuming all available memory on the PC. The number of points are configurable with a system.property, as are the limits for when to start auto sampling and when to force auto sampling on.

Data chunking, which is used for all data, accommodates large histories (those exceeding configured size limits) resulting in improved performance. Chunking limits the amount of memory consumed while data is loading. The chart displays once information about the series is received and data displays in the chart as it comes in from a chunked response.

An added chart command functions as described here:

- The **Stop** command (■), becomes visible only while data is loading. At any point during data loading, you can press the button to stop the chunking process. Press **Stop** once to halt data coming from the server. While stopped, the button displays a red border. Press **Stop** a second time to reload the data.

- Changing the **Time Range** while the page is loading also triggers the **Stop** command followed by a page reload.

- For performance reasons, you cannot turn off sampling once the number of points in the focused data set exceeds 50,000 (or the configured default maxSamplingSize). If you attempt to turn off sampling a popup alerts you that "The chart has too many points (>50,000). Sampling cannot be turned off until the page is focused on fewer points." You can change the **Time Range** to focus on fewer points.

The following configurable system.properties (`!default/system.properties`) allow you to fine tune sampling defaults:

- `#niagara.webChart.autoSamplingSize=2500`

This property sets the default auto sampling size. This applies when sampling is turned on to improve web browser interaction.

- `#niagara.webChart.maxSamplingSize=50000`

  This sets the default maximum sampling size. When exceeded, sampling cannot be turned off.

- `#niagara.webChart.maxSeriesCapacity=250000`

  This sets the maximum capacity for a data series. When the indicated **Time Range** loads more points than the configured maximum capacity (default=250,000), the **Sampling** command displays a red border and a popup (shown) alerts you that only the most recent 250,000 points will be shown in the chart.
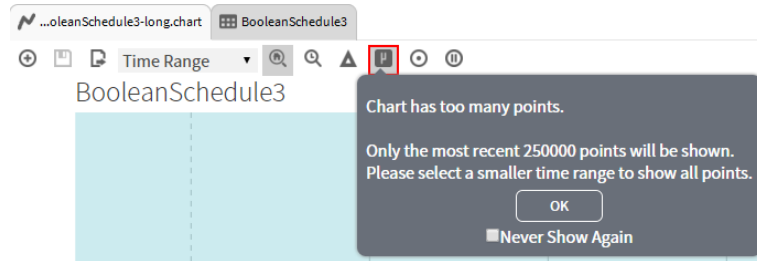
webChart-CircularGaugeWidget

Located in the `webChart` palette, this bajaux HTML5–based component allows you to add a `Circular-Gauge` widget to a Px or Hx page. You can add the gauge to a Dashboard, pane as well. Drag and drop a point component onto the widget to see its current value presented graphically and update showing live data. Also, if the status of the added point changes, the gauge color changes to reflect current status.

Additionally, the `CircularGauge` widget observes minimum and maximum facets for points, and has an override in the PxEditor to redefine min and max properties if needed.

Configurable properties for the `CircularGauge` widget:

| Property	Value	Description
Visible	true (default), false	Enables/disables display of the widget.
Enabled [webCharts]	true (default), false	Enables and disables use of the component.
Layout	Default values: X= 0.00, Y=0.00, Width=300.00, Height=2600.00, Fill=on, off (default)	Provides X and Y positioning coordinates for the widget as well as, Width, Height, and Fill. X and Y units can be specified as Absolute or Percent. While Width and Height dimensions can be specified as Absolute, Percent, or Preferred units. The Fill checkbox turns fill on or off.
Js	view:webChart:CircularGaugeWidget	Provides Ord for the Javascript widget. You can browse to select another widget.
Dashboard	true (default), false	Enables/disables usage in dashboards
wbViewBinding	Binding null — >WebWidget (default)	Provides ord for bound label. You can browse to select the Ord. Also provides selectable options for Degrade Behavior (None, Disable, and Hide).

workbench-WebWidget

This is a bajaux, HTML5-based application that incorporates a view with interactive functionality which allows you to edit properties and invoke commands from the view. You can easily add data to a WebWidget, such

as the WebChart or Dashboard, simply by dragging one or more components onto the widget. The widget renders in both Workbench and HTML5 Hx interfaces. The widget also integrates into the environment. For example, commands defined for a WebWidget render as added tool bar icons in Workbench, as well as in the HTML5 Hx profile in a web browser.

Examples of the bajaux WebWidget include the following:

• The WebChart displays the **Chart** view which can display historical data and update with live data. Also, in a the view you can easily add data and invoke numerous commands and settings to modify data presentation.

Figure 5   Chart WebWidget
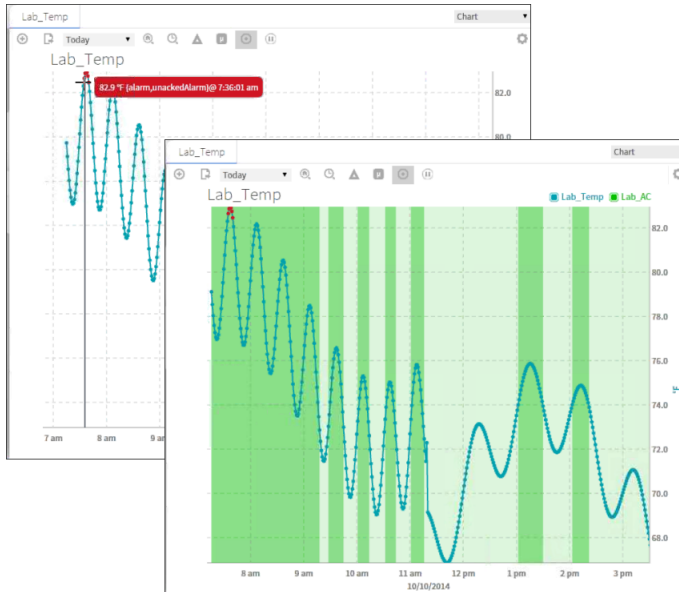
• The CircularGauge displays the graphical gauge view which updates with live data and provides contextual information for the current value. At any time you can dynamically switch the display to another component simply by dragging and dropping a different component onto this widget.

Figure 6   CircularGauge WebWidget
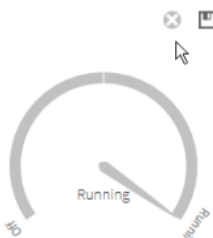
• The Dashboard may be added to any PxPage and displayed in the PxViewer. Additional WebWidgets may be added to the Dashboard pane to customize the presentation of data.

Figure 7   Dashboard WebWidget

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