

***Graphics Generator  
HEFS Release 0.1.1  
User's Manual***

*National Weather Service  
Office of Hydrologic Development*

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# 1 Overview

The Graphics Generator is a component of the Community Hydrologic Prediction System (CHPS) that allows for the construction of graphical, tabular, or XML products based on time series stored within the CHPS database. The Generator consists of four FEWS explorer plug-ins, which are panels displayed in the CHPS interface, seamlessly integrating Graphics Generator within CHPS. In addition, there is a model adapter that allows for products to be generated from within CHPS workflows.

For installation instructions for the Graphics Generator, refer to the *HEFS Release 0.0.1 Install Notes*.

## 1.1 Notation

The following notation is used:

- Important terms are displayed in *italics* the first time they are used and defined.
- Graphics user interface components are displayed in **Bold**.
- List items, such as available plug-ins or allowed parameter settings, will be in “quotes”.
- Parameter names are displayed as normal text.
- Text which is to be entered at a command line or into an ASCII text file (including XML files) is denoted in `courier font`.

## 2 Getting Started

The Graphics Generator includes multiple FEWS explorer plug-in panels displayed within the CHPS forecasting interface. The panels allow for the following: viewing and editing charts and graphs, and generating image, XML, and ASCII text files. Underlying the Graphics Generator is a charting engine that builds charts using various plug-ins and outputs those charts to flat-files.

In this chapter, several core concepts are presented that underlie the Graphics Generator. Also presented are general interface components used throughout the software and the overall layout of the Graphics Generator user interface.

### 2.1 Core Concepts

#### 2.1.1 Templates and Products

A *template* is a list of parameters instructing Graphics Generator on how to construct a chart. A template is identified by a template id and can refer to other templates.

A *product* is a combination of one-or-more templates with product specific parameters that yield a single chart, as well as instructions specifying what the Graphics Generator should do with the resulting chart or data underlying it, including generating images, tabular output, or XML output. Products are identified by a product id and CHPS segment id, identifying the segment for which to construct the product, or “all segments” if it applies to all.

When computing chart series and building a chart, the Graphics Generator builds the chart series implied by each template and adds them to the working chart, in order. It then builds a set of appearance modifiers based on the templates, with the parameters for a template overriding previously referenced templates. For example, if each template specifies a plot title, then it is the last template’s plot title that will be displayed, since there is only one plot title. The appearance modifiers constructed from the templates become the default appearance modifiers which can be overridden via the **Appearance Panel** (Section 12, pg 62).

#### 2.1.2 Arguments

Integral to the concept of templates and products is the concept of arguments. An *argument* is a mapping of a name to a value and has many uses. For example, arguments can be used to specify file names of output to generate, location ids of time series to load, and labels within the plot. By referring to arguments, a template or product can be designed such that, given a different set of arguments, it can be applied to a different location or forecast point. Within labels, file names, and so on, an argument is indicated by the “@” symbol before and after the name of the argument. For example, a template can be designed to display the time series loaded for location id “@defaultLocationId@”. Then, to apply the template to location AAAAA, specify an argument to the template with name “defaultLocationId” and value “AAAAA”. To apply the same template to location BBBBB, do the same but set the argument value to “BBBBB”.

### 2.1.2.1 Product Specific and Predefined Arguments

Arguments may be either predefined or product specific. A predefined argument is one that is made available to any product created for a specific segment. The predefined arguments for a segment are configurable within interfaces described in Section 3.1.2 (pg 19). However, there are five predefined arguments automatically included for any segment:

- `overrideActiveSegmentId`: Overrides the current active segment id in the CHPS interface, or “-undefined-” if none. This is the segment id used by the Graphics Generator to load the other predefined arguments configured for that segment.
- `defaultLocationId`: By default it has the same value as `overrideActiveSegmentId`.
- `defaultParameterId`: “QINE” by default.
- `defaultEnsembleId`: “ESP” by default.
- `systemTime`: The system time, T0, to use where appropriate; by default, it is the CHPS active system time.

Product specific arguments are defined by the user and tailored for the specific product. Whereas any predefined argument has a default initial value, a product specific argument does not. This means all product specific arguments must be provided before a template can be included in a product.

### 2.1.2.2 Argument Functions

An *argument function* is an argument that requires parameters. The parameters are specified within parentheses and are semicolon delimited, immediately after the argument function name and before the closing ‘@’. For example:

“@relativeDateToText(T0; MM/dd/yyyy HH:mm:ss z; GMT)@”.

Within the Graphics Generator, the following are argument functions:

- `latitude`: Returns the latitude of a location as defined in the Locations.xml CHPS configuration file. The parameter is the location id, and it may include any argument. For example, this is valid: “@latitude(@defaultLocationId@)@”.
- `locationDescription`: Returns text specifying the description for the location as defined in Locations.xml. The parameter is the location id, and it may include an argument.
- `locationShortName`: Returns text specifying the short name for the location as defined in Locations.xml. The parameter is the location id, and it may include an argument.
- `longitude`: Returns the longitude of a location as defined in Locations.xml. The parameter is the location id, and it may include an argument.
- `relativeDateToText`: Returns text corresponding to a relative date in a specified format. The parameters are: (1) the relative date string (e.g., “T0 + 90 days”); (2) the date format (e.g. “MM/dd/yyyy HH:mm:ss z”); and (3) the time zone. See Section 2.2.2.1 (pg 11) for information on the date format and valid time zones.
- `thresholdValue`: Returns text specifying a threshold value in the units of the input series provider that provided the threshold. The parameters are: (1) the identifier of the



threshold, viewed in the **Parameters Editing Panel** of the **Appearance Panel** when “Thresholds” is selected from the **Plug-in Tree** (see Section 12.2.8); and (2) the number of decimal places to display in the returned text.

Argument functions work exactly like arguments in every other way. For example, the `relativeDateToText` argument above would return text corresponding to the system time, `T0`, in the format specified by the date format string, “MM/dd/yyyy HH:mm:ss z”.

*NOTE: Do NOT use semicolons in the parameters of an argument function! They must only be used to separate the parameter values in the list.*

### 2.1.2.3 Global and Template Arguments

There are two levels of arguments: global and template. *Global arguments* are associated with a product and can be accessed by referenced templates or by the product specific parameters. *Template arguments* are associated with a specific referenced template, overriding any global arguments with the same argument names and being used in conjunction with the template to build the template chart series.

### 2.1.2.4 Arguments within Arguments

An argument can be referenced within the value of another argument or parameters of an argument function. An argument function can be referenced in the value of an argument, but cannot be referenced in the parameters of another argument function.

## 2.1.3 Settings

Settings define default behavior within the Graphics Generator. Specifically, the settings include (1) a definition of predefined arguments (Section 2.1.2.1, pg 3) associated with a segment and (2) which of the products are to be displayed as thumbnails within the **GraphGen Thumbnails Panel** for a segment (by default, all are displayed). Additionally, predefined arguments can be defined for “all segments”. Thus, for any segment, the predefined arguments are a combination of those defined for all segments overridden by those defined specifically for the segment. The settings are recorded in the CHPS local data store and central database, and, therefore, must be synchronized before CHPS is exited (see Section 2.1.8, pg 8). Settings are edited via the **Modify Settings Dialog** (Section 3.1.2, pg 19).

## 2.1.4 Plug-ins

The Graphics Generator makes use of five types of plug-ins to generate a graphic:

1. *Input Series Provider Plug-in*: provides time series that can be used to build chart series displayed in a Graphics Generator chart.
2. *Aggregator Plug-in*: aggregates a time series.
3. *Calculator Plug-in*: accepts time series as input and generates output series for display in a chart.

4. *Appearance Modifier Plug-in*: modifies the appearance of a Graphics Generator chart.
5. *Output Generator Plug-in*: accepts a chart and its underlying data and parameters as input and generates output of some kind; e.g. images, tabular text files, and XML files.

The plug-ins available with the release of Graphics Generator are described in the sections corresponding to the graphics user interface component used to specify the parameters of the plug-in. Except for appearance modifier plug-ins, users should feel free to add plug-ins to the Graphics Generator software as desired. Due to the complexity of implementation within the charting tool, new appearance modifier plug-ins must be added by OHD software developers. Instructions for implementing a plug-in are provided in Appendix B (under construction).

## 2.1.5 Components of a Chart

The main functions of the Graphics Generator are to build and display X-Y charts, and generate output files that are derived from the chart. Thus, the user should understand the components of a chart before using the Graphics Generator. See Figure 2-1 for a diagram of the components.

### 2.1.5.1 Chart Series

A *chart series*, as the term is used herein, is a set of displayable X-Y *series* computed by a single calculator plug-in and displayed within a chart. It is calculated based on four items:

1. *Selected time series*: Time series selected as input to the chart series computation process.
2. *Aggregators*: A sequence of aggregations to be performed by aggregator plug-ins, with the output of the previous plug-in becoming the input to the next plug-in.
3. *Calculator*: A calculation to be performed by a calculator plug-in that yields a set of series to be plotted on the chart.
4. *Series drawing parameters*: Parameters defining instructions for how to display the chart series in the chart (plot types, colors, shapes, etc).

### 2.1.5.2 Subplot

A *subplot* is any plot within the charting area. All subplots share the same x axis, but can have different y axes. A chart consists of any number of subplots, with the first subplot being the top subplot.

### 2.1.5.3 Domain Axis

The *domain axis*, or x-axis, is the horizontal axis along the bottom of the chart. Typically, the axis will be time-based, but there are some cases where it uses other units. The axis will include tick marks at regular intervals, tick mark labels, and a one-line axis label.

### 2.1.5.4 Range Axis

A *range axis*, or y-axis, is a vertical axis on either side of a subplot. Typically, the axis will be numerical. The axis will include a label, tick marks at regular intervals, and tick mark labels.

### 2.1.5.5 Titles

The *plot title* is a multi-line title at the top of the plot. A *subtitle* is an extra annotation on the plot that can be positioned above, below, or on either side of the plot. If above the plot, it will be positioned between the plot title and the top subplot.

### 2.1.5.6 Legend

The chart *legend* displays the series plotted within the chart. For each series, it will include a name and an image that will allow the viewer to recognize the series within the chart (usually a line and/or symbol of the same color as what is in the chart).

### 2.1.5.7 Threshold

A *threshold* is a labeled line within a subplot marking a significant value, such as a time or flood stage.

### 2.1.5.8 Zone

A *zone* labeled area within a subplot marking some significant range of values, such as the area above flood stage.

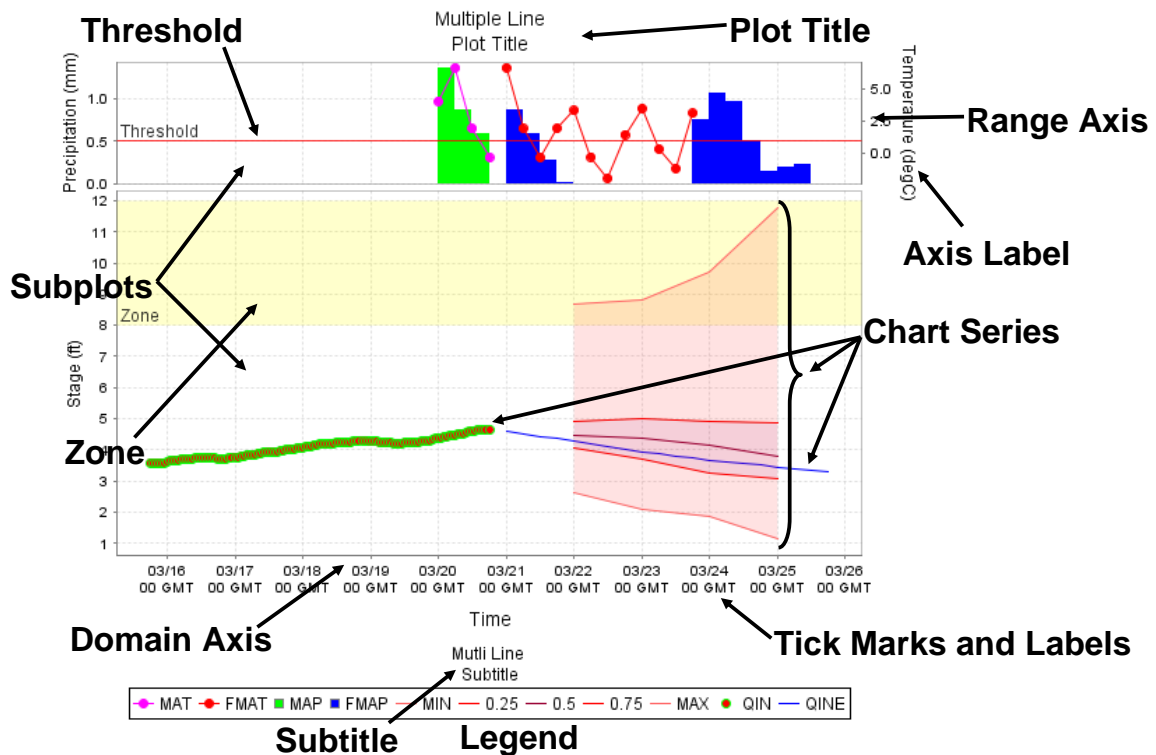


Figure 2-1: Components of a Graphics Generator chart.



## 2.1.8 Synchronization

The Graphics Generator stores products and settings within the CHPS database, or local data store, by use of the FEWS PI-service. The PI-service operates such that the local data store is kept in sync with a central database at all times, if synchronization is to be performed. To do so, the PI-service loads and saves products and settings into memory (referred to hereafter as the *PI-service memory layer*), only saving changes to the local data store and uploading those changes to the central server database when requested. Furthermore, when the localDataStore is updated with new products or settings due to a download synchronization with the central database, the PI-service memory layer is immediately updated with the new values. A download synchronization typically occurs when another user on another system changes products or settings and uploads those changes to the central database. Graphics Generator, therefore, must maintain a memory of the active settings and any unsaved changes made to a currently edited product. So, if the local data store is changed for whatever reason, then those remembered settings and changes are not lost; the user is given the option to keep the settings and changes.

Despite these precautions, it is distinctly possible for conflicts to occur when designing products. For example, if user A on system A edits product 1 and saves it, user B does the same but makes different changes, and user B then uploads those changes, then the changes user A made will be lost, being overwritten by user B's changes. For this reason, it is recommended that only one user edit a particular product at any given time.

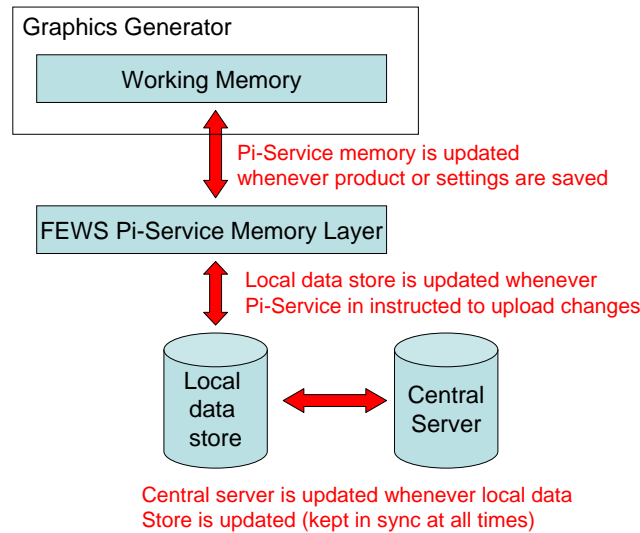


Figure 2-2: Diagram of synchronization layers.

## 2.2 General Graphical User Interface Components

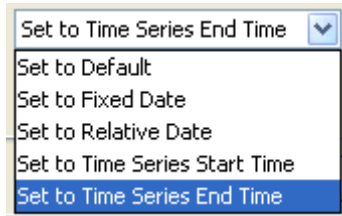
Some graphical user interface components are used many times within the Graphics Generator and are described below.

## 2.2.1 Date Chooser Panel

Within many panels of the Graphics Generator, a date must be specified. This is done so via a **Date Chooser Panel**:




The panel consists of a **Date Field** that displays the date text as a fixed date or relative date, and a **Date Choice Box** that is a selectable list of options for setting the date:



The choices within the list depend on the situation, but always include “Set to Fixed Date” and “Set to Relative Date”, which open up dialogs described in the next two subsections. The other options always specify a fixed time. For example, given a base time series, “Set to Time Series Start Time” sets the **Date Field** to the start time of the base time series, and “Set to Time Series End Time” sets the **Date Field** to the end time of the base time series. “Set to Default” always sets the **Date Field** to be the relative date, “T0”. The **Date Field** can be edited manually, and whenever a change is made that would yield an invalid date, the change is undone.

### 2.2.1.1 Choose Fixed Date/Time

When “Set to Fixed Date” is selected from the **Date Choice Box**, a **Choose Date/Time Dialog** will be displayed (see Figure 2-3). This dialog is similar to the **Current System Time Dialog** used to edit the CHPS system time. The time can be set manually, by clicking on the  button and modifying the drop-down calendar, or by clicking on the **Now Button** to set the time to the CHPS system time.

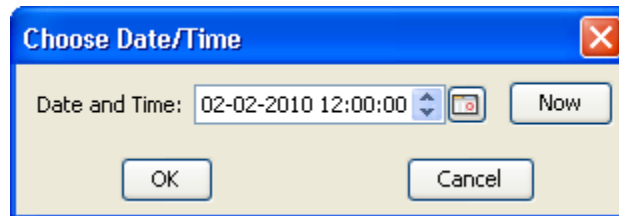



Figure 2-3: Chose Date/TimeDialog, used to edit fixed dates.

### 2.2.1.2 Choose Relative Date/Time

When “Set to Relative Date” is selected from the **Date Choice Box**, a **Choose Relative Date/Time Dialog** will be displayed (see Figure 2-4). This dialog allows for defining a relative date. The <basis date> is selected via the first choice box, , and includes all or

some of the four possible basis dates. The second choice box,  , defines the <+/-> component. The remaining spinner and choice box,  , and  , respectively, allow the user to specify [`<quantity>` `<unit>`] components of the relative date, with the text field at the bottom specifying all such components. To add a component to the field, select a [`<quantity>` `<unit>`] combination and click on the  button. The field can also be edited manually by clicking on it and typing. Clicking on the **Reset Button** will reset the relative date to the original relative date displayed when the dialog was opened.

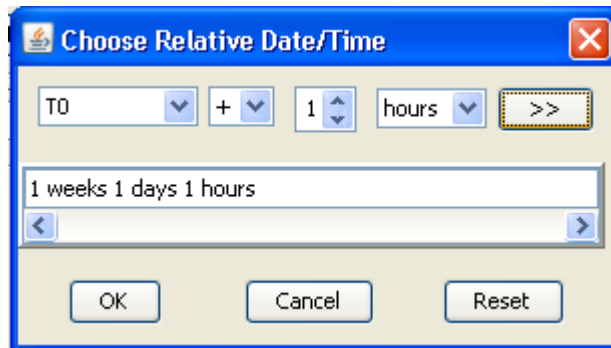


Figure 2-4: Choose Relative Date/Time dialog, used to edit relative dates.

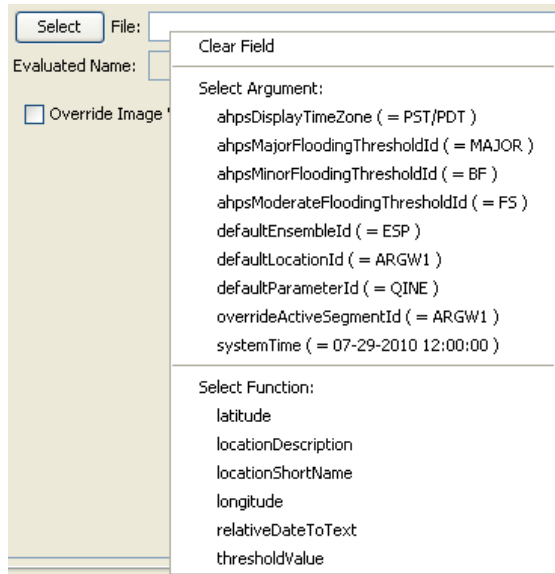
## 2.2.2 Argument Inserting Components

Argument inserting components come in three varieties:

- (1) **Argument Inserting Text Field,**
- (2) **Argument Inserting Text Area,** and
- (3) **Argument Inserting Choice Box.**

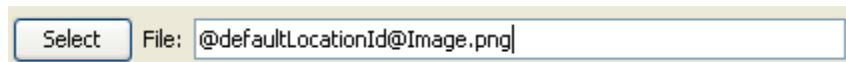
To insert an argument for any component, position the editing cursor where the argument is to be inserted and right click on the component. An **Arguments Pop-up Menu**, shown in Figure 2-5, will display allowing the user to specify an argument or argument function to be inserted. Upon completion, the argument will be inserted into the text where the cursor is located.

All three argument inserting components use the same **Arguments Pop-up Menu**:



**Figure 2-5: Standard Arguments Pop-up Menu.**

The first option of the pop-up menu clears the component value. The second section lists the names of arguments, alphabetized, with values displayed in parentheses. A value of “-undefined-” means an unspecified argument value. The third section displays argument functions, alphabetized. Upon selecting an argument or function, the component being modified will be updated. For example, this shows an **Argument Inserting Text Field** after “defaultLocationId” is selected from the menu:



When an argument function is selected from the **Arguments Pop-up Menu**, an **Argument Function Parameters Dialog** will be displayed allowing the user to specify parameters for the function. The dialog follows a general layout as described below, with argument function specific features being described afterwards.

### 2.2.2.1 General Argument Function Parameters Dialog Layout

Figure 2-6 shows an example of a dialog for specifying parameters of a relativeDateToText argument function. The components of the dialog are as follows:

- **Edit Parameters Panel:** Function specific panel displaying components used to edit parameters.
- **Function Text Field:** The text corresponding by the argument function and its parameters. For example, if editing the plot title, this is the text that will be visible to the user as the title is edited in the interface.
- **Function Value Field:** The evaluated value of the argument function. For example, if editing the plot title, this is the text that will be visible in the constructed chart.



In the sections that follow, the content of the **Edit Parameters Panel** for each argument function will be described.

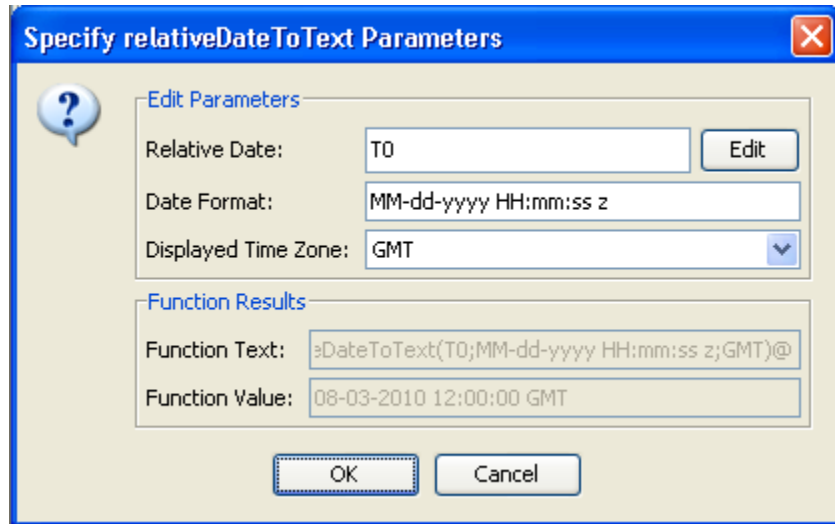
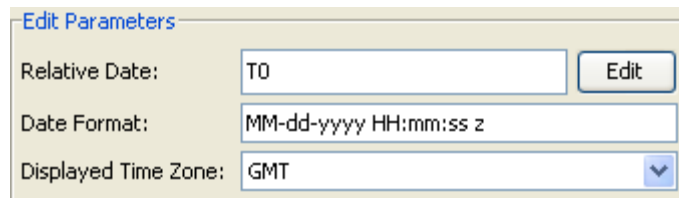


Figure 2-6: Argument Function Parameters Dialog for relativeDateToText function.

### 2.2.2.2 Edit Parameters Panel for relativeDateToText

The **Edit Parameters Panel** for the relativeDateToText function parameters is as shown:



The **Relative Date Text Field** specifies the relative date for which to produce a text string. It can be edited manually, or by clicking on the **Edit Button** to open up a **Choose Relative Date/Time Dialog** (Section 2.2.1.2, pg 9). The **Date Format Field** specifies the format of the date text to return from the argument function. The values that can be used in the date format string are as follows:

**Table 2-1:** Value characters to use within a date format.

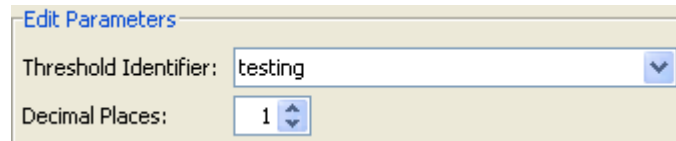
Letter	Date or Time Component	Presentation	Examples
G	Era designator	Text	AD
y	Year	Year	1996; 96
M	Month in year	Month	July; Jul; 07
w	Week in year	Number	27
W	Week in month	Number	2
D	Day in year	Number	189
d	Day in month	Number	10
F	Day of week in month	Number	2
E	Day in week	Text	Tuesday; Tue
a	AM/PM marker	Text	PM

H	Hour in day (0-23)	Number	0
k	Hour in day (1-24)	Number	24
K	Hour in AM/PM (0-11)	Number	0
h	Hour in AM/PM (1-12)	Number	12
m	Minute in hour	Number	30
s	Second in minute	Number	55
S	Millisecond	Number	978
z	Time zone	General time zone	Pacific Standard Time; PST; GMT-08:00
Z	Time zone	RFC 822 time zone	-800

The **Displayed Time Zone Choice Box** can be used to specify the time zone of the output date.

### 2.2.2.3 Edit Parameters Panel for thresholdValues

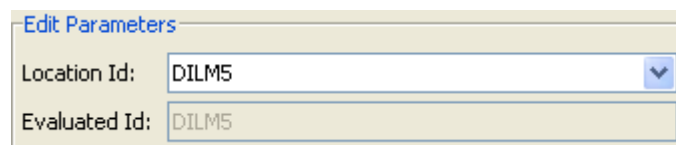
The **Edit Parameters Panel** used to specify the thresholdValue identifier and precision parameters is as shown:



The **Threshold Identifier Choice Box** is an **Argument Inserting Choice Box** that allows for specifying the identifier of the threshold whose value is to be displayed as text. See Section 12.2.8 (pg 72) for information on thresholds. The value can be edited directly or selected from a list of identifiers. The **Decimal Places Spinner** specifies the number of decimal places that will be displayed in the returned text. The number of decimal places must be a non-negative integer.

### 2.2.2.4 Edit Parameters Panel for Location Information Functions

The **Edit Parameters Panel** used to specify the location identifier required for the locationShortName, locationDescription, latitude, and longitude argument functions is as shown:



The **Location Id Choice Box** is an **Argument Inserting Choice Box** that allows for specifying the location id required for the argument function. The **Evaluated Id Text Field** displays the location id after arguments are replaced using their current values, if arguments are used.

## 2.2.3 Choose Color Dialog

A **Choose Color Dialog**, shown in Figure 2-7, is used within the **Series Drawing Parameters Table** of the **Calculator Panel** and some editing panels for appearance modifier plug-ins to select a color.

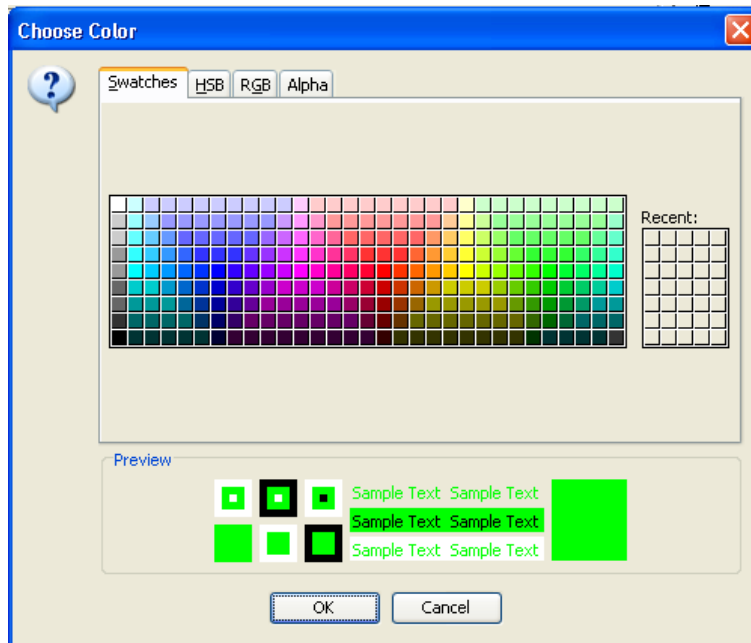


Figure 2-7: The Choose Color Dialog.

The dialog provides four different tabbed panels. The **Swatches Tabbed Panel**, **HSB Tabbed Panel**, and **RGB Tabbed Panel** can be used to select the color in standard ways. The **Transparency Tabbed Panel** specifies the transparency level for a color: 0 is completely transparent and 255 is opaque. The panels are shown in Figure 2-8.

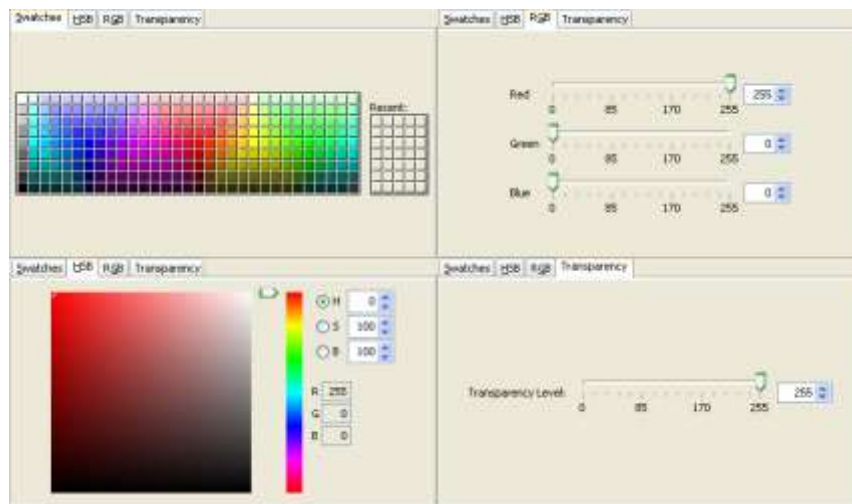



Figure 2-8: The four tabbed panels used to specify the color.

## 2.2.4 Table Delete and Status Columns

Throughout the **GraphGen Editor Panel**, plug-ins and time series are listed in tables. In most cases, the tables have the following as the first two columns:

- “Delete”: Displaying the icon, , when a cell of the column is clicked, the corresponding table row is removed, along with the plug-in, parameters, arguments, or time series it represents.
- “Status”: Displays the status of the plug-in or argument by showing one of two icons:
  - ✔ If the status is good, meaning the plug-in can be executed or the argument is used and specified.
  - ❗ If the status is bad, meaning there is an error attempting to apply the plug-in or the argument is used but a value is not specified.

If a table includes these two columns, it will be stated when described in a later section.

## 2.3 Overall Interface Layout

The Graphics Generator user interface consists of four plug-in components, or panels, displayed within the CHPS user interface. The components are as follows, with a screen shot shown in Figure 2-9:

1. **GraphGen Tree Panel**  
Typically displayed on the left along with the CHPS **Data Viewer** and **Forecasts Panels**, this panel allows for the user to manage and select Graphics Generator products and templates for editing or viewing.
2. **GraphGen Thumbnail Panel**  
Typically displayed on the right along with the CHPS **Plot Overview** and **Forecaster Help Panels**, this panel allows for the user to select products for viewing based on the current active segment within the forecasting process.
3. **GraphGen Editor Panel**  
Typically displayed in the center along with the **Map, Plots, Topology**, and other panels, this panel allows for the user to create or modify Graphics Generator products.
4. **GraphGen Viewer Panel**  
Typically displayed in the center, this panel allows for the user to view Graphics Generator products.

As with any CHPS interface component, a tab or toolbar button must be clicked to open a component. Furthermore, the components can be detached or reattached to the main interface, or be minimized.

The remaining sections of this manual discuss these four components and their associated subcomponents.

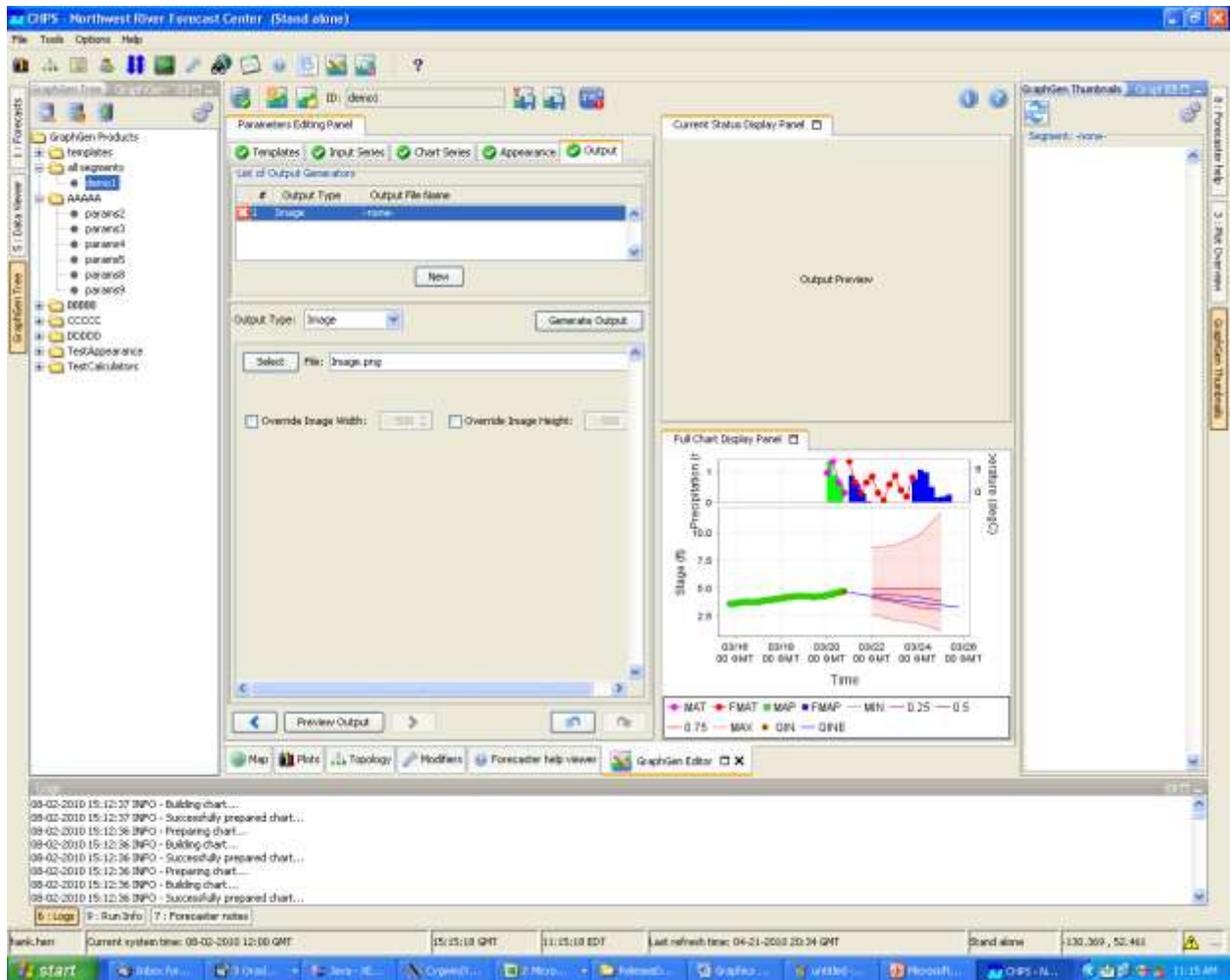


Figure 2-9: CHPS interface displaying Graphics Generator components.

### 3 GraphGen Tree Panel

The **GraphGen Tree Panel**, shown in Figure 3-1, is usually displayed on the left side of the CHPS graphics interface and is opened by clicking on the appropriate tab in the CHPS interface. The Panel provides a listing of all of the Graphics Generator products and templates stored in the CHPS database using a tree structure. The first level of the tree displays segment IDs and second level displays product IDs. This panel also provides access to two other key components:

1. The **Product and Template Manager Dialog**, which allows for removing, importing, and exported products.
2. The **Modify Settings Dialog**, which allows for modifying Graphics Generator settings (Section 2.1.3, pg 4).

The section describes the components and usage of the **GraphGen Tree Panel**, the **Product and Template Manager Dialog**, and the **Modify Settings Dialog**.

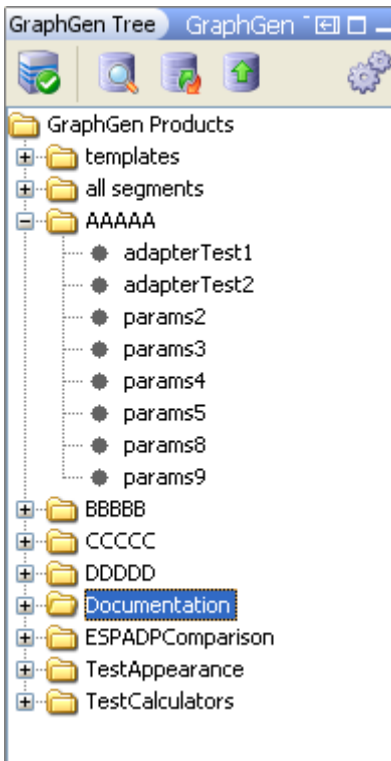









Figure 3-1: Top portion of the **GraphGen Tree Panel**.

#### 3.1 Components

The following describes the **GraphGen Tree Panel** components:

- **Tree:** Displays all templates and products by segment id and product id. The segment ids are displayed as “nodes” or “branches” that can be clicked on and expanded. The product ids are displayed as selectable “leaves”. The “templates” node lists all templates

and the “all segments” node lists products that are defined to be displayed for all segments. Both nodes will exist even if there are no leaves below them. Products are selected for editing in the **GraphGen Editor Panel** by selecting the appropriate product id leaf. If more than one leaf is selected, only the first selection is communicated to the editor. Products can be moved or copied between segments by dragging-and-dropping; to copy, press and hold the <Ctrl> key when the product is dropped (i.e., mouse button released). Products can be deleted by selecting products or segments and pressing the <Delete> key.

-  **Reconnect to CHPS PI-service Button:** Click to open an **Enter Port Number Dialog** that allows for entering a port number to use for connecting to the PI-service. This is useful if the port number used previously (default is 8100) failed to yield a connection or connected to the wrong PI-service. After clicking, all open panels associated with the Graphics Generator will be redrawn. If a **Graphics Generator Editor Panel** is open, the edited product will be redrawn, but the parameters of the product will not be changed. When the PI-service is not connected, any plug-in that requires the CHPS database will fail and the user will not be able to save templates and products to the CHPS database. A status icon is included within the larger icon,  indicates a good connection, while  indicates a bad connection.
-  **Manage Products Button:** Click to open the **Product and Template Manager Dialog**, described below, centered over the panel.
-  **Refresh Tree Button:** Click to force the tree to be reloaded from FEWS PI-service memory layer (Section 3.1.7, pg 8) and redrawn in the interface.
-  **Upload Products Button:** Click to request that the FEWS PI-service save all changed products and settings stored in the Pi-Service memory layer to the local data store and upload to the central server.
-  **Change Default Settings Button:** Click to open the **Modify Settings Dialog**, described below, centered over the panel.

### 3.1.1 Product and Template Manager Dialog

The **Product and Template Manager Dialog**, shown in Figure 3-2, allows for removing, importing, and exporting templates and products to and from the Pi-Service memory layer (see Section 2.1.8, pg 8). The components are as follows:

- **List of Templates Found Table:** List of all templates found in a table format, including a delete column, template id, and description. The table can be sorted by clicking on the header of the column on which sorting is to be based.
- **List of Products Found Table:** List of all products found in a table format, including a delete column, segment id, product id, and description. The table can be sorted by clicking on the header of the column on which sorting is to be based.
- **Refresh Button:** Click to refresh both tables by reloading the information from the CHPS database.

- **Remove Button:** Click to remove all templates and products selected in either table. A **Confirm Delete Dialog** will open after clicking on the button; click on the **No Button** to cancel the removal.
- **Import Button:** Click to import products and templates from a previously exported XML file. A file selection dialog will open allowing the user to select a file to import. Upon selecting a file, a dialog will popup displaying the status of the import job and close when the job is completed.
- **Export Button:** Click to export products and templates to an XML file for later importing. A file selection dialog will open allowing the user to specify a file to export. Upon selecting a file, a dialog will popup displaying the status of the export job and close when the job is completed.
- **Close Button:** Click to close the dialog.

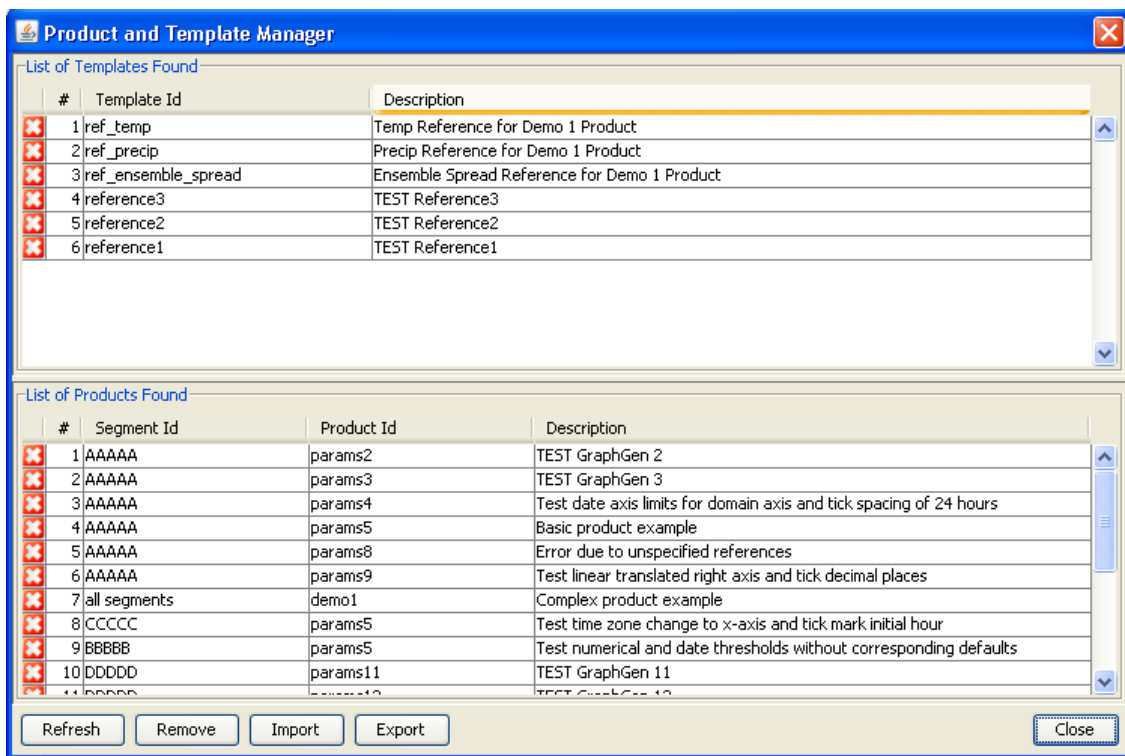




Figure 3-2: The Product and Template Manager Dialog.

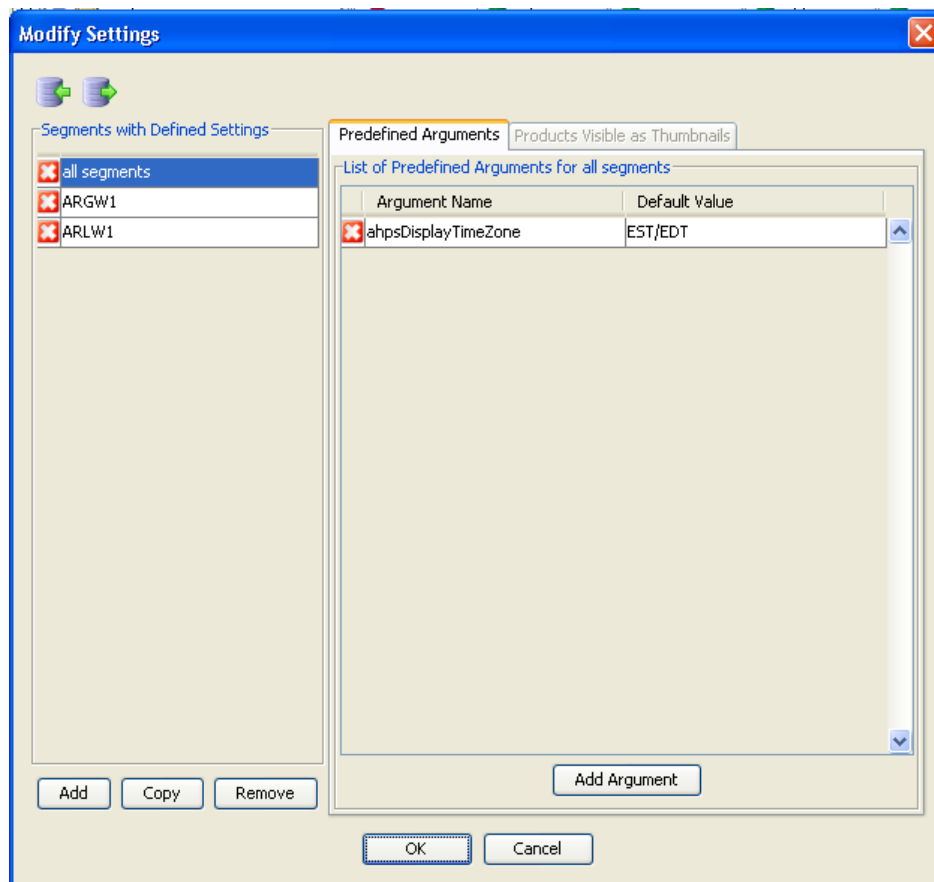
### 3.1.2 Modify Settings Dialog

The **Modify Settings Dialog** allows for the user to set segment-specific settings of the Graphics Generator. Those settings include two items: (1) predefined arguments (see Section 2.1.2.1, pg 3) and (2) products that are defined for “all segments” that are to be included in the **GraphGen Thumbnail Viewer**. Two tabbed panels are used to specify these settings: **Predefined Arguments Tabbed Panel** and **Products Visible as Thumbnails Tabbed Panel**, respectively. The components of the dialog and two panels are described herein.

The **Modify Settings Dialog** is shown in Figure 3-3. The components of the dialog are as follows:



- **Segments With Defined Settings Table:** A table displaying those segments that have defined settings. The first column is a delete column and the second column displays the segment id and is editable when double-clicked. The first row will always display segment id “all segments”, which is not be editable. If a segment does not have defined settings, then the predefined arguments will be those included by default or defined for all segments, and all products defined for the segment, including those for all segments, will be displayed in the **GraphGen Thumbnail Viewer**. When one row is selected, the tabbed panels will be updated.
- **Add Button:** Click to create settings for a new segment. A **Specify Segment Id Dialog** will popup allowing for the segment id to be entered.
- **Copy Button:** Create a copy of the currently selected segments. The copies will be identical, but with a segment id that begins with “Copy of”.
- **Remove Button:** Click to remove settings for the segments currently selected in the list.
-  **Import Settings Button:** Click to import settings from an XML file. A file selection dialog will open allowing the user to specify the file to import. Upon clicking **OK**, the settings will be imported, overwriting existing settings where appropriate.
-  **Export Settings Button:** Click to export the settings to an XML file. A file selection dialog will open allowing the user to specify the file to create. Upon clicking **OK**, the file will be exported.



**Figure 3-3: The Modify Settings Dialog and Predefined Arguments Tabbed Panel.**

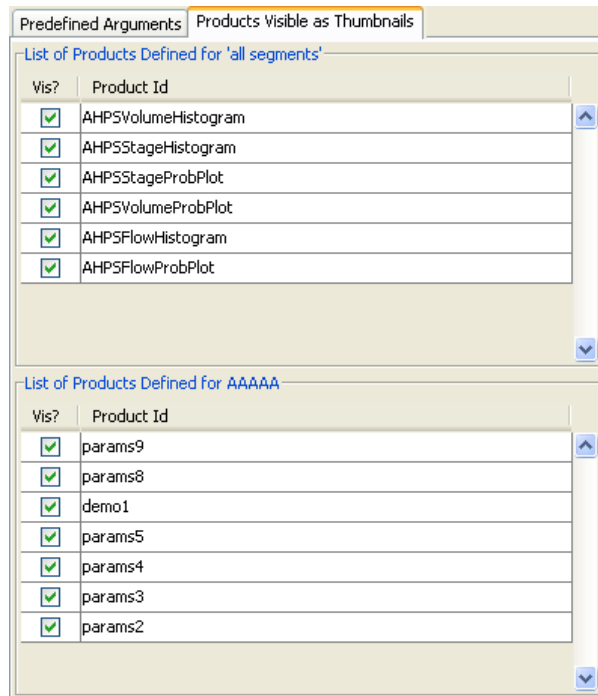
- **OK Button:** Click to close the dialog and save the settings to the FEWS PI-service memory layer (Section 3.1.7, pg 8).
- **Cancel Button:** Click to close the dialog without saving changes

The components of the **Predefined Arguments Tabbed Panel**, shown in Figure 3-3, are as follows:

- **List of Predefined Arguments Table:** Displays the predefined arguments defined for the selected segment. These predefined settings are in addition to those provided by default (see Section 2.1.2.1, pg 3), though the default predefined argument values can be overridden. The first column is a delete column. The remaining two columns are both editable and display the name of the predefined argument and the value, respectively.
- **Add Argument Button:** Click to add a new predefined argument. A **Specify Argument Name Dialog** will open allowing the user to either select one of the predefined arguments provided by default or specify a new one. Upon clicking **OK**, a new row will be added to the table.

The components of the **Products Visible as Thumbnails Tabbed Panel**, shown in Figure 3-4, are as follows:

- **List of Products Defined for ‘all segments’ Table:** Lists all of the products defined for “all segments”. The first column, “Vis?”, displays a checkbox indicating if the product is to be displayed in the **GraphGen Thumbnail Viewer**; only checked products are displayed. Note that if a segment has no settings, then all products defined for “all segments” are displayed in the **GraphGen Thumbnail Viewer**.




**Figure 3-4: The Products Visible as Thumbnails Tabbed Panel.**

- **List of Products Defined for Segment Table:** Lists all of the products defined for the segment selected in the **Segments With Defined Settings Table**. The table is identical to the **List of Products Defined for ‘all segments’ Table**. Note that if a segment has no settings, then all products defined for the segment are displayed in the **GraphGen Thumbnail Viewer**.


## 3.2 Usage

### 3.2.1 Selecting a Product or Template for Editing


To select a product or template for editing, click on the ‘+’ next to the node with the segment id of the product to be edited. This will expand that branch. Click on the product id of the product to be edited. To edit a template, click on the ‘+’ next to the node labeled “templates” and select the id of the template to edit. If the **GraphGen Editor Panel** is open, the actively edited product will be changed to the product selected in the tree. If not, then clicking on the **GraphGen Editor Button**, , in the CHPS toolbar will open up the editor initialized to edit the selected product or template.

### 3.2.2 Managing Products and Templates in the CHPS Database

Clicking on the **Managed Products Button** opens up the **Product and Template Manager Dialog**, shown in Figure 3-2. The following tasks can be performed via the dialog:

- *Delete templates or products:* To delete a product or template, click on the delete column, , of the row corresponding to the product or template to be removed. This will force the **GraphGen Tree Panel** to refresh.
- *Export products:* To export products or templates, select entries from the tables displaying products and templates and click on the **Export Button**. From the **Export Selected Only Confirmation Dialog**, click either **Yes** or **No**, appropriately. Then specify a file name and click **Open**. If you do not select any rows in either of the tables of templates and products, then all templates and products are exported.
- *Import products:* To import products and templates, click on the **Import Button** and use the file browser that opens up to select the XML file that contains the desired products.

### 3.2.3 Defining Predefined Arguments for a Segment

To define predefined arguments for a segment, click on the **Change Default Settings Button**. From the **Segments With Defined Settings List** in the **Modify Settings Dialog**, select the desired segment. If the segment is not listed, click on the **Add Button** and specify the segment id. After the segment is selected, the tabbed panels will update to display settings for the segment. Make sure the **Predefined Arguments Tabbed Panel** is selected. Arguments can be added by clicking on the **Add Argument Button**, removed by clicking on the delete column, , for the argument to remove, or edited directly in the **Default Value Column** of the table.

*NOTE: Default predefined arguments when removed are reverted to their standard default value. See Section 2.1.2.1, pg 3.*







### **3.2.4 Changing Products Display as Thumbnails for a Segment**

To change which products are displayed as thumbnails within the **GraphGen Thumbnail Viewer** for a segment, click on the **Change Default Settings Button**. From the **Segments With Defined Settings List** in the **Modify Settings Dialog**, select the desired segment. If the segment is not listed, click on the **Add Button** and specify the segment id. After the segment is selected, the tabbed panels will update to display settings for the segment. Select the **Products Visible as Thumbnails Tabbed Panel**. Uncheck the rows for any product that is not to be included for the segment within the **GraphGen Thumbnail Panel**. Check any rows for products that are to be displayed, if not already checked.



## 4.1 Components


The components of the **GraphGen Thumbnail Panel** are as follows:

- **Thumbnail Scrollpane:** This component displays thumbnails of each of the Graphics Generator products available for the active segment in a panel with a scrollbar on the right. To remove a product from the **GraphGen Thumbnail Panel**, right click on the thumbnail and click the **Do Not Display Thumbnail Menu Item**. Note that this changes the settings for the active segment. Products can be included, again, by clicking on the **Change Default Settings Button** (below) and using the **Modify Settings for Segment Dialog** to include the removed product.
-  **Refresh Thumbnails Button:** Click to reload and redraw the products for the active segment. Clicking this button will typically not be needed. At least one and sometimes all of the thumbnails will automatically refresh whenever one of the following occurs:
  1. One of the products is changed via the **GraphGen Editor Panel**.
  2. A change is made to a template affecting one of the displayed products via the **GraphGen Editor Panel**.
  3. The settings for the active segment are changed via the **Modify Settings Dialog**.
  4. Products or templates are imported or exported via the **Product and Template Manager Dialog**.
  5. The active segment is changed via the CHPS interface **Forecasts Panel**.
  6. A synchronization has occurred in which the local data store has been changed and that change impacts the active segment in some manner.
  7. The connection to the PI-service is reset
-  **Select First Thumbnail Button:** Selects the first (top) thumbnail in the list.
-  **Select Previous Thumbnail Button:** Selects the previous thumbnail in the list.
-  **Select Next Thumbnail Button:** Selects the next thumbnail in the list.
-  **Select Last Thumbnail Button:** Selects the last (bottom) thumbnail in the list.
-  **Change Default Settings Button:** Click to open the **Modify Settings for Segment Dialog** centered over the panel. The dialog allows for modifying the settings for the active segment, and is exactly identical to the tabbed panels portion of the **Modify Settings Dialog** shown in Figure 3-3. The dialog will only allow modification of settings for the active dialog. See Section 3.1.2 (pg 19) for more details.


Note that the thumbnails are rendered in a background process. While the thumbnails are being drawn, the panel will display a message starting with “Building for <segment id>...” and a wait cursor will be displayed over the **GraphGen Thumbnail Panel**.

## 4.2 Usage

### 4.2.1 Selecting a Product for Viewing

To select a product for viewing, click on the thumbnail of the product so that it is bordered in red and click on the **GraphGen Viewer Button**, , in the CHPS tool bar. The **GraphGen Viewer Panel** will be opened in the center of the CHPS interface displaying the full version of the selected product.

### 4.2.2 Defining Predefined Arguments for Active Segment

To define predefined arguments for the active segment, click on the **Change Default Settings Button** to open the **Modify Settings for Segment Dialog**. Make sure the **Predefined Arguments Tabbed Panel** is selected. Arguments can be added by clicking on the **Add Argument Button**, removed by clicking on the delete column, , for the argument to remove, or edited directly in the **Default Value Column** of the table.


*NOTE: Default predefined arguments when removed are reverted to their standard default value. See Section 2.1.2.1, pg 3.*

### 4.2.3 Changing Products Display as Thumbnails for a Segment

To change which products are displayed for the active segment, click on the **Change Default Settings Button**. Select the **Products Visible as Thumbnails Tabbed Panel**. Uncheck the rows for any product that is not to be included for the segment within the **GraphGen Thumbnail Panel**. Check any rows for products that are to be displayed, if not already checked.

Alternatively, to exclude a product, right click on the thumbnail and from the pop-up menu, select the **Do Not Display Thumbnail Menu Item**.

## 5 GraphGen Editor Panel

The **GraphGen Editor Panel**, shown in Figure 5-1, allows the user to create new or edit existing templates and products. It is opened by clicking on the **GraphGen Editor Button**, , in the CHPS toolbar.

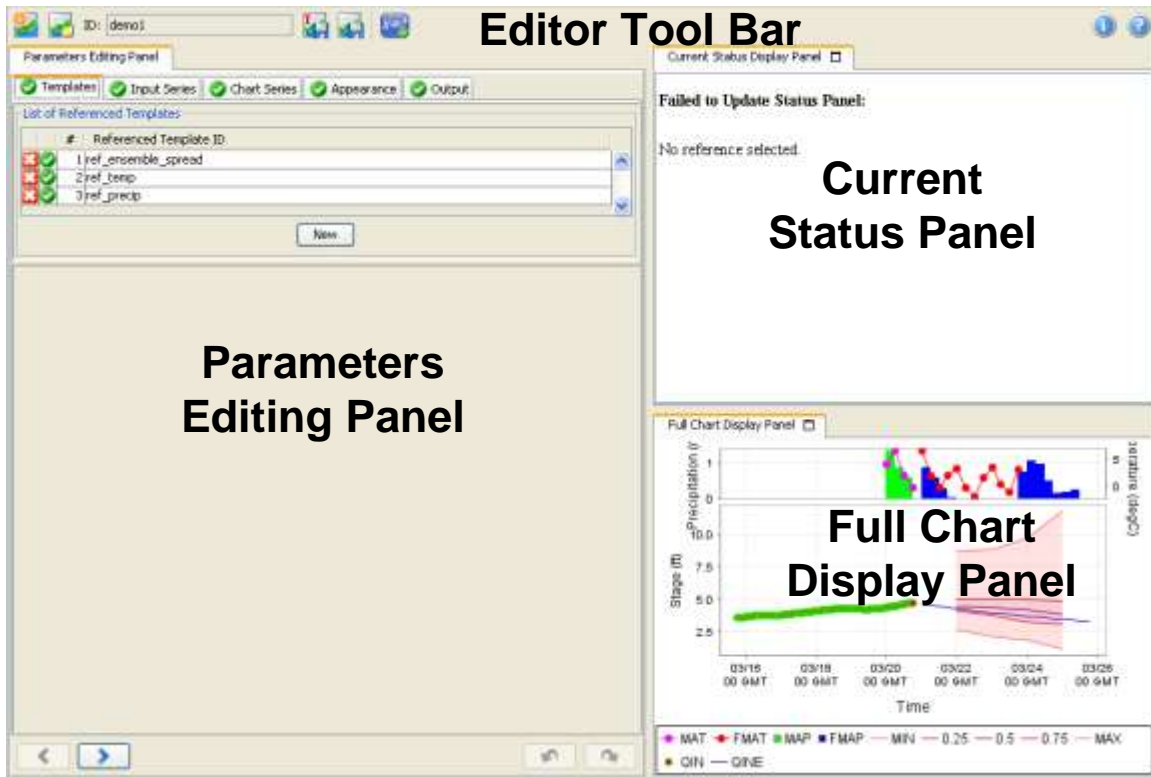


Figure 5-1: GraphGen Editor Panel.

### 5.1 Components and Layout










The layout of the **GraphGen Editor Panel** includes four components:

1. **Editor Tool Bar**: Tool bar above the other panels displaying buttons and a text field.
2. **Parameters Editing Panel**: On the left-hand side of the editor, used to edit parameters defining the product. It consists of five tabbed panels used to edit different types of parameters.
3. **Current Status Display Panel**: On the upper right of the editor, displays status information relative to the current active tabbed panel within the **Parameters Editing Panel**. This panel can be undocked from the main display by clicking on the  next to the panel name in the title tab and docked by closing the resulting dialog.
4. **Full Chart Display Panel**: On the lower right of the editor, displays the full chart that would be rendered if the user were to save it as is, without any additional changes. This panel can be undocked from the main display by clicking on the  next to the panel name in the title tab and docked by closing the resulting dialog.








Both the **Current Status Display Panel** and **Full Chart Display Panel** display error information. Each of the tabbed panels are described in later sections within this manual.


The following is a list of components that are present regardless of the active tabbed panel:

-  **New Button**: Creates a new product or template for editing, closing the product or template currently being edited.
-  **Open Button**: Opens a **Product and Template Manager Dialog** that allows the user to select a product or template to edit. See Chapter 4 for other features of this dialog.
- **ID Text Field**: Displays the product or template identifier for the product currently being edited.
-  **Save as Template Button**: Opens a **Save Template Dialog** that allows the user to save the template from the current editing product.
-  **Save as Product Button**: Opens a **Save Product Dialog** that allows the user to save the product currently being edited. Upon saving, the **ID Text Field** will display the new product id.
-  **Managed Product Arguments Button**: Opens a **Customize Global Arguments Dialog** that allows the user to modify the global arguments for the current product. A status icon is included within the larger icon:  indicates that all used arguments are specified, while  indicates at least one used argument is not specified.
-  **About Button**: Opens a dialog that displays version information.
-  **Help Button**: Opens up a help dialog that can be used to navigate the contents of this manual while using the Graphics Generator.
- **Tabbed Panel Tabs**: There are five tabs displayed in the **Parameters Editing Panel**; one for each of the tabbed panels that can be used to edit parameters:




The tab displays the name of the tabbed panel, each of which is described later. Also displayed is a status for that tab:  indicates that the parameters specified in the corresponding tabbed panel were successfully processed by the Graphics Generator engine to build the chart;  indicates that a problem was encountered, the nature of which will be described in the **Current Status Display Panel** when that tab is active. The order of the tabs dictates the order used for the **Back** and **Next Buttons**, below.

-  **Back Button**: Makes the previous tabbed panel active.
-  **Next Button**: Makes the next tabbed panel active.
-  **Undo Button**: Undo the last change made to the parameters of the edited product. This will change the active tabbed panel to be the one that was active when the change was made. The tabbed panel will be updated to the state of the panel immediately before the change was made. A history of up to 10 actions that can be undone is kept.

-  **Redo Button:** Redo the last undone change made to the parameters.

### 5.1.1 Save Product/Template Dialogs

The **Save Product Dialog** and **Save Template Dialog**, shown in Figure 5-2 and Figure 5-3, respectively, are used to save a template or product, allowing the user to specify a product/template id and segment id, if appropriate. The following are the components present in the dialogs:

- **List of Existing Product/Templates Table:** Provides a list of the existing products/templates. Note that clicking on  will delete the corresponding product/template from the CHPS database.
- **One Segment/All Segments Radio Buttons:** If the **All Segments Radio Button** is selected, then the product will be applied for “all segments”. If the **One Segment Radio Button** is selected, then the product will be saved for one segment, and the **Segment Id Text Field** and **Active Segment Button** will both be enabled. This is only available in the **Save Product Dialog**.
- **Segment Id Text Field:** Specifies the segment id to be used when saving a product. This is only available in the **Save Product Dialog**.
- **Active Segment Button:** Sets the **Specify Segment Id Text Field** value to be the id of the currently active segment. This is only available in the **Save Product Dialog**.
- **Specify Product/Template Id Text Field:** Specifies the product/template id of the product or template being saved.
- **Enter Description Below Text Area:** Specifies a description of the product or template being saved.
- **OK Button:** Click to save the product or template.
- **Cancel Button:** Click to cancel the save action.

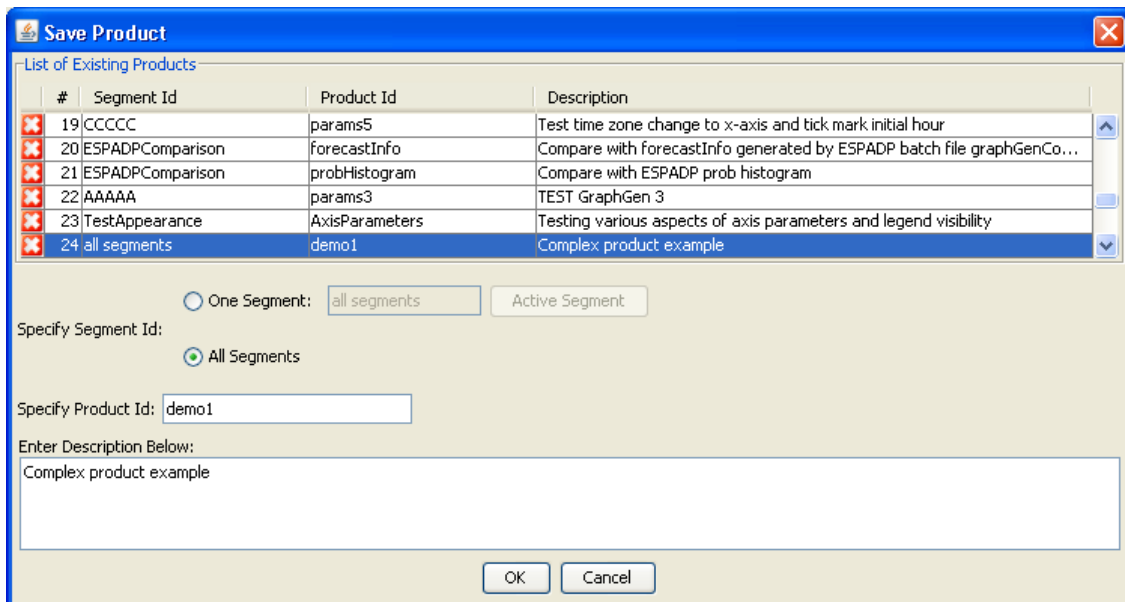


Figure 5-2: Save Product Dialog

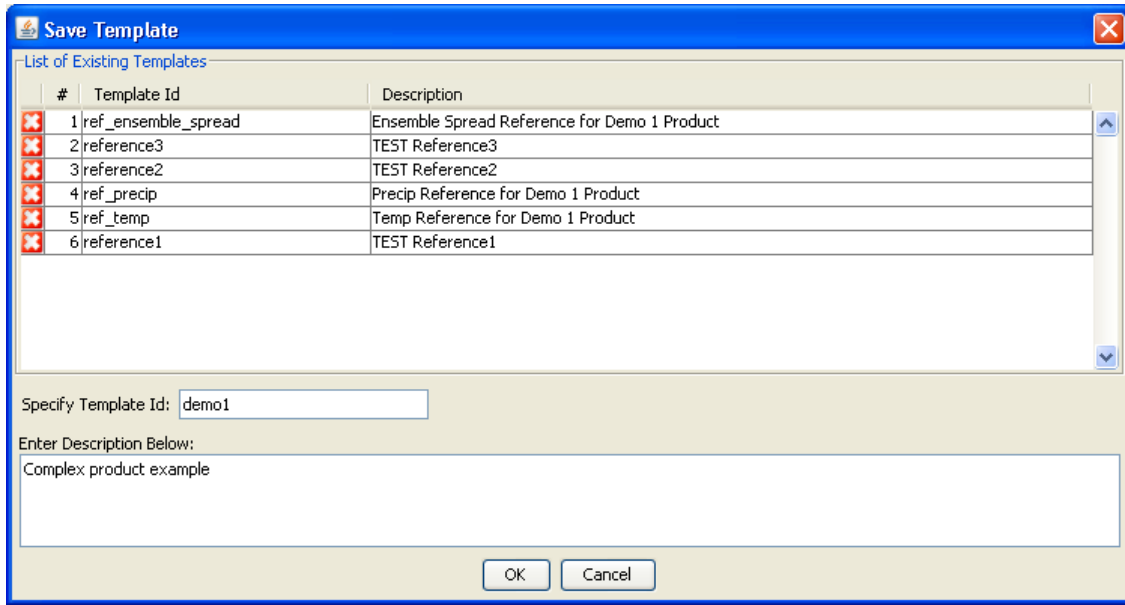




Figure 5-3: Save Template Dialog

### 5.1.2 Customize Global Arguments Dialog

The **Customize Global Arguments Dialog**, shown in Figure 5-4, is used to define new arguments or override existing arguments. The following are the components present in the dialog:

- **Override Predefined Arguments Table:** Lists arguments that are predefined for the active segment, allowing the user to override the argument value if desired. To override an argument, click on the checkbox in the “Override” column and set the value in the “Value” column. The value column is only editable when the override column displays a checkmark. The “Used” column specifies if the argument is used in the parameters. The status column (first column) displays a  when a used argument is specified and a  when a used argument is not specified (i.e. the value is “-undefined-”).
- **Define Product Specific Arguments Table:** List other arguments that have been specified manually by the user. The format of the table is the same as the **Override Predefined Arguments Table**, except there is no override column, the status column is the second column, and the first column is a delete column.
- **New Button:** When clicked, a **Specify Argument Name Dialog** will open requesting a name for the new argument. Upon specifying a name and clicking **OK**, the dialog will close and a new argument by that name will be added to the **Specify Other Arguments Table**.
- **OK Button:** Closes the dialog.

Note that there is no cancel button or undo button associated with the dialog.

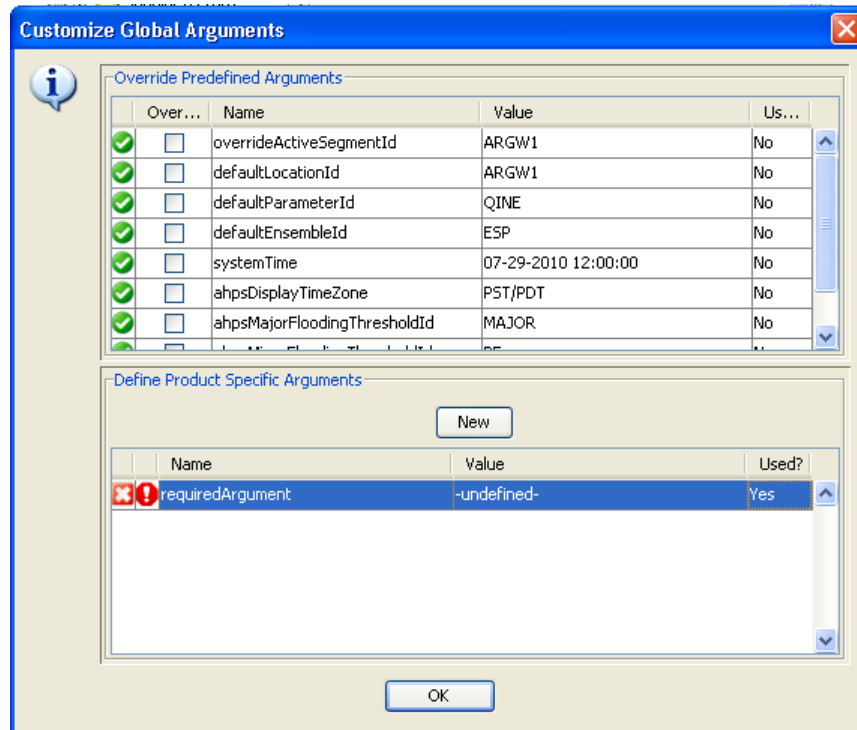


Figure 5-4: Customize Global Arguments Dialog

## 5.2 Usage

### 5.2.1 Building a Product or Template from Scratch

To start the process, click on the **New Button** within the **Editor Tool Bar**. When building a new template or product, it is recommended that the user follow the order of the tabbed panels:

1. **Templates Panel:** Specify templates to be applied to the product.
2. **Input Series Panel:** Specify all input series that will be used in the calculations performed to construct the chart series displayed in the product chart.
3. **Chart Series Panel:** Specify the calculations made for each chart series to display in the product chart. This includes:
  - a. selecting time series to use in the computations;
  - b. aggregating those time series as needed;
  - c. specifying the calculations to perform using the aggregated time series; and
  - d. specifying the appearance of those chart series within the chart.
4. **Appearance Panel:** Modify other aspects of the appearance of the product chart, including the plot title, axis settings, legend, etc.
5. **Output Panel:** Specify output to generate if the product is built via the model adapter within a workflow (i.e. non-interactively). When building a template, skip this step, as templates can never specify output to be generated.

Once the parameters are specified for the template or product, save the product or template by clicking on the appropriate **Save as Button** (Section 5.1). Details about each step are provided in the usage sections of the sections describing the panels.

## 6 Editor: Templates Panel

The **Templates Panel**, shown in Figure 6-1, is used to specify templates to apply when Graphics Generator builds a chart. See Section 2.1 (pg 2) for a description of the template concept. A template may require arguments in order to be constructed. Those arguments can be specified within the **Customize Global Arguments Dialog** or can be specified directly as “overridden” arguments to the template. Overridden arguments take precedent over global arguments.

The **Current Status Display Panel** displays the template as it would be constructed if it were built by itself. If an error occurs while building the template, possibly due to missing required product specific arguments, a message will be displayed in the panel describing the error.

The screenshot shows the 'Templates Panel' interface. At the top is a table titled 'List of Referenced Templates' with columns '#', 'Referenced Template ID', and status icons. The third row, '3 ref\_precip', is selected. Below this is a 'New' button. The next section has a 'Referenced Template ID:' field containing 'ref\_precip' and a 'Load' button. Below that is an 'Override Subplot Indices:' field with a value of '0'. The main part of the panel contains two tables. The first is 'List of Product Specific Arguments' with columns: Global?, Override?, Argument, Value, and Used?. It contains one row for 'requiredArgument' with a red error icon in the Global? column and '-undefined-' in the Value column. The second table is 'List of Used Predefined Arguments' with the same columns, containing one row for 'defaultLocationId' with a green checkmark in the Global? column and 'NFDC1UP' in the Value column.

#	Referenced Template ID	Status
1	ref_ensemble_spread	✓
2	ref_temp	✓
3	ref_precip	✗

Referenced Template ID:  Load

Override Subplot Indices:

Global?	Override?	Argument	Value	Used?
✗ No	<input type="checkbox"/>	requiredArgument	-undefined-	No





Global?	Override?	Argument	Value	Used?
✓ Yes	<input checked="" type="checkbox"/>	defaultLocationId	NFDC1UP	Yes

Figure 6-1: Templates Panel.

### 6.1 Components

The following describes the **Templates Panel** components:

- **List of Referenced Templates Table:** List of the templates currently included in the product. The first column is a delete column. The second column displays the status: ✓ if the template can be constructed or ✗ if the template cannot be constructed because of an error. When a row of the table is selected, the **Current Status Display Panel** will be updated to display the corresponding template.

- **New Button:** Adds a new template to the product. This will result in a row being added to the table.
- **Referenced Template ID Text Field:** The identifier of the referenced template for the row selected in the **List of Referenced Templates Table**. This field can be edited only by clicking on the **Load Button**. This component is only visible when a row of the **List of Referenced Templates Table** is selected.
- **Load Button:** Opens an **Open Template Dialog**, displaying a **List of Existing Templates Table** identical to that in the **Product and Template Manager Dialog**, whose components are described in Section 3.1.1. The user can select a template from the list and click **OK**. This component is only visible when a row of the **List of Referenced Templates Table** is selected.
- **Override Subplot Indices Checkbox and Spinner:** Allows the user to specify the subplot on which to plot all components of the referenced template. If checked, then all chart series created by the referenced template will be plotted on the subplot indicated by the spinner value, regardless of the subplot index currently assigned to those chart series. See the components of the **Calculator Panel** described in Section 11.1 (page 51).
- **List of Product Specific Arguments Table:** List of arguments required for the template that are not predefined arguments, based on the **Customize Global Arguments Dialog** (Section 6.2.2). To override the value of an argument, click on the checkbox in the “Override?” column of the table and edit the “Value” column. This component is only visible when a row of the **List of Referenced Templates Table** is selected. The first column displays the status of the argument:  if the argument is required and/or used but is not defined (“-undefined-”), or  otherwise.
- **List of Used Predefined Arguments Table:** List of arguments that are predefined arguments, according to the **Customize Global Arguments Dialog**. To override the value of an argument, click on the checkbox in the “Override?” column of the table and edit the “Value” column. This component is only visible when a row of the **List of Referenced Templates Table** is selected. The first column displays the status of the argument:  if the argument is required and/or used but is not defined (“-undefined-”), or  otherwise.

## 6.2 Usage

### 6.2.1 Adding a Template

To add a template to the product being edited, click on the **New Button** and then click on the **Load Button** to select the template. When the two tables are drawn in the lower half of the display, specify any arguments within the **List of Product Specific Arguments Table** for which the “Value” column is “-none-” or empty. Then specify any arguments within the **List of Used Predefined Arguments Table** for which the “Value” column is “-none-” or empty. After the arguments are fully specified, the **Current Status Display Panel** will display the template unless an error occurs, in which case it will display the error message.

## 7 Editor: Input Series Panel

The **Input Series Panel**, shown in Figure 8-1, is used to specify input time series that must be loaded from the CHPS database, a pi-timeseries XML file (i.e., an XML file used to specify a time series data following a schema developed by Deltares), or other location. Those input time series provide the data used within the Graphics Generator to calculate chart series that comprise the product. Input series are loaded by input series provider plug-ins and this panel allows the user to select plug-ins and specify parameters for the plug-ins.

The **Current Status Display Panel** displays the time series specified in the plug-in(s) that are currently selected in the **List of Input Series Providers Table**.

A list of available input series provider plug-ins is provided in Appendix A.

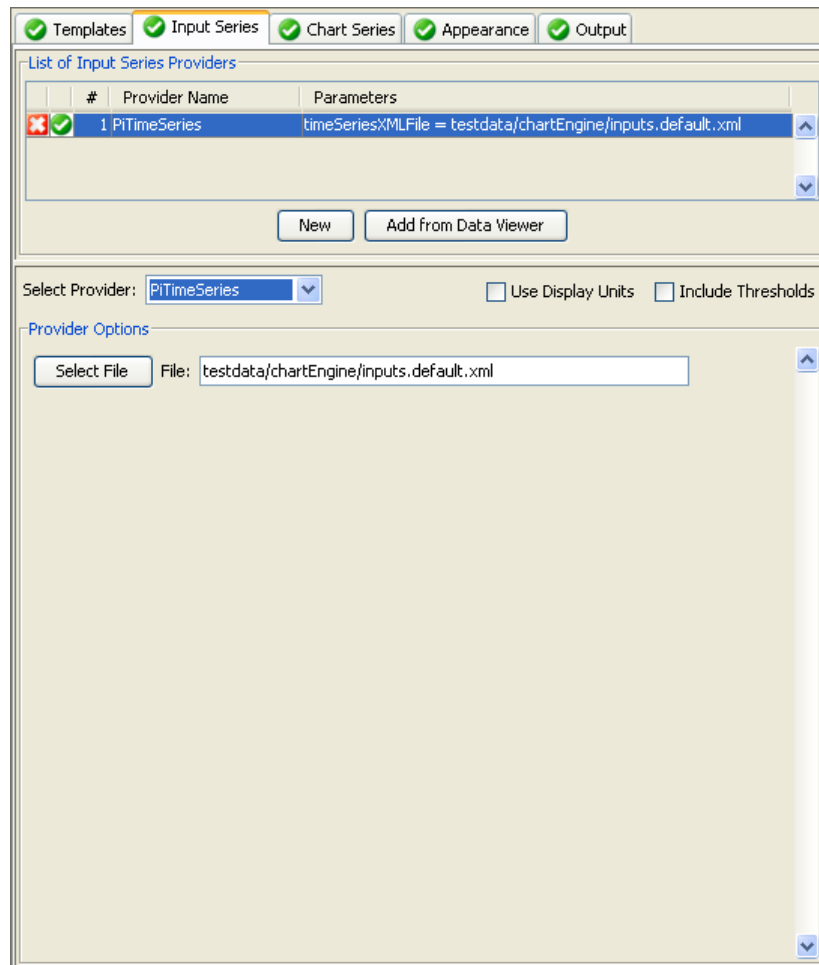




Figure 7-1: Input Series Panel

### 7.1 Components

The following is a description of the components of the **Input Series Panel**:

- **List of Input Series Providers Table:** List of the Input Series Provider Plug-ins currently included in the product. The first column is a delete column. The second column displays a status icon:  if the input series can be loaded successfully or  if the input series cannot be loaded. When rows of the table are selected, the **Current Status Display Panel** will be updated to display the time series loaded using the selected provider(s). When exactly one row is selected, the components below the table, including the **Select Provider Box**, two checkboxes, and **Provider Options Panel**, will be reconstructed to match the settings of the selected plug-in and allow for user editing. If no rows or multiple rows are selected, then those panel objects will not be displayed or will be disabled (only one plug-in can be edited at a time).
- **New Button:** When clicked, a new input series provider plug-in will be added to the product, using the default plug-in “PiTimeSeries” (see Section 7.3.2, pg 37).
- **Add From Data Viewer Button:** Button which adds a “SelectTimeSeries” plug-in with parameters specified according to user selections made within the **Data Viewer** panel of the CHPS interface.
- **Select Provider Choice Box:** Selectable list of available plug-ins. When selected, the **Provider Options Panel** will be updated to display a panel for editing the plug-in parameters.
- **Use Display Units Checkbox:** If checked, the units of the data loaded from the provider will be converted to the display units (English or metric) of the CHPS interface. If unchecked (default), it will be left in the stored units; typically metric?
- **Include Thresholds Checkbox:** If checked, then any thresholds associated with the loaded time series will be added to a list of thresholds that can be made visible on the chart via the **Appearance Panel** (see Section 12.2.8, pg 72). The Graphics Generator obtains the thresholds via the time series loading mechanism when the time series comes from the CHPS database.
- **Provider Options Panel:** Displays a panel designed for editing the parameters of the plug-in. This panel is empty unless a row of the **List of Input Series Providers Table** is selected.

## 7.2 Usage

Each plug-in has an individual set of instructions described in Section 7.3 (pg 36). Below is a description of how to add a “SelectTimeSeries” plug-in via the **Add From Data Viewer Button** that is part of the **Input Series Panel**.

### 7.2.1 Using the Add From Data Viewer Button

Make a complete selection within the **Data Viewer Panel** of the CHPS interface, selecting only “leaves” (i.e. entries with no subentries) within the tree interface. See Figure 7-2 at the end of this section. A complete selection will include one or more leaf nodes selected within each of the three panels. In the **Input Series Panel**, click on the **Add From Data Viewer Button**. This will add a “SelectTimeSeries” initialized for the selections in the **Data Viewer**.



## 7.2.2 Adding A Provider Plug-in

To add a provider plug-in, click on the **New Button**. Then select the provider via the **Select Provider Choice Box** and set the parameters in the **Provider Options Panel**.

## 7.3 Plug-Ins

An input series provider plug-in is required for providing time series to the Graphics Generator when computing chart series. The plug-ins released with Graphics Generator are described below.

### 7.3.1 ConfiguredQuery Plug-in

A ConfiguredQuery input series provider reads in time series from the CHPS database via a query configured within a file under Config/PiServiceConfigFiles. An example of a file defining user-configurable queries is provided within the file Config/PiServiceConfigFiles/GraphGen.xml delivered with the Graphics Generator. Here is part of that file:

```
<fewspIServiceConfig>
  <general>
    <importIdMap>IdImportPiService</importIdMap>
    <exportIdMap>IdExportPiService</exportIdMap>
  </general>
  ...
  <timeSeries>
    <id>QINE ESP</id>
    <timeSeriesSet>
      <moduleInstanceSetId>QINE</moduleInstanceSetId>
      <valueType>scalar</valueType>
      <parameterId>QINE</parameterId>
      <locationSetId>RRS_Preprocessing</locationSetId>
      <timeSeriesType>simulated forecasting</timeSeriesType>
      <timeStep unit="hour" multiplier="6" timeZone="GMT-0"/>
      <readWriteMode>read only</readWriteMode>
      <ensembleId>ESP</ensembleId>
      <ensembleMemberIndexRange start="1949"/>
    </timeSeriesSet>
  </timeSeries>
  ...
</fewspIServiceConfig>
```

The parameters of the plug-in are as follows:


- **clientId**: The client identifier of the query, which equals the name of the XML file under Config/PiServiceConfigFiles without the .xml extension. For example, clientId “GraphGen” identifies the file delivered with the software, GraphGen.xml.
- **queryId**: The id tag used to identify the query within the configuration file. In the example above, “QINE ESP” is a queryId.
- **locationId**: The location id of the time series to acquire. This parameter is required, because the FEWS PI-service requires it.

- **parameterId**: The parameter id of the time series to acquire. This parameter is required, because the FEWS PI-service requires it.
- **startTime**: Adjusts the time series acquired so that they start from the given start time.
- **endTime**: Adjusts the time series acquired so that they end at the given end time.
- **T0**: Sets the target system time, or T0, of the time series to acquire, allowing past time series to be retrieved. Currently, this is not used.
- **ensembleId**: The ensemble id of the time series to acquire. This works like the **locationId**, in that if a time series acquired via the query does not match this parameter id, then it will be discarded.
- **memberIndex**: The member index of the time series to acquire. This works like the **locationId**, in that if a time series acquired via the query does not match this parameter id, then it will be discarded.

Each parameter corresponds to components within the **Provider Options Panel**:

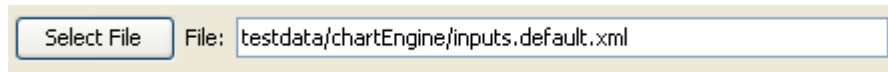
The screenshot shows the Provider Options Panel with the following settings:

<input checked="" type="checkbox"/> Override clientId	<input type="text"/>	Set to Default
<input checked="" type="checkbox"/> Override queryId	<input type="text"/>	
<input checked="" type="checkbox"/> Override locationId	<input type="text"/>	Set to Default
<input checked="" type="checkbox"/> Override parameterId	<input type="text"/>	Set to Default
<input checked="" type="checkbox"/> Override startTime	T0	Set to Relative Date ▼
<input checked="" type="checkbox"/> Override endTime	T0 + 10 days	Set to Relative Date ▼
<input type="checkbox"/> Override t0	T0	Set to Default ▼
<input type="checkbox"/> Override ensembleId	<input type="text"/>	Set to Default
<input type="checkbox"/> Override memberIndex	-1	

In each case, there is a check box that, if selected, indicates that the parameter is to be overridden and there is a field displaying the value. For the **clientId**, **queryId**, **locationId**, **parameterId**, and **ensembleId**, the field is an editable **Arguments Inserting Text Field** (Section 3.2.2, pg 10). If the field has a pink background, then it is a required parameter but no value is specified. The **Set to Default Button** sets the field to be equal to the “GraphGen” for the **clientId**, “@defaultLocationId@” for the **locationId**, “@defaultParameterId@” for the **parameterId**, and “@defaultEnsembleId@” for the **ensembleId**. Use the **Customize Global Arguments Dialog** to view and set the argument values. For the **startTime**, **endTime**, and **T0**, a **Date Chooser Panel** (see Section 3.2.1, pg 9) is used. Lastly, the **memberIndex** is an integer value and can be either typed into the corresponding field or by using the up/down arrows: .

### 7.3.2 PiTimeSeries Plug-in

A PiTimeSeries provider plug-in reads in time series from an XML file following the pi-timeseries XML schema. The only parameter of the plug-in is the XML file name, which is specified in the **File Field** within the **Provider Options Panel**:



It can be set manually or by using a standard file browser opened by clicking on the **Select File Button**: The **File Field** is an **Arguments Inserting Text Field** (Section 2.2.2, pg 10).

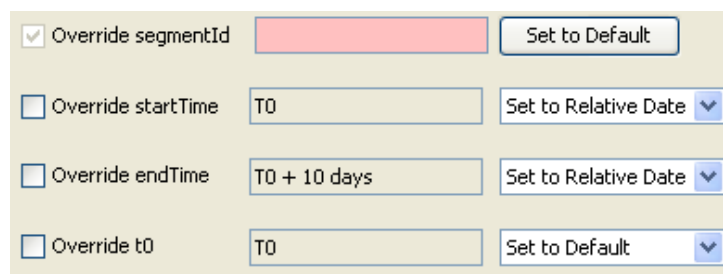
### 7.3.3 SegmentTimeSeries Plug-in

The SegmentTimeSeries provider plug-in reads time series from the CHPS database for a given segment id, as the data would be viewed within the **Plot Overview Panel** of the CHPS interface. This panel is configured via the Config/RegionConfig/DisplayGroups.xml file, and can display various time series of many data types for the active forecast segment. All displayed time series for a segment are be loaded via this plug-in.

The parameters are as follows:

- segmentId: The segment id of the time series to acquire.
- startTime: Adjusts the time series acquired so that they start from the given start time.
- endTime: Adjusts the time series acquired so that they end at the given end time.
- T0: Sets the target system time, or T0, of the time series to acquire, allowing past time series to be retrieved. Currently, this is not used.

Each parameter corresponds to components within the **Provider Options Panel**:



In each case, there is a check box that, if selected, indicates that the parameter is overridden and there is a field displaying the value. For the segment id, the field is an editable **Arguments Inserting Text Field** (Section 3.2.2, pg 10). A pink background indicates a parameter is required but has not be specified by the user. The **Set to Default Button** sets the field to be equal to the “@defaultSegmentId@”. Use the **Customize Global Arguments Dialog** to view and set the argument value. For the startTime, endTime, and T0, a **Date Chooser Panel** (see Section 2.2.1, pg 9) is used.

### 7.3.4 SelectTimeSeries Plug-in

The SelectTimeSeries plug-in reads time series from the CHPS database as configured in the Config/RegionConfig/Filters.xml file and displayed in the **Data Viewer Panel** of the CHPS interface (see the figure below list figure number). See Section 7.2.1 (pg 35) for how to add a SelectTimeSeries plug-in based on the **Data Viewer Panel**.

Plug-in parameters are:

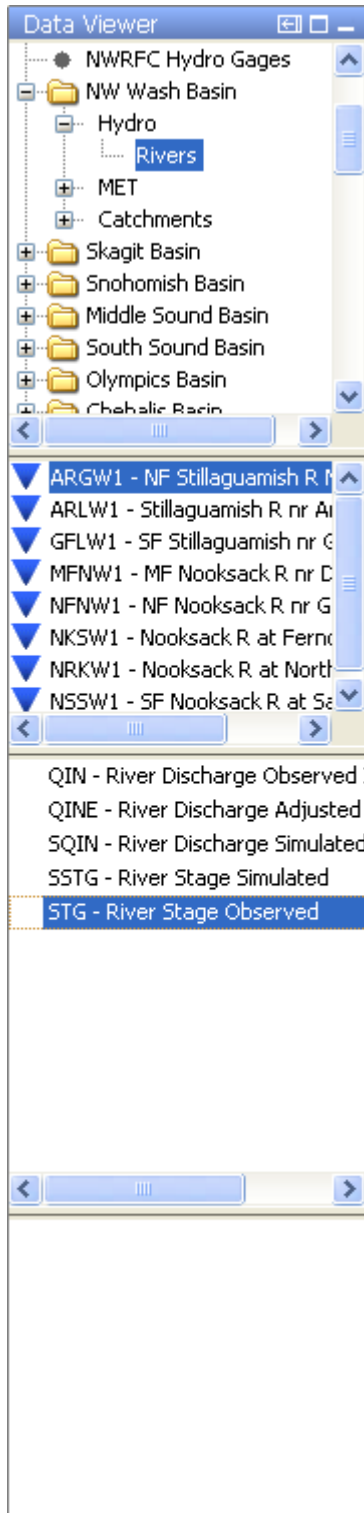
- filterId: The identifier of the filter defined in the Filter.xml configuration file. Corresponds to the first panel in the **Data Viewer Panel**.
- locationId: The location id of the time series to acquire.
- parameterId: the parameter id of the time series to acquire.
- startTime: Adjusts the time series acquired so that they start from the given start time.
- endTime: Adjusts the time series acquired so that they end at the given end time.
- T0: Sets the target system time, or T0, of the time series to acquire, allowing past time series to be retrieved. Currently, this is not used.

Each parameter corresponds to components within the **Provider Options Panel**:

The screenshot shows the Provider Options Panel with the following configuration options:

<input checked="" type="checkbox"/> Override filterId	<input type="text"/>	
<input checked="" type="checkbox"/> Override locationId	<input type="text"/>	<input type="button" value="Set to Default"/>
<input checked="" type="checkbox"/> Override parameterId	<input type="text"/>	<input type="button" value="Set to Default"/>
<input type="checkbox"/> Override startTime	<input type="text" value="T0"/>	<input type="button" value="Set to Relative Date"/> ▼
<input type="checkbox"/> Override endTime	<input type="text" value="T0 + 10 days"/>	<input type="button" value="Set to Relative Date"/> ▼
<input type="checkbox"/> Override T0	<input type="text" value="T0"/>	<input type="button" value="Set to Default"/> ▼

In each case, there is a check box that, if selected, indicates that the parameter is overridden and there is a field displaying the value. For the filterId, locationId, and parameterId, the field is an editable **Arguments Inserting Text Field** (Section 2.2.2, pg 10). If the background of the field is pink, then the parameter is required but has not been specified by the user. The **Set to Default Button** sets the field to be equal to the “@defaultLocationId@” for the locationId, and “@defaultParameterId@” for the parameterId. Use the **Customize Global Arguments Dialog** to view and set the argument value. For the startTime, endTime, and T0, a **Date Chooser Panel** (see Section 2.1, pg 9) is used.



**Figure 7-2: Data Viewer Panel** with example selections made.

## 8 Editor: Chart Series Panel

The **Chart Series Panel**, shown in Figure 9-1, is used to specify series to be included in a Graphics Generator chart. Each set of chart series is added to the full chart in reverse order, so that the first set of chart series overlays the second set, and so forth. The parameters specifying a set of chart series include the following pieces of information:

1. Time series to use in the calculations.
2. Aggregations to perform on the time series, if any, before performing the calculations; specified by any number of aggregator plug-ins.
3. Calculations to generate the set of chart series; specified by a calculator plug-in.
4. Instructions for how to draw the chart series on the chart.

Each of the four items above is specified within tabbed subpanels:

1. the **Select Time Series Panel**,
2. the **Aggregators Panel**,
3. the **Calculator Panel**, and
4. the **Caclulator Panel**.

The subpanels are described in Sections 9 (pg 44), 10 (pg 47), and 11 (pg 51). The **Current Status Display Panel** summarizes the parameters and will be described with the subpanel. The **Full Chart Display Panel** is updated only when the **Update Full Chart Button** is clicked.

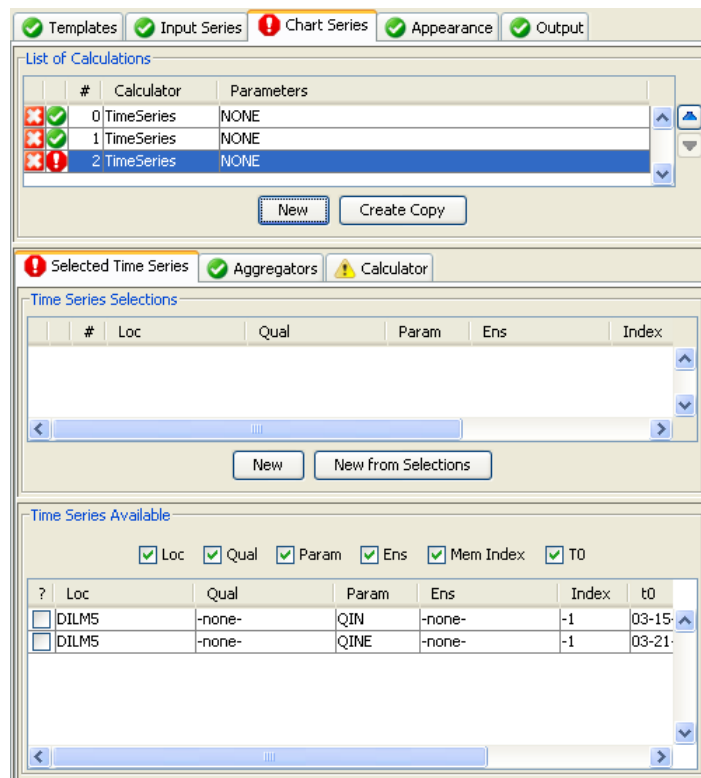









Figure 8-1: Chart Series Panel

## 8.1 Components

The following describes the **Chart Series Panel** components:



- **List of Calculations Table:** A list of the chart series to be displayed in the chart by calculator plug-in name. For each set of chart series to be added to the chart, there can be only one calculator plug-in specifying computations to perform. The name of the plug-in and a summary of the parameters are displayed in each row of the table. The first column is a delete column. The second column displays a status icon:  if the chart series can be calculated or  if the chart series cannot be calculated for any reason. When a row of the table is selected, the subpanel display will be updated for editing of the corresponding chart series parameters.
- **Move Item(s) Buttons:** Two buttons are provided that allow for reordering the chart series: the **Move Item(s) Up Button**, , and the **Move Item(s) Down Button**, . When rows of the **List of Calculations Table** are selected and either button is clicked, the selected rows will be moved in the table accordingly. Note that the order of the chart series in the table dictates the order in which they are drawn: series higher in the table are drawn on top of those lower in the table.
- **New Button:** Click on the **New Button** to add empty chart series parameters to specify a set of plot chart series.
- **Create Copy Button:** Click on the **Create Copy Button** to add new chart series parameters as a copy of the currently selected chart series parameters in the **List of Calculations Table**.
- **Chart Series Parameter Tabbed Panel:** Displays the tabbed subpanels used to specify how to compute a set of chart series for display. There are three subpanels: (1) **Select Time Series Panel**, (2) **Aggregators Panel**, and (3) **Calculator Panel**. Each is described in a later section.
- **Tabbed Subpanel Tabs:** There are three tabs displayed in the **Chart Series Parameter Tabbed Panel**; one for each of the tabbed panels that can be used to edit the chart series parameters:



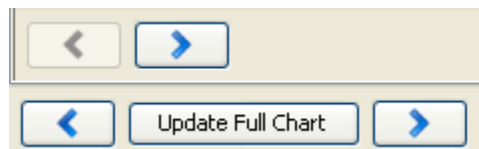
The tab displays the tabbed subpanel name and status:  indicates that the parameters specified in the corresponding tabbed panel were successfully processed by the Graphics Generator;  indicates that a problem was encountered, and is described in the **Current Status Display Panel**;  indicates that errors in previous tabbed subpanels prevented processing so that the status is unknown. The order of the tabs, left-to-right, dictates the order used by the **Subpanel Back** and **Next Buttons**, described below.

- **Update Full Chart Button:** When clicked, the **Full Chart Display Panel** will be updated displaying the chart. The panel will update only when this button is clicked or the active panel is changed so that the **Chart Series Panel** is no longer active.

At the bottom of the **Chart Series Parameter Tabbed Panel** are two buttons used to navigate the tabbed subpanels. They appear exactly as other buttons used to navigate the tabbed panels within the **Parameters Editing Panel**. The buttons are as follows:

-  **Subpanel Back Button**: Return to the previous tabbed subpanel.
-  **Subpanel Next Button**: Move to the next tabbed subpanel.

These two buttons will be displayed *above* the similar buttons for the **Parameters Editing Panel Tabbed Subpanel**:




## 8.2 Usage

### 8.2.1 Adding and Editing a Set of Chart Series

To add a set of chart series, click on the **New Button** below the **List of Calculations Table**. If chart series parameters already exist and can serve as a starting point for the new chart series, select the chart series from the table and click on the **Create Copy Button**. A new chart series parameters object will be added to the table and selected for editing. At any time, to switch between chart series to be edited, select the appropriate row of the **List of Calculations Table**.

### 8.2.2 Removing a Set of Chart Series

To remove a set of chart series, click on the  within the first column of the row within the **List of Calculations Table** that corresponds to the chart series. This will remove the row from the table and the corresponding chart series parameters from the chart.



## 9 Editor (Chart Series Panel): Selected Time Series Panel

The **Select Time Series Panel**, a subpanel within the **Chart Series Panel** shown in Figure 10-1, is used to select time series to be used in chart series calculations. Selections are made from those time series added via input series provider plug-ins. Each time series selection consists of a set of instructions specifying which time series should be included. Any time series matching at least one of the selections will be included.

The **Current Status Display Panel** displays all series selected within the **Time Series Selections Table**.

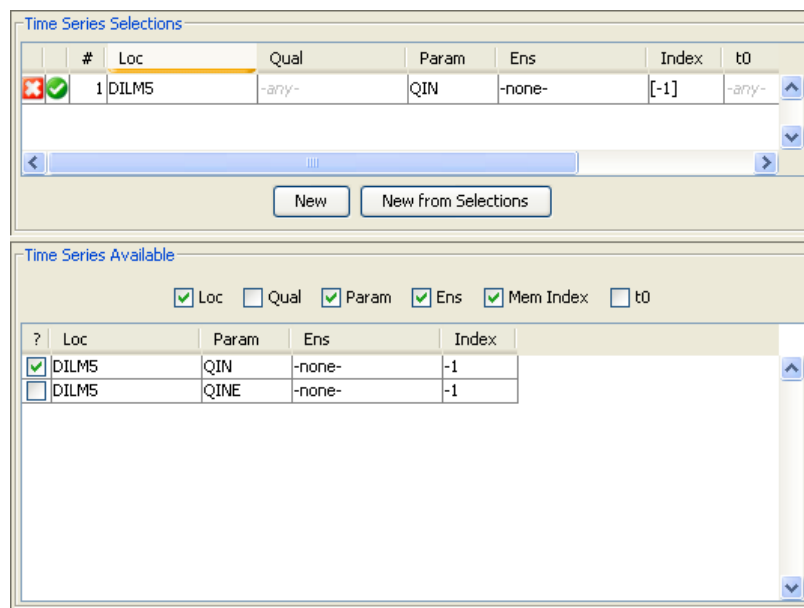


Figure 9-1: Selected Time Series Panel

### 9.1 Components

The following describes **Chart Series Panel** components:

- **Time Series Selections Table:** A list of the time series selections made. Each row of the table specifies the instructions for selecting time series. The table is described in the next section.
- **New Button:** Click to create a new time series selection in which all of the entries in the row are “-none-” or empty.
- **New from Selections Button:** Create a time series selection based on the rows selected within the **Time Series Available Table**.
- **Attribute Check Boxes:** A check box is provided for each of the attributes listed in the next section. When checked, the **Time Series Available Table** will include the column corresponding to the attribute and any selections made based on the table will include that

attribute. When unchecked, the table will not include the column and selections will have values set to “-any-” for the unchecked attribute.

- **Time Series Available Table:** A list of the available time series, providing the attributes for each time series with columns dictated by the **Attribute Check Boxes**. Each row will only be included once, so that a row within the table may correspond to multiple time series. For example, if an ensemble is included in the provided time series with 100 members and the “Mem Index” **Attribute Check Box** is unchecked, then the row within the table will correspond to all 100 members.

## 9.2 Time Series Selections Table

The **Time Series Selections Table** provides a list of time series selections that, together, specify which time series are included in the calculations for the given chart series. Each row of the table specifies the instructions for selecting time series. The cells within each row correspond to one attribute of a time series:

1. location id (“Loc”)
2. qualifier id (“Qual”)
3. parameter id (“Param”)
4. ensemble id (“Ens”)
5. ensemble member index (“Index”)
6. forecast T0 (“T0”)

The location id, parameter id, ensemble id, and forecast T0 can all be edited via the table. Each cell when selected becomes a choice box where the user can either set the value manually (for a time series to be included, it must match the attribute exactly) and hit <Enter> or select one of the following:

- “Default”: The corresponding default argument (open the **Global Arguments Dialog** to see the choices) is used. The default arguments are: location id – defaultLocationId; parameter id – defaultParameterId; ensemble id – defaultEnsembleId; and forecast T0 – “T0” (a relative date; see Section 2.1.7, pg 7).
- “Any”: Any value is allowed for that attribute. The cell will display “-any-”.
- “None” The value is expected to be empty. This is only useful for ensemble id, as the other attributes cannot be empty. The cell will display “-none-”.

For the column “T0”, the choice box option “None” is not available. Instead, the following options are available:

- “Fixed Date”: Set the date as a fixed date, opening a **Choose Date/Time Dialog** (Section 3.2.1.1, pg 9) to allow the user to set the date.
- “Relative Date”: Set the date as a relative date, opening a **Choose Relative Date/Time Dialog** (Section 3.2.1.2, pg 9) to allow the user to set the date.

The qualifier id and ensemble member index cannot be specified manually. Instead, they must be specified by selecting the appropriate rows within the **Time Series Available Table** with the appropriate checkbox selected and clicking on the **New from Selections Button**.

*NOTE: Setting the ensemble id column to “main” is equivalent to selecting “None”. In fact, if an argument is used for ensemble id and the user wants to select time series with no ensemble id, then the argument’s value must be set to “main”.*

*NOTE: As a general rule, make the smallest number of specifications possible in order to define a time series selection. For example, if parameter id is sufficient to identify the appropriate time series, then do not include the location id. This will make the product more easily applicable to other locations when building templates.*

## **9.3 Usage**

### **9.3.1 Selecting Time Series to Include in the Calculations**

To add a time series selection based on one row within the **Time Series Available Table**, click on the checkbox in the first column of that row. To add time series selections based on multiple rows within the table, either (1) select the rows within the table while holding down the <Ctrl> key and click on the **New from Selections Button**, or (2) click on the check box for each row to be selected. To add time series selections from scratch, click on the **New Button** and edit the cells within the row.

*NOTE: When adding selections based on rows of the **Time Series Available Table**, the **Select Time Series Panel** will combine selections, if possible. This affects the member indices and qualifier ids specifically, as the selection is defined by a list for those two attributes.*

## 10 Editor (Chart Series Panel): Aggregators Subpanel

The **Aggregators Panel**, a subpanel within the **Chart Series Panel** and shown in Figure 10-1, is used to specify a sequence of aggregations to perform on the selected time series prior to performing the chart series calculations. See Appendix A Section A.1 for details about aggregations and the required parameters.

The **Current Status Display Panel** shows the time series that result from performing all of the aggregations on the selected time series.

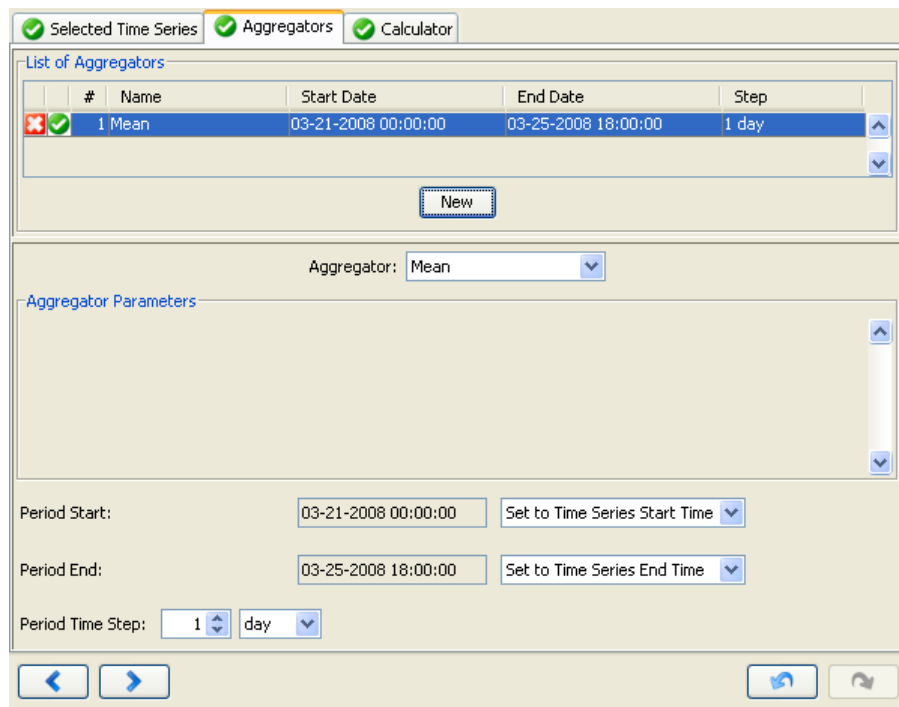





Figure 10-1: Aggregators Panel

### 10.1 Components

The following describes the **Aggregators Panel** components:

- **List of Aggregators Table:** A list of the aggregations to perform on the selected time series in order of application. The “Name” column provides the name of the aggregator plug-in to perform, while the “Start Date” and “End Date” columns specify the aggregation time period and “Step” column specifies the time step. The first column is a delete column. The second column displays a status icon:  if the aggregator was successfully executed or  if the aggregator plug-in failed for any reason.
- **New Button:** Click on the **New Button** to add a generic “Mean” aggregator with the start time and end time initialized to the start and end time of the first found selected time series and a time step of “1 day”.
- **Aggregator Choice Box:** A selectable list of aggregator plug-ins.

- **Aggregator Parameters Panel:** A panel used to edit the parameters of the selected aggregator plug-in. It updates whenever a change is made in the **Aggregator Choice Box**. For most aggregator plug-ins, this panel is empty.
- **Period Start Field:** The start time of the period of aggregation. Editing is done via a generic **Date Chooser Panel** (see Section 2.2.1, pg 9).
- **Period End Field:** The end time of the period of aggregation. Editing is done via a generic **Date Chooser Panel** (see Section 2.2.1, pg 9).
- **Time Step Panel:** A text field and choice box that allow the user to specify a quantity and unit for the time step. The quantity can be specified by typing it in or clicking on the up/down arrows, , to increase or decrease the value by a single step. The unit can be specified by selecting from the choice box, which includes all units available: “hours”, “days”, “weeks”, “months”, or “period”. A selection of “period” sets the time step to be the entire period of aggregation, so that each time series yields only one value.

## 10.2 Usage

### 10.2.1 Specifying Aggregations to Perform

To add an aggregation to perform on the selected time series, click on the **New Button**. Next, select the aggregator to apply from the **Aggregator Choice Box**, specify the aggregation period in the **Period Start Field** and **Period End Field**, and select a time step via the combination text field and choice box within the **Time Step Panel**. With any change, the **Current Status Display Panel** will be updated to display the new set of aggregated time series in graphical form. When the aggregator plug-in fails to compute, an error message is displayed..

## 10.3 Plug-Ins

An aggregator plug-in takes a time series and aggregates the data according to parameters, including the period of aggregation, time step, aggregation plug-in, and plug-in specific parameters. There are six input series provider plug-ins released with Graphics Generator.

### 10.3.1 Counter Plug-in

The counter plug-in counts the number of occurrences of an event to occur in the period of aggregation within the time series. The counter and event is defined by three parameters:

1. Counter Type: The following types of counts may be performed:
  - “NDTO” for the number of time series time steps to the first occurrence of an event (above or below a threshold) within the current aggregation step.
  - “NDIS” for the total number of time series time steps for which the event (above or below a threshold) occurs.
  - “NDMN” for the number of time series time steps to the minimum of the time series within the current aggregation step

- “NDMX” for the number of time series time steps to the minimum of the time series within the current aggregation period
2. Counter Flag: Either “above” or “below”; it defines what comparison will be made with the threshold to be defined. This is not used with the “NDMN” or “NDMX” counter types.
  3. Threshold: The value against which to do comparisons. This is not used with the “NDMN” or “NDMX” counter types.

The event is specified by the counter flag and threshold; for example “above 10.0” might be an event. The components of the panel for editing the parameters are as shown:

The image shows a horizontal panel with three controls. On the left, 'Counter Type:' is followed by a dropdown menu showing 'NDTO'. In the middle, 'Counter Flag:' is followed by a dropdown menu showing 'above'. On the right, 'Threshold:' is followed by a text input field containing the number '0'.

The **Counter Type Choice Box** is used to select the counter type and the **Counter Flag Choice Box** is used to select the flag. The threshold must be entered manually into the **Threshold Field**. If the “NDMN” or “NDMX” counter type is selected, the **Counter Flag Choice Box** and **Threshold Field** will be disabled.

### 10.3.2 Instantaneous Plug-in

The instantaneous plug-in extracts from the input time series the value at each time step dictated by the period of aggregation and time step. No parameters are required.

### 10.3.3 Maximum Plug-in

The Maximum aggregator plug-in computes the maximum of the time series over each time step. No parameters are required.

### 10.3.4 Mean Plug-in

The Mean aggregator plug-in computes the mean of the time series over each time step. No parameters are required. If the input to the aggregator has units of CFS or CMS, then the output will have units of CFSD or CMSD, respectively. Otherwise, the output units equal the input units.

### 10.3.5 Minimum Plug-in

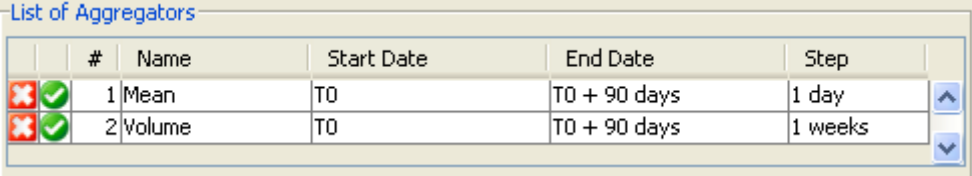
The Minimum aggregator plug-in computes the minimum of the time series over each time step. No parameters are required.

### 10.3.6 Sum Plug-in







The Sum aggregator plug-in computes the sum of all of the values of the time series within each time step. No parameters are required.

### 10.3.7 Volume Plug-in

The Volume aggregator plug-in computes volume of a streamflow time series within each time step. No parameters are required, however, the input time series to the aggregator must be mean daily (24-hour) streamflow, having a unit of CFSD or CMSD. If CFSD, then the volume is computed in acre-feet (ACFT), otherwise it is computed in cubic meters (M3). If using instantaneous flow values at a time step of less than 1 day as input to the Volume aggregator, you will first need to add a Mean aggregator plug-in with a 24-hour time step. For example:



The screenshot shows a window titled "List of Aggregators" containing a table with the following data:

	#	Name	Start Date	End Date	Step	
		1 Mean	T0	T0 + 90 days	1 day	
		2 Volume	T0	T0 + 90 days	1 weeks	

# 11 Editor (Chart Series Panel): Calculator Panel

The **Calculator Panel**, a subpanel within the **Chart Series Panel** shown in Figure 11-1, is used to specify the calculator plug-in to use in computing chart series. It is also used to set the appearance of the chart series within the chart.

The **Current Status Display Panel** shows the chart series that result from performing the calculations using as input the aggregated time series as computed based on the **Aggregators Panel**.

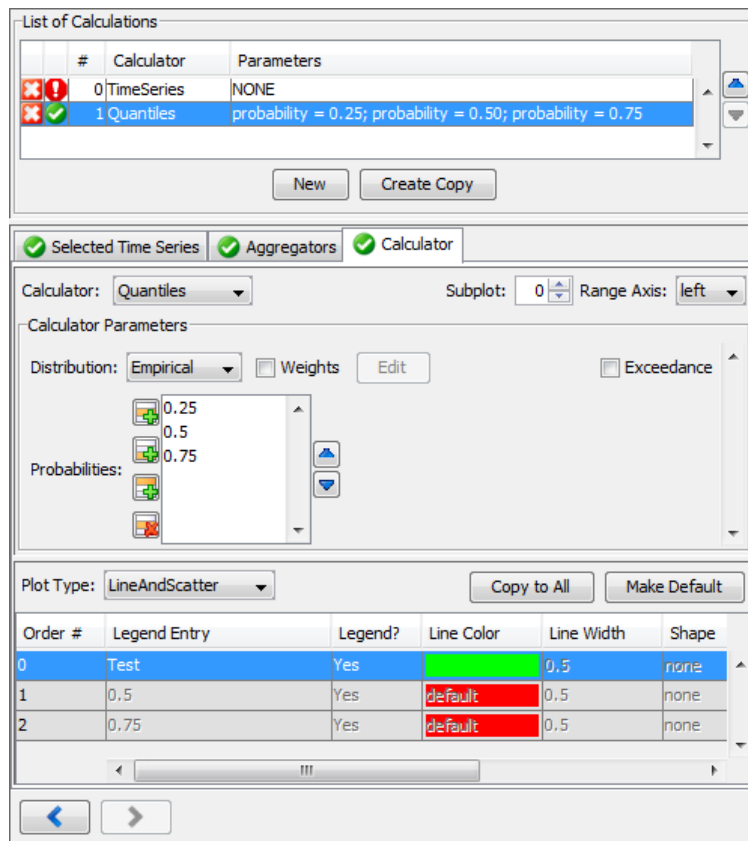


Figure 11-1: Calculator Panel

## 11.1 Components

The following describes the **Calculator Panel** components:

- **Calculator Choice Box:** A selectable list of calculator plug-ins.
- **Subplot Field:** Specifies the index of the subplot on which the chart series will be plotted. 0 is the top subplot, 1 is the next one from the top, and so on. The field can be set by typing in the value or using the up/down arrows.
- **Range Axis Choice Box:** A selectable list of range axes against which to plot the chart series. The list contains “left” and “right”.



- **Calculator Parameters Panel:** Displays a panel for editing the parameters of the calculator plug-in. It will update when a change is made in the **Calculator Choice Box**.
- **Plot Type Choice Box:** A selectable list of plot types that can be used to draw the chart series on the chart. The plot types are described in Section 12.4 (pg 53).
- **Copy to All Button:** Click to apply the value of the current selected cell within the **Series Drawing Parameters Table** to all cells within that column.
- **Make Default Button:** Click to set all the selected cells within the **Series Drawing Parameters Table** to their default values, as computed in the calculator.
- **Series Drawing Parameters Table:** Described in the next section.

## 11.2 Series Drawing Parameters Table

The **Series Drawing Parameters Table** is used to set the parameters of the series drawn on the chart. By default, the appearance of each series is specified by the calculator plug-in. Via this table, the user may override individual settings to customize the appearance of the series. The columns of the table correspond to the series drawing parameters and vary depending on which plot type is selected from the **Plot Type Choice Box**; only those parameters that affect the appearance of the series based on the plot type will be included. For example, when using a box-whisker plot type, the shape parameter is ignored and will not be included in the table because shapes are not drawn for that plot type.

The table columns are:

- “Legend Entry”: The name given to the series in the chart legend. This can include arguments (Section 2.1.2, pg 2).
- “Legend?”: Flag indicating if the series should be displayed in the legend.
- “Line Color”: Color of the line used; also the color used to draw shape outlines.
- “Line Width”: Width of the line in pixels.
- “Shape”: Shape to use for data points.
- “Shape Size”: The size of the shape to use; it is a scalar that multiplies a default shape size (default shape is defined when the size is 1.0).
- “Fill?”: Flag indicating if a fill color should be applied to shapes, areas, or boxes.
- “Fill Color”: Fill color to use for shapes, areas, and boxes.
- “Box Width”: The width of a box in a box-whisker diagram in pixels.
- “Bar Width”: The width of a bar in a histogram plot as a proportion of available space.

Each cell value can be edited manually or by selecting from a choice box that appears when the cell is clicked on. The exceptions are the color cells, which can only be edited by clicking on the cell and selecting “Edit Color” from the drop-down choices. The choices in the choice box vary by cell, but will include “default” and “to all”, which mimic the function of the **Make Default Button** and **Copy to All Button**, respectively. When editing the “Legend Entry” column, arguments can be included similar to an **Argument Inserting Text Field** (Section 2.2.2, pg 10).

When a parameter is a default value, the background color of the cell will be gray and the foreground color will be dark gray. If the parameter is not a default value, then the background color of the cell will be white and the foreground color will be black.

*NOTE: The order of the series in the table corresponds to the order in which the series are drawn on the chart, with earlier series drawn on top of later series, and the order in the legend.*

## 11.3 Usage

### 11.3.1 Specifying Calculation to Perform and Series Drawing Parameters

To specify the calculations to perform to compute a chart series and the appearance of that chart series, first select the calculator plug-in from the **Calculator Choice Box**. Then, set the subplot and range axis via the **Sub Plot Field** and **Range Axis Choice Box**. Next, set the parameters of the calculator plug-in via the **Calculator Parameters Panel**.

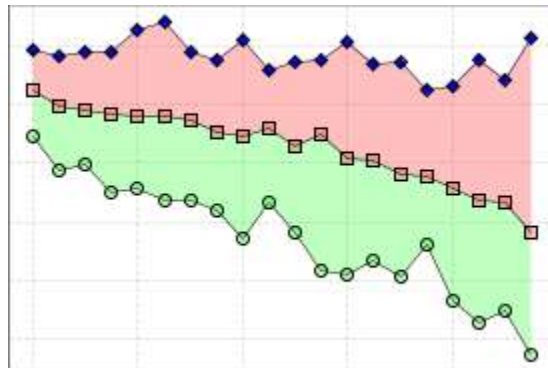
After the calculations are set, modify the appearance of the chart series via the **Series Drawing Parameters Table**. When doing so, be sure to click the **Update Full Chart Button** regularly to view the series in the context of the entire chart.

As changes are made, the **Current Status Display Panel** will be updated to display the series. The **Current Status Display Panel** will only display the chart series being edited; not the full chart.

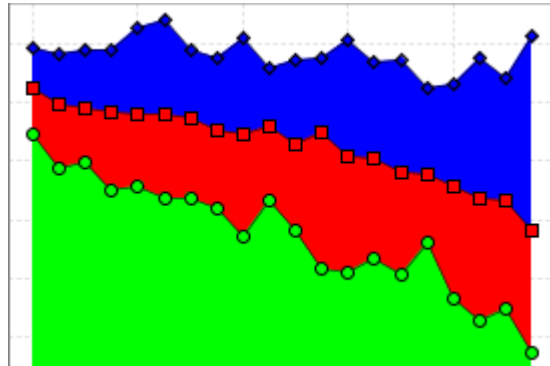
## 11.4 Plot Types

The following plot types can be selected from within the **Plot Type Choice Box**:

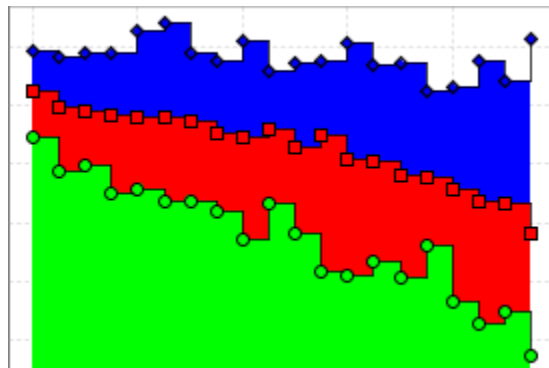
- **AreaBetweenLines**: Lines and shapes are drawn with areas filled in between the lines. The fill color for the first series listed in the **Series Drawing Parameters Table** applies to the area between the first and second series. The fill color for the last series is only used to fill shapes.



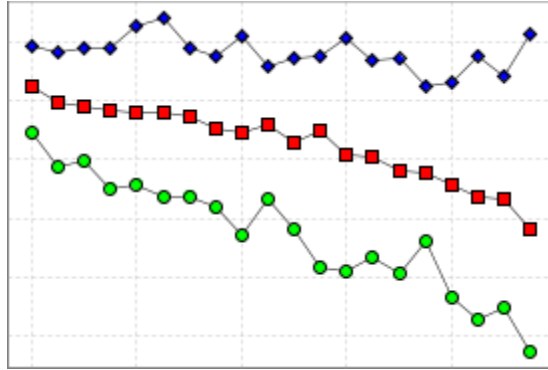
- **AreaUnderLines:** Lines are drawn with areas filled underneath down to the horizontal axis. The last series in the **Series Drawing Parameters Table** is drawn first, with the preceding series drawn on top of it, and so on, so that the first series is drawn on top.



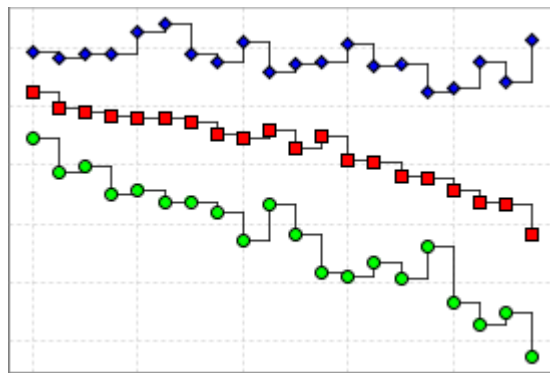
- **AreaUnderSteps:** A step plot is drawn, such that a value is extended to the next time in the time series at which it steps down or up to the next value. This plot should only be used for instantaneous data. If the data is aggregated, use the TimeHistogram plot. As shown in the example, the plot type can include shapes at each computational point in the step plot, which will be filled with the same color as the area.



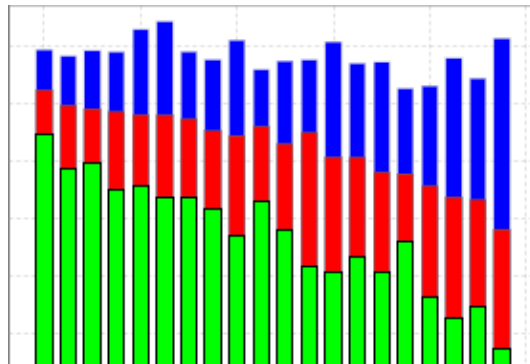
- **LineAndScatter:** Values are plotted as points connected by lines.



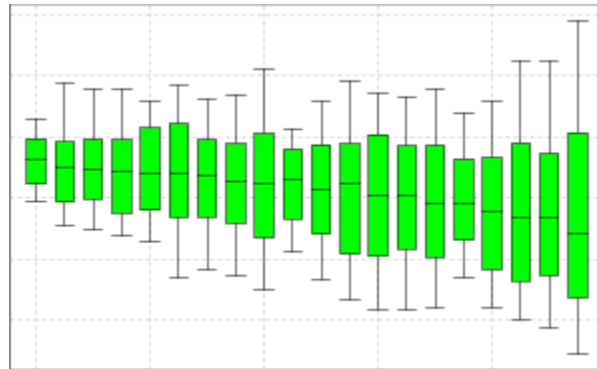
- Step: Identical to an AreaUnderSteps plot, but without areas being filled.



- TimeHistogram: Values are plotted such that a value within the time series is displayed as a bar spanning the area between the start of time step associated with the value and the end of the time step. For instantaneous data, the time step associated with a value is centered around the time of the value. For aggregated (i.e., accumulated) data, the time step associated with a value ends at the time of the value (i.e., the time of the value is associated with the end of the aggregation time step). The width of the bars are specified as a proportion of available space between bars, and is specified by the bar width of the first series listed in the **Series Drawing Parameters Table**.



- XYBoxWhisker: A box-and-whisker diagram is drawn, which is only valid if either 3 or 5 series are calculated via the calculator plug-in. The appearance of the box-and-whisker items is specified by the first series listed in the **Series Drawing Parameters Table**.



## 11.5 Plug-Ins

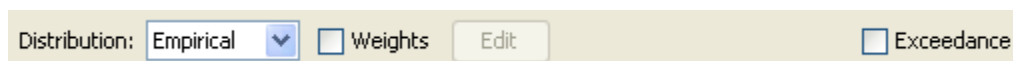
A calculator plug-in takes a set of time series, possibly an ensemble, and computes displayable chart series. There are six calculator plug-ins provided with the release of Graphics Generator. All probability based plug-ins use certain standard parameters and panel components, which are described next.

### 11.5.1 General Probability-Based Plug-in

A probability-based plug-in treats the set of time series input to the plug-in as an ensemble in order to compute a cumulative distribution function describing the uncertainty in the input. All probability based plug-ins employ the following parameters in addition to plug-in specific parameters:

- **Distribution to Fit:** Identifies which distribution to fit to the data, with empirical distribution being the default.
- **Probability Manual Weights:** Weights to apply to each ensemble member for calculating the cumulative probability distribution. Appendix A Section A.2 describes how empirical distributions are computed and weights are applied.
- **Exceedance Flag:** Flag that indicates if exceedance or non-exceedance values are desired.

These parameters are edited via a common parameters panel:





The components of this panel are as follows:

- **Distribution Choice Box:** Selectable list of available distributions. Note that the Wakeby distribution requires an optimization to estimate its parameters which can sometimes fail to find a solution.
- **Weights Check Box:** If checked, manual weights are used.

- **Edit Weights Button:** When clicked, an **Edit Member Weights Dialog** is opened, which is described in the next section. This button is enabled only when the **Weight Check Box** is checked.
- **Exceedance Check Box:** If checked, exceedance values are displayed. If left unchecked, non-exceedance values are displayed.

#### 11.5.1.1 Edit Member Weights Dialog

The **Edit Member Weights Dialog**, shown in Figure 11-2, allows the user to modify weights that are employed when computing the empirical distribution. Within the dialog, the user must specify a range of member indices and then specify weights for each of the members. The components are as follows:

- **Start Member Index Field:** Used to specify the starting member index either by typing the value into the field or by using the up/down arrows, . This start value must be less than the end member index.
- **End Member Index Field:** Used to specify the ending member index either by typing the value into the field or by using the up/down arrows, . This end value must be greater than the start member index.
- **Weights by Member Index Table:** Lists the weights to be applied by member index. The “Normalized” column displays the normalized weights (i.e. weights adjusted to sum to 1), as computed based on the value in the “Weight” column. Only the “Weight” column is editable. There is one row per member index ranging from the starting member index to ending member index.
- **Reset Button:** Click to set all of the weights to 1.
- **OK button:** Click to accept the changes and close the dialog.
- **Cancel Button:** Click to discard the changes and close the dialog.

Weights can only be used if the following is true:

1. all time series within the input time series set have member indices,
2. the smallest member index is not smaller than the starting member index parameter, and
3. the largest member index is not larger than the ending member index parameter.

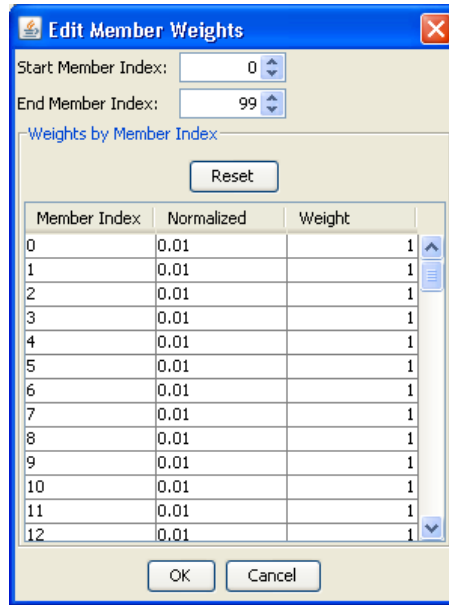
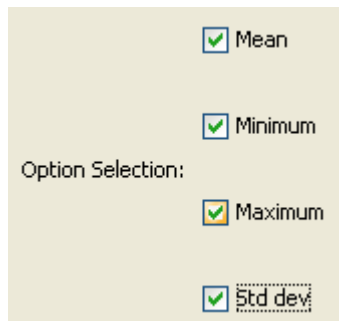


Figure 11-2: Edit Member Weights Dialog.

### 11.5.2 Moments Plug-in

This plug-in calculates the mean, +/- 1 standard deviation, minimum, and maximum determined from the given set of time series at each time step. One time series is yielded per desired value. The parameters of the plug-in specify which values are calculated, and are edited via this panel:

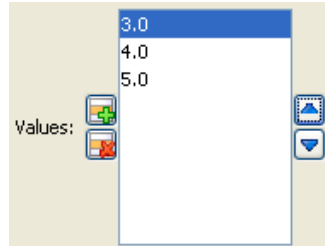


The order in which the check boxes are checked dictates the order in which the series are computed (which dictates which series are drawn first on the chart). Checking the “Std dev” box will yield two individual series within the computed chart series for the calculator: the mean minus one standard deviation (default series legend entry “Mean – Stdev”) and the mean plus one standard deviation (legend entry “Mean + Stdev”).


### 11.5.3 Probabilities Plug-in

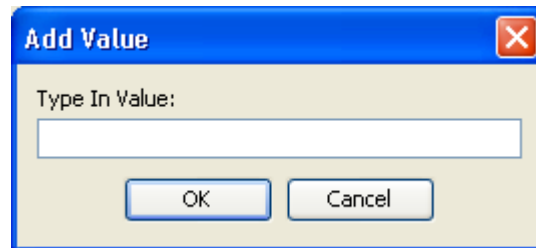
This is a probability-based plug-in. For each value given in a set of values, the plug-in calculates the probability of exceedance or non-exceedance for that value for each time step, depending on the exceedance flag parameter. It yields one time series of probabilities for each given value.

The plug-in parameters specify the values, and are edited via this panel:






The components of the panel are as follows:

-  **Add New Value Button:** Click to open an **Add Value Dialog** in which a new value can be entered:



Enter the value into the **Type In Value Field**, which is an **Argument Inserting Text Field** (Section 2.2.2, pg 10), and click **OK**.

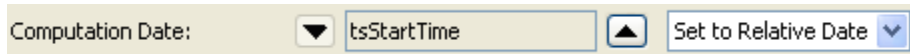
-  **Delete Selected Value Button:** Click to remove all values currently selected in the **Values List**.
- **Values List:** A selectable list of the probabilities currently included.
-  **Move Item(s) Up Button:** Click to move the values selected in the **Values List** up one in the order.
-  **Move Item(s) Down Button:** Click to move the values selected in the **Values List** down one in the order.



As implied by the components, the order of the values dictates the order of the computed series within the chart series output by the Probabilities calculator plug-in.

#### 11.5.4 Probability Plot Plug-in

This is a probability-based plug-in. This plug-in displays the exceedance or non-exceedance (cumulative distribution) function, depending on the exceedance flag parameters, for each time step of the input time series. It assumes that the first time series in the input set specifies the start time, end time, and time step of all input time series. In addition to the probability-based plug-in parameters, it also includes a single parameter specifying the computation date, or the date for which to compute the function. This date is edited via the following panel:





This panel is a slight variation on the **Date Chooser Panel** (Section 2.2.1, pg 9), with an **Up Arrow Button**, , and a **Down Arrow Button**, , included to allow for moving to the next or previous time step in the time series, respectively. By default, the computation date is set to the “tsStartTime”, which is a relative date (Section 2.1.7, pg 7). If the distribution selected in the **Distribution Choice Box** is not “Empirical”, then both the empirical distribution and fitted distribution, based on that selected in the choice box, will be displayed with the fitted drawn on top.

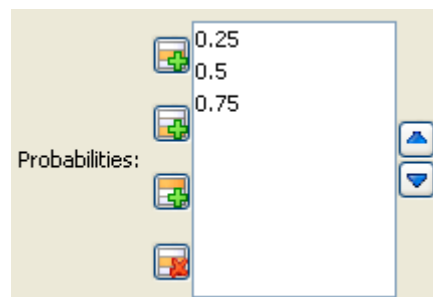
*NOTE: For this plug-in, the **Distribution Choice Box** will also display a measure of fit, the largest absolute difference(Kolmogorov-Smirnov test statistic) between the empirical and fitted distribution, for each distribution in the list.*

*NOTE: The Probability Plot plug-in yields a numerical domain (x) axis, and is the only one within the Graphics Generator release that does so. This means that it cannot be displayed on the same chart with other calculated chart series that use a time-based domain axis (all other calculator plug-ins yield a time-based domain axis).*

### 11.5.5 Quantiles Plug-in

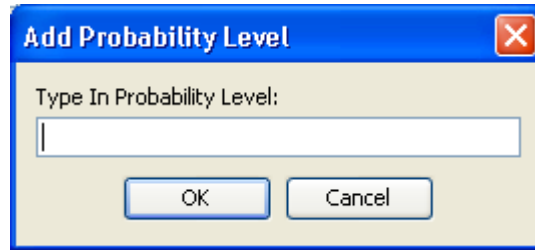
This is a probability-based plug-in. For each probability given in a set of probabilities, the plug-in calculates the value for which the probability of exceedance or non-exceedance equals the given probability for each time step, depending on the exceedance flag parameter. It yields one time series of values for each given probability. Note that “MIN” (minimum) or “MAX” (maximum) can also be specified in the list of probabilities, and instruct the calculator to generate a time series of minimum or maximum values among the set of input time series at each time step.

The plug-in specific parameters specify the probabilities, and are edited via this panel:








The components of the panel are as follows:

-  **Add New Probability Level Button:** Click to open an **Add Probability Level Dialog** in which a new probability can be entered:



Enter the value into the **Type In Probability Level Field** and click **OK**.

-  **Add Minimum Button**: Click to add “MIN” to the **Probabilities List**.
-  **Add Maximum Button**: Click to add “MAX” to the **Probabilities List**.
-  **Delete Selected Value Button**: Click to remove all probabilities currently selected in the **Probabilities List**.
- **Probabilities List**: A selectable list of the probabilities currently included.
-  **Move Item(s) Up Button**: Click to move the values selected in the **Probabilities List** up one in the order.
-  **Move Item(s) Down Button**: Click to move the values selected in the **Probabilities List** down one in the order.

As implied by the components, the order of the probabilities dictates the order of the computed series within the chart series output by the Quantiles calculator plug-in.

### 11.5.6 Spaghetti Plug-in

The Spaghetti calculator plug-in outputs one series per time series in the input set. Each series has a default legend entry equal to its member index and a color based on a graduated color scheme that starts with blue and moves to red via green. This plug-in is useful if the member indices correspond to climatic years.

### 11.5.7 Time Series Plug-in

The Time Series calculator plug-in outputs one series per time series in the input set. Only one legend entry, “Series”, is displayed in the chart legend by default, and all time series are red.

## 12 Editor: Appearance Panel

The **Appearance Panel**, shown in Figure 12-1, is used to specify appearance modifier plug-ins to apply to the chart which will adjust its appearance but not change the chart series. The default appearance of the chart is dictated by two things:

1. Default appearance parameters determined based on the plotted data and hardcoded internal settings.
2. Appearance modifier plug-ins specified in referenced templates.

For a specific product, the Graphics Generator builds the chart based on chart series calculated from referenced templates and chart series calculated specifically for the product and specified in the **Chart Series Panel**. Then appearance modifiers specified in the templates are applied to the chart in the order of the templates. The resulting chart is the *default chart*, whose appearance is modified via appearance modifier plug-ins.

The **Current Status Display Panel** displays the appearance of the base chart.

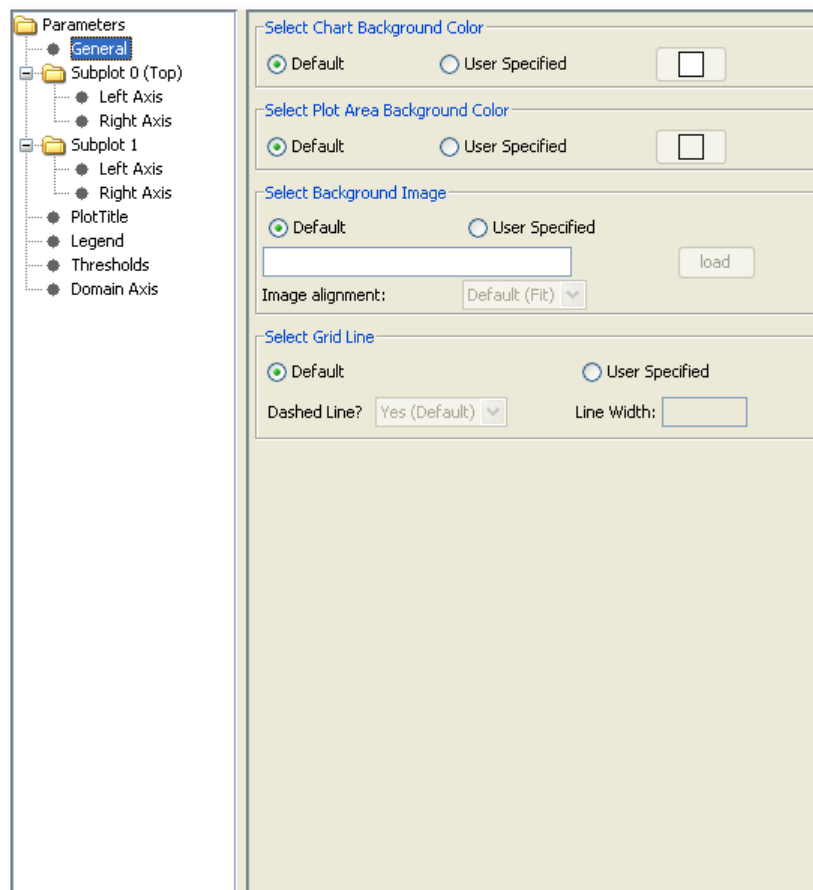


Figure 12-1: Appearance Panel

## 12.1 Components

The following describes **Appearance Panel** components:

- **Plug-in Tree:** Lists all of the appearance modifiers available for the chart in a tree format showing that a modifier can have other modifiers nested within it. Every element in the tree can be selected, except the top level “Parameters” node.
- **Parameters Editing Panel:** Displays a panel for editing the parameters of the modifier and updates any changes in the **Plug-in Tree**.

## 12.2 Plug-Ins

An appearance modifier plug-in changes the appearance of part of the Graphics Generator chart (using JFreeChart). Each of the modifiers is described below. First, however, two subpanels used within some of the plug-in panels are described: (1) a component used to specify if the modifier should be left as its default value, and (2) a component used to modify label text and font.

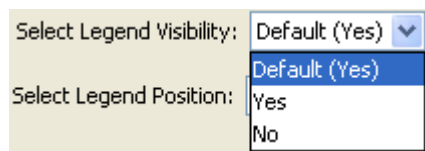
### 12.2.1 Default and User Specified Modifiers

Every modifier consists of one or more parameters devoted to modifying one aspect of the corresponding chart component’s appearance. For example, the Plot Title modifier includes text and font parameters. Each parameter has a default value determined as described above. The user may chose to use the default value or specify an override value. This is typically done by one of two mechanisms. The first are **Default/User Specified Radio Buttons**:



When the **Default Radio Button** is selected, the default value is used with the rest of the corresponding subpanel being disabled. When the **User Specified Radio Button** is selected, the rest of the subpanel will be enabled allowing the user to specify a value.


The second mechanism used is a **Default/User Specified Choice Box** (selectable list):



Here the legend visibility parameter can be set to “Yes” or “No”. The default value is “Yes”. When you select “Default...”, the default value is used. Note that the “Default...” item in the list will be followed by the default value for the current product, such as “Default (Yes)”. However, when either “Yes” or “No” is selected, a user specified override is being used, forcing the flag to be either “Yes” or “No”, regardless of the default.

## 12.2.2 Text and Font Modifier Component

When a modifier includes the capability of modifying text or font, such as those that modify a chart label, the standard text and font modifying component, shown in Figure 12-2, is used. There are two subpanels: **Select Font Panel** and **Select Text Panel**. Each includes **Default/User Specified Radio Buttons**. Additionally, the **Select Font Panel** contains these components:

- **Font Name Choice Box:** A list of available fonts.
- **Font Size Field:** Specifies the size of the font. The size can be entered directly or clicking on the up/down arrows, .
- **B Button:** Sets the font to bold.
- **I Button:** Sets the font to italicized.
- **Color Button:** Set font color. Open up a **Color Chooser Dialog** to select a font color.

The **Select Text Panel** displays a **Text Area** which can be edited by the user and displays the user specified text in the font dictated by the settings in the **Select Font Panel**. The **Text Area** is an **Argument Inserting Text Area** (Section 2.2.2, pg 10).

For both panels, when the user clicks on the **Default Radio Button**, the panel is reset to display the default value, which may vary depending on the modifier plug-in.

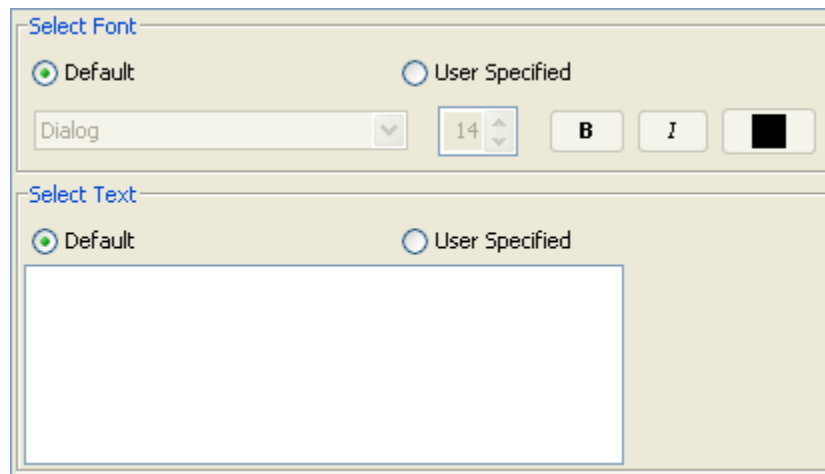


Figure 12-2: The standard text and font modifying component.

## 12.2.3 General Appearance Modifier

A General appearance modifier plug-in, displayed in Figure 12-3, is used to specify various features about the chart that are not specific the data. The features are as follows:

- **Chart Background Color:** The background color used for the chart. White, by default.
- **Plot Area Background Color:** The background color used for plot areas within the chart. White and transparent, by default.
- **Background Image:** The background image of the chart. The image is specified by providing an image file name and can be left justified, right justified, centered, or

stretched to fit the chart (default). An example background image, a NOAA watermark, is included in the installation (see Chapter 2 list page number).

- **Grid Line Settings:** The grid line appearance for all subplots within the chart. The grid lines can be either dashed lines (default) or solid lines, and the width of the lines can be specified (0.5 by default).
- **Default Time Zone:** The default time zone used in the chart; for example, in tick marks along the domain axis of a time series plot.

For the background colors, **Default/User Specified Radio Buttons** are used to specify if the user is overriding the default colors, and a **Select Color Button** is provided displaying the currently selected color (default or overridden). Clicking on the button opens a **Choose Color Dialog** to select a color.

For the background image, **Default/User Specified Radio Buttons** are used to specify if the user is overriding the default background image, which is none. If overridden, the user can click on the **Select Image File Button** to specify an image file using a standard file browser. The image alignment is specified in the **Image Alignment Choice Box**.

For the grid line appearance, **Default/User Specified Radio Buttons** are used to specify if the user is overriding the grid line appearance. If overridden, the user can specify whether or not the line is dashed by selecting from the **Dashed Line Choice Box**, which includes a default option. The line width is specified in the **Line Width Text Field** and must be a decimal number.

For the time zone, **Default/User Specified Radio Buttons** are used to specify if the user is overriding the default time zone, which is the time zone used in CHPS. If overridden, the user can specify the time zone via the **Time Zone Choice Box**, which is an **Argument Inserting Choice Box**.

The screenshot shows a configuration window with five sections:

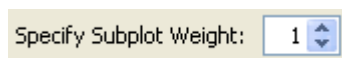
- Select Chart Background Color:** Radio buttons for 'Default' (selected) and 'User Specified'. A small square icon to the right.
- Select Plot Area Background Color:** Radio buttons for 'Default' (selected) and 'User Specified'. A small square icon to the right.
- Select Background Image:** Radio buttons for 'Default' (selected) and 'User Specified'. A 'Select' button, a 'File:' text input field, and an 'Image Alignment:' dropdown menu set to 'Default (Fit)'.
- Select Grid Line:** Radio buttons for 'Default' (selected) and 'User Specified'. A 'Dashed Line?' dropdown menu set to 'Yes (Default)' and a 'Line Width:' text input field set to '0.5'.
- Select Time Zone:** Radio buttons for 'Default' (selected) and 'User Specified'. A 'Time Zone:' dropdown menu set to 'GMT'.


**Figure 12-3:** General appearance modifier editing component.

## 12.2.4 Subplot Appearance Modifier

A Subplot appearance modifier plug-in, displayed in Figure 13-4, is used to specify the weight given to the subplot, whether to reverse the rendering order of the series, and the background image and color for the subplot. It also contains two axis appearance modifiers, described later. There is one subplot appearance plug-in defined per subplot within the overall chart.

The subplot weight parameters specify the weight to give the plot when determining the heights of each plot in the generated chart. For example, if there are two subplots, the first having weight 1 and the second having weight 2, then the second subplot will be twice as tall as the first subplot within the overall chart. The subplot weight parameter is specified via the **Specify Subplot Weight Field**:

A small dialog box with a light beige background. It contains the text "Specify Subplot Weight:" followed by a numeric input field containing the value "1" and a small up/down arrow icon.

The subplot weight is initialized to 1. A user can change the value by entering a value or clicking on the up/down arrows, .

Whether to reverse the rendering order is specified in the **Select Reverse Rendering Choice Box**, with “No” being the default. Normally, the first series displayed in the legend (if one) is drawn on top of the second series, and the second on top of the third, and so forth. By reversing the order, the last series is drawn on top of all others. This may be important for histograms or area plot types.

The background image and color are specified via components identical to that used in the General Appearance Modifier editing components (Section 12.2.3, pg 64).

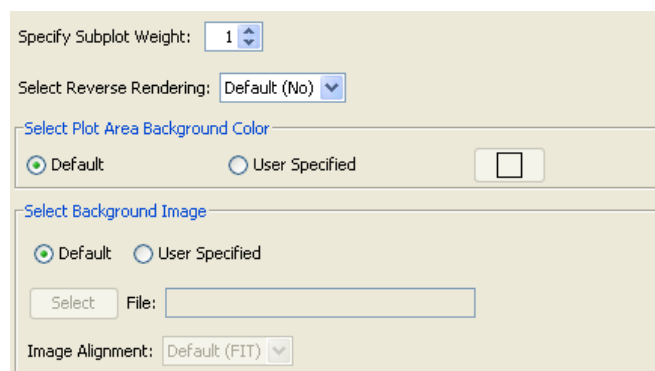
A larger dialog box with a light beige background. It contains several sections: "Specify Subplot Weight:" with a numeric input field set to "1"; "Select Reverse Rendering:" with a dropdown menu showing "Default (No)"; "Select Plot Area Background Color:" with two radio buttons, "Default" (selected) and "User Specified", and a small square color selection box; "Select Background Image:" with two radio buttons, "Default" (selected) and "User Specified", and a "Select File:" button followed by a text input field; and "Image Alignment:" with a dropdown menu showing "Default (FIT)".

Figure 12-4: The subplot appearance modifier plug-in editing component.

## 12.2.5 Axis Appearance Modifier

An Axis appearance modifier plug-in, shown in Figure 12-5, exists for the domain (x) axis and the left and right range (y) axes of each subplot. It is used to specify the following:

**Figure 12-5:** The axis appearance modifier plug-in editing component.

- Axis Visibility: Specifies if axis should be displayed.
- Axis Inversion: Specifies if axis should be inverted, meaning that, for example, if the axis is vertical then it and any corresponding plotted chart series will appear upside down (larger values toward the bottom of the axis).
- Axis Type: Specifies the type of axis, and can be one of the following:
  - “Numerical”: A linear axis with limits determined based on the plotted data.
  - “Logarithmic”: A logarithmic axis in which the plotted values are transformed prior to plotting. Limits are determined based on the plotted data.
  - “Probability”: A linear axis with a minimum of 0, maximum of 1, and tick marks spaced 0.1 apart.
  - “Normalized Probability”: A probability axis that has been transformed via a normal distribution. See Appendix A Section A.3.
  - “Time”: A temporal axis, only appropriate for the domain (x) axis when time series are plotted.
  - “Translated”: A numerical axis computed based on the opposite axis. Only applicable to a range (y) axis that does not have any data plotted against it.
- Label Font: Specifies the font for the axis label.
- Label Text: Specifies the text for the axis label.
- Axis Limits: Specifies the lower and upper bounds of the axis.



- Tick Spacing: Specifies the spacing between tick marks along the axis.
- Decimal Places (numerical axis only): Specifies the decimal places to display in a numerical tick mark.
- Date Tick Format (time axis only): Specifies the format of tick marks for a time axis.
- Initial Hour for Date Ticks (time axis only): Specifies the hour of the first tick mark placed along a time based axis.

Standard **Default/User Specified Choice Boxes** are used for the visibility, inversion, and axis type, whereas **Default/User Specified Radio Buttons** are used for the remaining components. The label text and font are specified via standard text and font modifier components.

### 12.2.5.1 Numeric Axis Parameters

Displayed in Figure 2-1 are the editing components for the axis range, tick spacing, and tick label format for a numerical axis, including logarithmic, probability, and normalized probability axes. The tick spacing and tick number format of the components uses **Default/User Specified Radio Buttons**, while the limits uses a **Auto Range Calculation Choice Box**, with selections of “Default”, “Auto”, and “Manual”. The axis limits are specified within the **Lower Field** and **Upper Field**, both of which must be numbers. The two fields are updated to show the manually specified or automatically calculated limits whenever a choice is made from the **Auto Range Calculation Choice Box**. The tick spacing is specified within the **Unit Spacing Field** which must be either “-auto-” to use the automatically computed value or a number. Click on the **Auto Button** to set the field to “-auto-”.

The format of the tick labels is specified via a format *number format pattern*, provided in the **Tick Number Format Field**. The number format pattern is defined by a sequence of characters, each of which is defined in Table 12-1. Examples of possible number formats are provided in Table 12-2, which displays example tick mark labels for four numbers shown at the top of each column and for patterns shown in the first column:

For more details, see

<http://download.oracle.com/javase/tutorial/i18n/format/decimalFormat.html>.

**Table 12-1:** Characters that can be used in the number format pattern.

Symbol	Description
0	a digit
#	a digit, zero shows as absent
.	placeholder for decimal separator
,	placeholder for grouping separator
E	separates mantissa and exponent for exponential formats
;	separates formats
-	default negative prefix
%	multiply by 100 and show as percentage
?	multiply by 1000 and show as per mille
X	any other characters can be used in the prefix or suffix
'	used to quote special characters in a prefix or suffix

**Table 12-2:** Example labels generated for four numbers using example patterns.

Pattern	1000	1	0.1	0.01
<nothing>	10	1	0.1	0.01
0.000	1000.000	1.000	0.100	
#.###	1000	1	0.1	0.01
0000	1000	0001	0000	0000
####	1000	1	0	0
##%	100000%	100%	10%	1%
###,###.00%	100,000.00%	100.00%	10.00%	1.00%

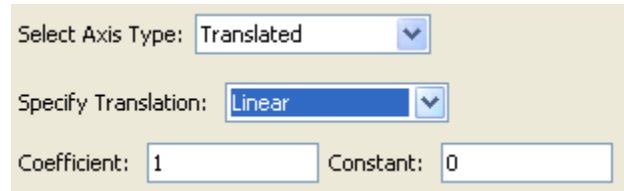
### 12.2.5.2 Time Axis Parameters

If the axis is time-based, then the numerical axis editing components are replaced by those shown in Figure 12-6. The components for editing the tick spacing, tick label format, and initial hour for date ticks use **Default/User Specified Radio Buttons**, while the editing component for axis limits uses the **Auto Range Calculation Choice Box** with selections of “Default”, “Auto”, and “Manual”. The lower and upper bounds for the axis are displayed in the **Lower Bound Panel** and **Upper Bound Panel**, respectively, which allows for modifying the dates via **Date Chooser Panels** (Section 2.2.1, pg 9). The tick spacing is specified via an **Auto Checkbox**, and a **Unit Spacing Spinner** and **Choice Box**. If the **Checkbox** is checked, then the limits are automatically calculated, otherwise they are manually specified using the **Spinner** to specify the quantity and **Choice Box** to specify the time unit. The tick spacing editing components are updated whenever a choice is made from the **Auto Range Calculation Choice Box** to reflect the selected values. The date tick format is specified in the **Date Tick Format Text Area** and must use the same format as that format string described in Section 2.2.2.2 (pg 12). The initial hour for date ticks is specified via the **Hour of Day (0-23) Spinner**, and is always specified in GMT, regardless of the axis displayed time zone.

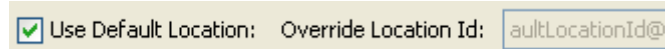
**Figure 12-6:** Editing components for time-axis specific axis modifier parameters.

### 12.2.5.3 Translated Axis Parameters

If the axis type is set to “Translated”, then a panel will be displayed below the **Select Axis Type Choice Box** that can be used to specify the translation:



By default, the translation will be “Linear”, with the coefficient and constant of the linear transformation being specified in the **Coefficient Field** and **Constant Field**. The other two choices, “StageToDischarge” or “DischargeToStage”, apply a rating curve to the opposite axis to compute the tickmarks of the translated axis. In either case, a location id is required:



If the **Use Default Location Check Box** is checked, then the location corresponding to predefined argument “defaultLocationId” (Section 2.1.2.1, pg 3) will be used. If unchecked, the location id can be entered in the **Override Location Id Text Field** which is an **Argument Inserting Text Field** (Section 2.2.2, pg 10).

### 12.2.6 Plot Title Appearance Modifier

The Plot Title appearance modifier component, shown in Figure 12-7, is used to specify the following:

- Plot Title Text: Specifies multiple lines of text to display in plot title.
- Plot Title Font: Specifies font and color of text.
- Plot Title Border Line Widths: Specifies line width of each side of rectangular border drawn around title.
- Plot Title Border Color: Specifies the color to use to draw the border.
- Plot Title Text Insets: Specifies spacing in pixels around text within the border.
- Plot Title Horizontal Alignment: Specifies the alignment (CENTER, LEFT, RIGHT) of the title and border within the chart.
- Plot Title Text Alignment: Specifies the alignment (CENTER, LEFT, RIGHT) of the text within the border rectangle.

The text and font are specified using standard text and font components. The border line widths of the border are specified via the **Top Line Width Field**, **Left Line Width Field**, **Bottom Line Width Field**, and **Right Line Width Field**. Each field must be a number. The border color is specified by clicking on the **Border Line Color Button** which opens a **Choose Color Dialog** (Section 2.2.3, pg 13) to be used to select a color. The text insets are specified via field similar to the border line widths. The horizontal and text alignments are specified via the **Select**

**Horizontal Alignment** and **Select Text Alignment Choice Boxes**, each of which provides CENTER, LEFT, and RIGHT as options, with CENTER being the default.

**Figure 12-7:** Plot title appearance modified editing component.

### 12.2.7 Legend Appearance Modifier

The Legend appearance modifier, shown in Figure 12-8, is used to specify the following:

- Legend Visibility: Specifies if the legend should be displayed.
- Legend Position: Specifies where to place the legend: on the “Top”, “Right”, “Left” or “Bottom” of the chart.
- Legend Title Font: Specifies the font to use for the title of the legend, if there is one.
- Legend Title Text: Specifies the title of the legend.
- Border Line Width: Specifies the width of the border line to be drawn around the legend. A width of 0 implies no border.
- Border Line Color: Specifies the color of the border line.
- Legend Entry Font: Specifies the font to use for entries in the legend.

The legend visibility and legend position are both specified using **Default/User Specified Choice Boxes**, whereas **Default/User Specified Radio Buttons** are used for the remaining components. The legend title and font are specified via standard text and font modifier components, which the legend entry font is specified using a standard font modifier component.

**Figure 12-8:** Legend appearance modifier editing component.

The border line width, if not default, is set within the **Border Line Width Spinner**. The **No Line Button** can be clicked to set the line width to 0. The border line color is specified by clicking on the **Border Line Color Button** which opens a **Choose Color Dialog** (Section 2.2.3, pg 13) to be used to select a color.

### 12.2.8 Thresholds Appearance Modifier

The Threshold appearance modifier, shown in Figure 12-9, specifies marks and zones that must displayed on the plot highlighting key values or regions along the domain and range axes. Each mark or zone is specified via threshold parameters, so that the Threshold appearance modifier specifies a list of threshold parameters. Threshold parameters include the following:

- Identifier: A unique identifier for the threshold. Arguments can be used for the identifier, and should be used if a template is being created. An *evaluated identifier* is the identifier after its arguments have been replaced by their argument values.
- Visible Flag: Indicates if the threshold should be drawn on the chart.
- Font: Font applied to the mark or zone label.
- Text: The label text.
- Label Anchor: The position of the label relative to the mark or zone.
- Color: The color of the mark or zone.
- Line Width: The width of a mark line.
- Subplot Index: The index of the subplot on which the mark or zone is to be drawn.

- Axis Id: The identifier of the axis the zone should be drawn against: “domain”, “left” (default), or “right”.
- Zone Flag: Indicates if a zone or mark is used.
- Axis Value Start: The value used for a numerical mark or the starting value of a zone. It can include arguments, including using the thresholdValue argument function, but after replacing arguments the value must be a number or “unbounded”. If unbounded, then the threshold must be a zone and the end value cannot be unbounded.
- Axis Value End: The end value of a zone. It can include arguments, but after replacing arguments the value must be a number or “unbounded”. If unbounded, then the start value cannot be unbounded.
- Date Axis Value Start: The date used for a time mark or the starting date of a zone. If unbounded, then the threshold must be a zone and the end date cannot be unbounded.
- Date Axis Value End: The end date of a zone. If unbounded, then the start date cannot be unbounded.

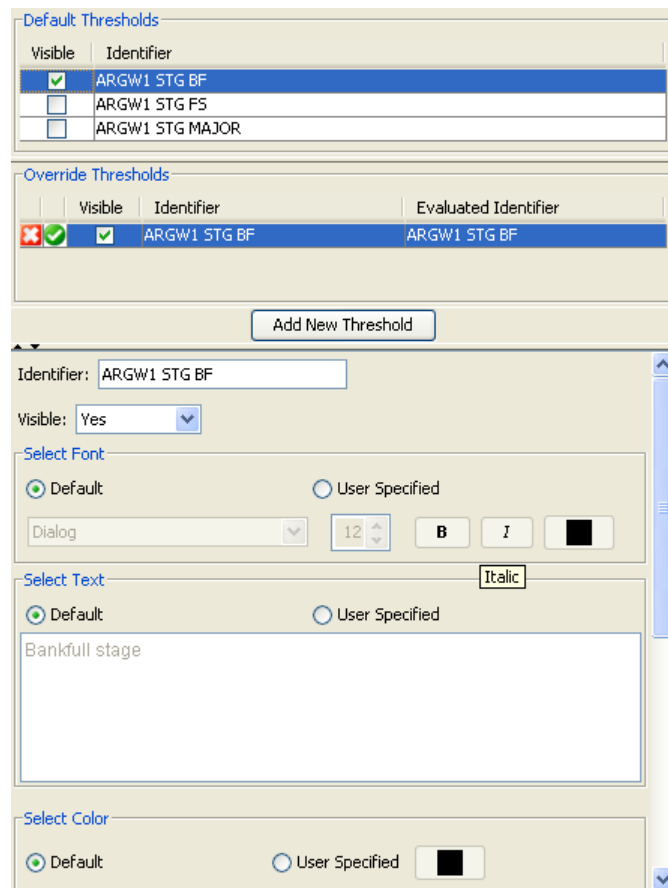


Figure 12-9: Thresholds appearance modifier editing component.

### 12.2.8.1 Managing Thresholds

Default thresholds are loaded based on the flag in the **Include Thresholds Checkbox** in the **Input Series Panel**. They are listed in the **Default Thresholds Table**, which also includes a checkbox that can be clicked to change the visibility of the thresholds:



Default Thresholds	
Visible	Identifier
<input checked="" type="checkbox"/>	ARGW1 STG BF
<input checked="" type="checkbox"/>	ARGW1 STG F5
<input type="checkbox"/>	ARGW1 STG MAJOR

The default threshold identifier will always be set to



<location id> <parameter id> <threshold id>

where location id and parameter id identify the time series data type, and threshold id identifies a threshold for that time series.

A user may choose to override a default threshold or define a new threshold. Such thresholds are listed in the **Override Thresholds Table**:

Override Thresholds				
	Visible	Identifier	Evaluated Identifier	
	<input checked="" type="checkbox"/>	ARGW1 STG BF	ARGW1 STG BF	
	<input checked="" type="checkbox"/>	ARGW1 STG F5	ARGW1 STG F5	

The table includes five columns:

1. A delete column.
2. A column that displays a status icon:  if the threshold parameters are valid, meaning they either override a default threshold that can be found or are fully specified with no corresponding default; or  if the threshold parameters are supposed to override a default set of parameters, but the default cannot be found. The latter will occur if, for example, a default threshold is made visible and then a change is made to the input series in the **Input Series Panel** such that the identifiers of the default thresholds change. When override threshold parameters are invalid, the chart will be drawn without that threshold and a warning message will be sent to the log window.
3. A “Visible” column, which displays the visibility of the threshold as a checkbox (if visible, it will be checked).
4. An “Identifier” column, displaying the identifier for the threshold which can include arguments (Section 2.1.2, pg 2).
5. An “Evaluated Identifier” column, displaying the value of the identifier after any arguments have been replaced.

To override a default threshold, the evaluated identifier for the override threshold must be identical to the identifier of the default threshold. When a selection is made from the **Default Thresholds Table**, the corresponding override threshold, if one exists, is selected in the **Override Thresholds Table**, and vice-versa.

To add a new threshold, click on the **Add New Threshold Button** and specify an identifier. If the evaluated identifier corresponds to a default threshold identifier, it is assumed to override that default.

### 12.2.8.2 Threshold Parameters Panel

When a threshold is selected in either table, a **Threshold Parameters Panel**, shown in Figure 12-10, will be displayed below the two tables.

When modifying a default threshold, once a change is made in the panel, an override threshold will be created and added to the **Override Thresholds Table**. To revert back to the default parameters, delete the override threshold from the table.

The image shows a 'Threshold Parameters Panel' with the following fields and options:

- Identifier: ARGW1 STG BF
- Visible: Yes (dropdown)
- Select Font: Default (selected), User Specified (radio button). Includes font face (Dialog), size (12), and bold/italic/color buttons.
- Select Text: Default (selected), User Specified (radio button). Text area contains 'Bankfull stage'.
- Select Color: Default (selected), User Specified (radio button). Includes a color swatch.
- Select Line Width: Default (selected), User Specified (radio button). Value: 01.00.
- Select SubPlot Index: SubPlot Index: Default (0) (dropdown)
- Select Axis Id: Axis Id: Default (left) (dropdown)
- Select label anchor: Label anchor: Default (auto) (dropdown)
- Zone: Yes (dropdown)
- Select Axis Value Start: Default (selected), User Specified (radio button). Value: 3.261359930038452 (dropdown)
- Select Axis Value End: Default (selected), User Specified (radio button). Value: 3.962399959564209 (dropdown)

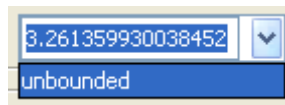
**Figure 12-10: Threshold Parameters Panel.**

Each parameter displayed in the **Threshold Parameters Panel** can be either user specified or default, if a corresponding default threshold exists. This choice is made either by using



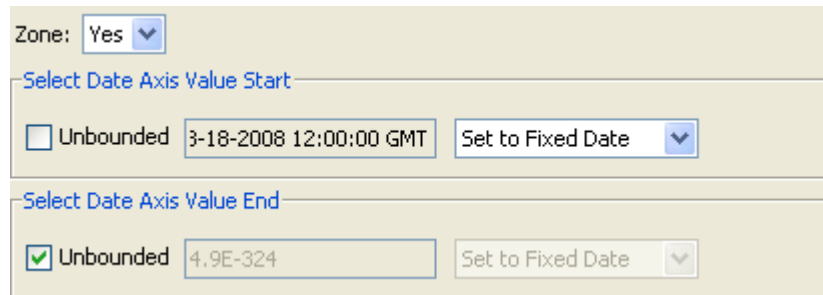
**Default/User Specified Radio Buttons** or **Default/User Specified Choice Boxes**. If no default threshold exists whose identifier equals the evaluated identifier of the threshold being modified, then all parameters must be set, and no default radio buttons or choice boxes will be made available in the panel.

The values or times for a threshold marker or zone are modified at the bottom of the **Threshold Parameters Panel**. Which component is displayed depends on what type of axis the threshold is plotted against. If the axis is numerical, then a **Select Axis Value Start Panel** will be displayed, and, if it is a zone, a **Select Axis Value End Panel** will be displayed, as shown in Figure 12-10. The start and end values are specified in **Axis Value Start Choice Box** and **Axis Value End Choice Box**, respectively. Each can be edited manually or set to “unbounded” by selecting it from the choice box:



Note that an unbounded value is only allowed if the threshold is a zone.

If the axis is time-based (typical of the domain axis), the two components are the **Select Axis Date Start** and **Select Axis Date End Panels**:



For times, the value can be edited via a **Date Chooser Panel** (see Section 2.2.1, pg 9) or can be set to be unbounded if it is a zone by clicking on the **Unbounded Checkbox**. If unbounded, then the **Data Chooser Panel** will be disabled; to set a date, the **Unbounded Checkbox** must be unchecked first.

### 12.2.9 Subtitles Appearance Modifier

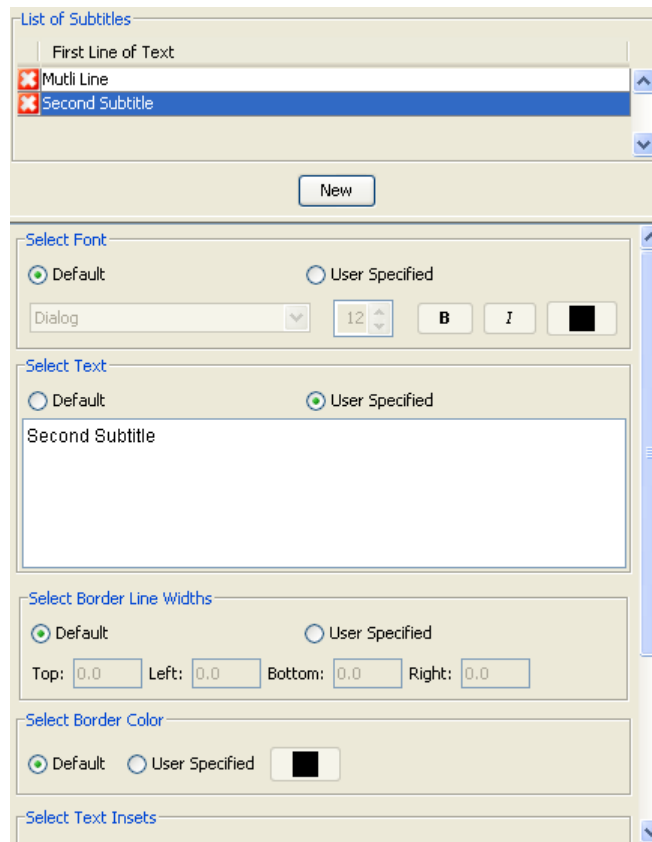
The Subtitles appearance modifier, shown in Figure 12-11, specifies subtitles that must be displayed on the chart on any side of its subplots. Each subtitle is specified via subtitle parameters, so that the Subtitle appearance modified specifies a list of subtitle parameters. Subtitle parameters are identical to the Plot Title parameters specified in Section 12.2.6, pg 70. In addition, subtitle parameters include the following:

- **Subtitle Position:** Specifies the position of the subtitle relative to the subplots (TOP, LEFT, BOTTOM, RIGHT).

A subtitle is added to the plot by clicking on the

If a subtitle position is TOP, it will be displayed between the plot title and the subplots. If a position is identical to that of the legend, it will be displayed between the legend and the subplots.

Subtitles specified in referenced templates (Section 2.1, pg 2) are always drawn on the plot. It is impossible for those subtitles to be made invisible or replaced by the subtitles defined in the **Appearance Panel**. For this reason, it should be carefully considered before adding a subtitle to a template.



**Figure 12-11: Subtitle Parameters Panel.**

### 12.2.9.1 Managing Subtitles

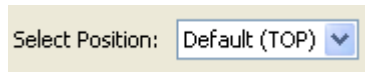
The subtitles defined for the product are listed in the **List of Subtitles Table**. The table includes two columns:

1. A delete column.
2. A column that displays the first line of text of the subtitle.

the **New Button** below the table is clicked, a new subtitle is added with no text and is selected.

### 12.2.9.2 Subtitle Parameters Panel

The **Subtitle Parameters Panel** is displayed below the **List of Subtitles Table** and **New Button**. It is updated whenever a row of the table is selected to display an interface used to modify the parameters of the selected subtitle. It is identical to the editing component for the plot title appearance modifier (Section 12.2.6, pg 70) except that it includes a **Select Position Choice Box** for selecting the position (TOP is default):



# 13 Editor: Output Panel

The **Output Panel**, shown in Figure 13-1, is used to specify output generator plug-ins that will be applied when the product is executed via a workflow to generate output files. The parameters specified in this panel are only saved when a product is saved, not when a template is saved, as they only apply products.

The **Current Status Display Panel** displays a preview of the output generated from the plug-in, and is updated whenever the **Preview Output Button**.

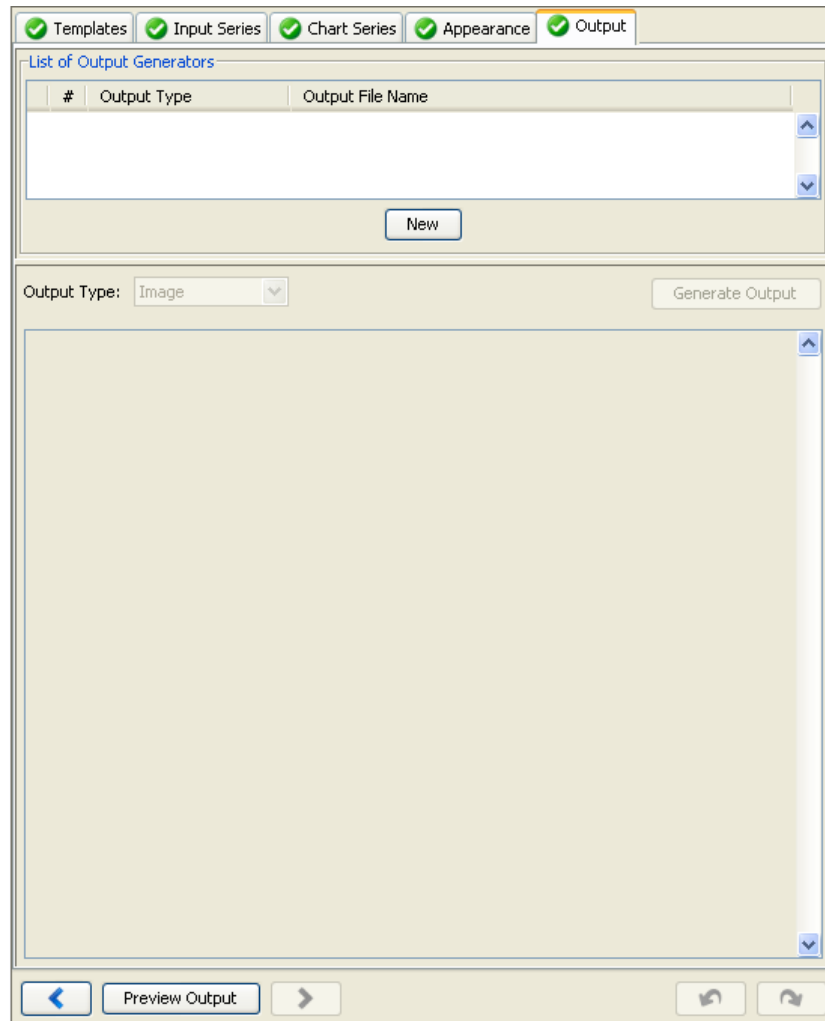


Figure 13-1: Output Panel.

## 13.1 Components

The following describes the **Output Panel** components:

- **List of Output Generators Table:** A list of the output generator plug-ins currently included in the product. The plug-ins are listed by output type (i.e. plug-in name) and output file name. The first column is a delete column.
- **New Button:** Click to create a new output generator plug-in, which by default will have the output type image and an empty output file name.
- **Output Type Choice Box:** A selectable list of output types.
- **Generate Output Button:** Creates the output file specified by the output plug-in.
- **Output Parameters Panel:** Displayed below the choice box, the **Output Parameters Panel** displays a panel for editing the parameters of the output plug-in. It is updated whenever the output type is changed.
- **Preview Output Button:** Updates the **Current Status Display Panel** to display the output generated via the plug-in. For example, if the output type is “Image”, then the **Current Status Display Panel** will display the image created in the file.

## 13.2 Usage

### 13.2.1 Specifying an Output Generator Plug-In

To add an output generator plug-in to the product, click on the **New Button**. Then, select the desired output type from the **Output Type Choice Box** and specify the parameters in the **Output Parameters Panel**, which will include the file name. To verify the settings, click on the **Generate Output Button** and check that the file was created.

## 13.3 Plug-Ins

An output generator plug-in takes information from the charting engine within the Graphics Generator and generates an output file. There are four output generator plug-ins delivered with the Graphics Generator, each corresponding to an output type. All of them share a common parameter: the output file name. It is specified via the following panel:

The image shows a user interface panel with a light beige background. At the top left is a small rectangular button labeled 'Select'. To its right is the text 'File:' followed by a wide, empty text input field. Below these two elements is the text 'Evaluated Name:' followed by another wide, empty text input field.

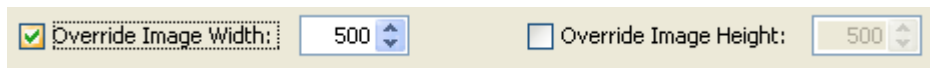
The components of the panel are:


- **Select Button:** Click to open a file browser and select the output file.
- **File Field:** Displays the name of the output file. This field is an **Argument Inserting Text Field** (see Section 2.2.2, pg 10), meaning that the output file name can accept an embedded argument, allowing it to be set generically. This allows for the user to create a new product by opening a previous product, changing its arguments, and saving the new product. The output file name, if it uses arguments, will not need to be updated each time.
- **Evaluated Name Field:** Displays the file name after replacing any arguments.

The plug-ins are described below.

### 13.3.1 Image Plug-in

The Image output generator plug-in generates a chart image file. The type of image is determined by the file name, and can be a .jpg, .png, or .gif. The width and height of the image are dictated by parameters edited via the following panel:



The default dimensions are 500 x 500 pixels. To override either the width or height, click on the appropriate override check box and set the value by typing it into the field or using the up/down arrows, .

### 13.3.2 ParametersXML Plug-in

The ParametersXML output generator plug-in generates an XML file specifying the parameters of the product. This file can then be imported via the **Product and Template Manager Dialog** (see 3.1.1, pg 18) if desired.

Here is an example of part of a parameters XML file:

---

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<productTemplateParameters>
  <referencedTemplate productId="ref_ensemble_spread">
    <argument id="defaultEnsembleId">HMOS</argument>
  </referencedTemplate>
  <referencedTemplate productId="ref_temp">
    <argument id="defaultLocationId">FOLC1UP</argument>
  </referencedTemplate>
  <referencedTemplate productId="ref_precip">
    <argument id="defaultLocationId">NFDC1UP</argument>
  </referencedTemplate>
  <inputSeriesProviderParameters convertToDisplayUnits="false"
includeThresholds="false" name="PiTimeSeries">
    <parameter
id="timeSeriesXMLFile">testdata/chartEngine/inputs.default.xml</parameter>
  </inputSeriesProviderParameters>
  <chartSeriesParameters>
...

```

---

### 13.3.3 PiTimeSeriesXML Plug-in

The PiTimeSeriesXML output generator plug-in generates a pi-timeseries schema compliant XML file that contains the time series output by the calculator plug-ins, if the plug-ins generated time series. If any calculated chart series is not a time series, an error will occur.

Here is an example of part of a pi-timeseries XML file:

---

```
<?xml version="1.0" encoding="UTF-8"?>
<TimeSeries xmlns="http://www.wldelft.nl/fews/PI" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.wldelft.nl/fews/PI
http://fews.wldelft.nl/schemas/version1.0/pi-schemas/pi_timeseries.xsd" version="1.2">
  <timeZone>0.0</timeZone>
  <series>
    <header>
      <type>instantaneous</type>
      <locationId>DILM5</locationId>
      <parameterId>QIN</parameterId>
      <timeStep unit="second" multiplier="3600"/>
      <startDate date="2008-03-15" time="18:00:00"/>
      <endDate date="2008-03-20" time="18:00:00"/>
      <missVal>NaN</missVal>
      <stationName>Dillworth</stationName>
      <units>m3/s</units>
      <fileDescription>testdata\piTimeSeriesProvider\inputs.default.xml</fileDescription>
    </header>
    <event date="2008-03-15" time="18:00:00" value="3.5890002" flag="0"/>
    <event date="2008-03-15" time="19:00:00" value="3.5890002" flag="0"/>
  ...
```

---

### 13.3.4 Tabular Plug-in

The Tabular output generator plug-in generates an ASCII text file specifying all of the plotted chart series in a tabular format, including information contained in the header of the time series (such as location id, data type, etc.).

Here is an example of part of a tabular ASCII text file:

---

```
=====
DATA SOURCE #0
=====
Input Time Series:
  Location #1:
    Location id: DILM5
    Location name: Dillworth
    Location description: null
    Parameter id: QINE
    Ensemble id: HMOS

Aggregations Performed In Order:
  Aggregator #1:
    Type: Mean
    Period start time: 2008-03-21 00 GMT
    Period end time: 2008-03-25 18 GMT
    Time step: 1 day

Calculations Performed:
  Name: Quantiles
  Calculator-specific parameters:
    probability: MIN
```

probability: 0.25  
probability: 0.50  
probability: 0.75  
probability: MAX  
distribution: Empirical


Computed (Range) Data Description: Discharge [m3/s]  
Domain Data Description: Time

...

---



## 14 GraphGen Viewer Panel

The **GraphGen Viewer Panel**, shown in Figure 14-1, displays chart constructed by the Graphics Generator. It is opened by clicking on the **GraphGen Viewer Button**, , in the CHPS interface tool bar. When clicked, the viewer will be opened to display the currently selected product in the **GraphGen Thumbnail Panel**, or, if none is selected, the current selected product in the **GraphGen Tree Panel**.

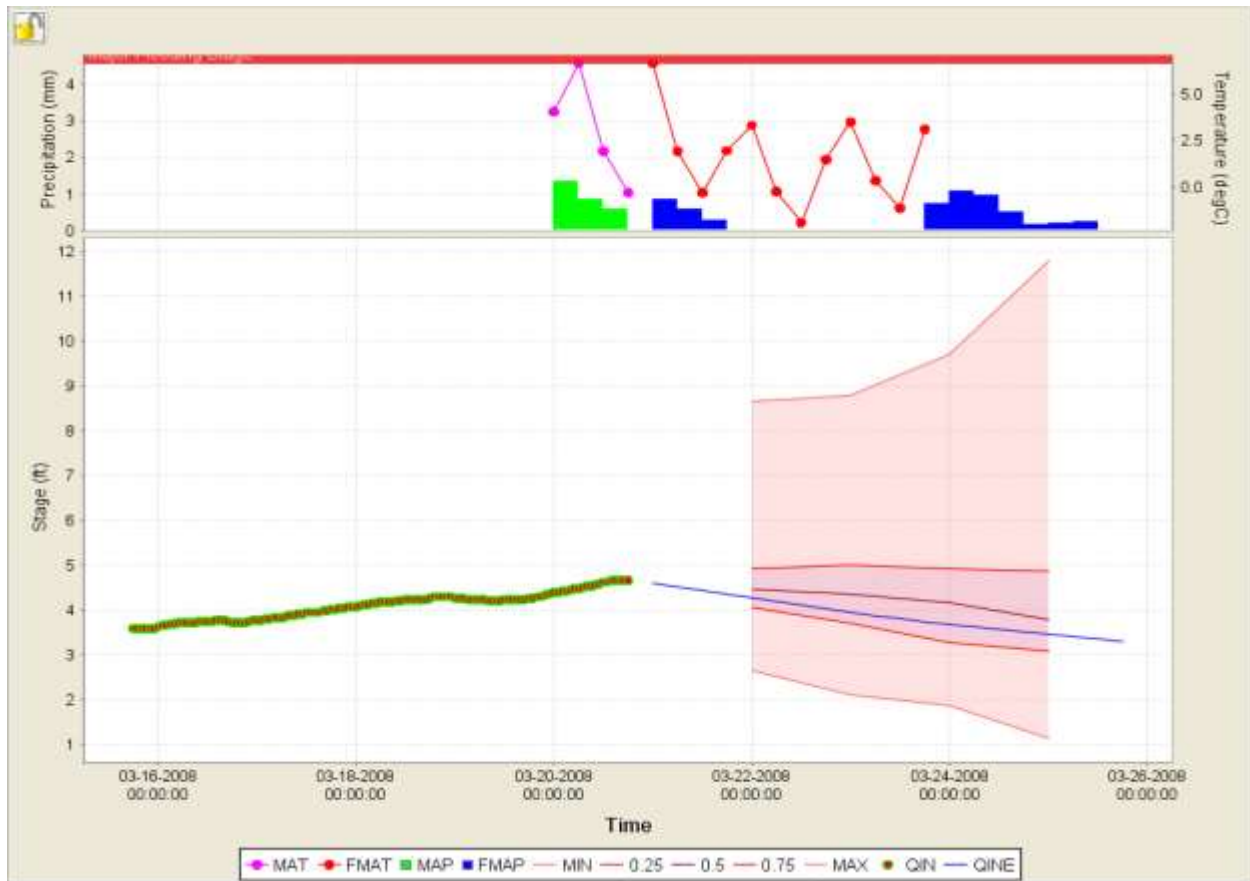




Figure 14-1: GraphGen Viewer Panel.

### 14.1 Components

There is one component displayed above the chart in the viewer: the **Lock/Unlock Viewer Button**. It controls a lock/unlock flag within the viewer:

- : Indicates that the viewer is locked, so that the image will never change, even if the product displayed is modified.
- : Indicates that the viewer is unlocked, so that any change in the **GraphGen Thumbnails Panel** will be reflected in the **GraphGen Viewer Panel**.

## 15 GraphGen Model Adapter

The GraphGen Model Adapter is designed to generate product output files via a workflow. The model adapter requires as input only the segment id and product id of each product to generate. Each product must be constructed beforehand using the **GraphGen Editor Panel**, with the output files to produce specified via output generator plug-ins. The adapter is configured as any other module of CHPS within a module configuration file.

### 15.1 Execute Activity

The class name that must be used within the `executeActivity` section of a module configuration file for the GraphGen Model Adapter is:

```
ohd.hseb.graphgen.adapter.GraphGenModelAdapter
```

It expects a single argument specifying the location of the run information file. The following is an example of an `executeActivity`:

---

```
<executeActivity>
  <command>
    <className>ohd.hseb.graphgen.adapter.GraphGenModelAdapter</className>
  </command>
  <arguments>
    <argument>%ROOT_DIR%/run_info.xml</argument>
  </arguments>
  <timeOut>300000</timeOut>
</executeActivity>
```

---

### 15.2 Properties

The GraphGen Model Adapter uses three properties, input via the `exportRunFileActivity` section of the module configuration file: `baseOutputDir`, `product.<segment id>`, and `productXMLFile.<segment id>`. Each is described below.

#### 15.2.1 Property `baseOutputDir`

The `baseOutputDir` defines a base output directory for all generated products defined such that the output file name is defined as a relative path (i.e., a path not starting in `'/'` or `'.'`). Example:

```
<string key="baseOutputDir" value="%ROOT_DIR%/products"/>
```

#### 15.2.2 Property `products.<segment id>`

The `products.<segment id>` property defines a list of products to generate for a segment. The products are defined in a semicolon delimited list as the property value. When generating each

of these products, the predefined argument “overrideActiveSegmentId” (see Section 2.1.2.1, pg 3) is set to the value of “<segment id>” specified as part of the property name after “products.” An example of a line within an `exportRunFileActivity` section of the configuration file is as follows:

```
<string key="products.ARGW1" value="AHPSFlowHistogram; AHPSStageHistogram; AHPSVolumnHistogram"/>
```

In this example, the segment id is “ARGW1” and the three specified products are generated.

The list of products defines a list of patterns used to match product ids. Standard Java pattern matching is used; for a description, see

<http://download.oracle.com/javase/1.4.2/docs/api/java/util/regex/Pattern.html>.

For example, the following line will generated all products for segment ARGW1 such that the product id begins with “AHPS” and does not include any numbers or white-space:

```
<string key="products.ARGW1" value="AHPS[a-zA-Z]*"/>.
```

This example is similar, but uses two patterns to specified the AHPS flow and stage products, while excluding the volume product:

```
<string key="products.ARGW1" value="AHPSFlow[a-zA-Z]* ; AHPSStage[a-zA-Z]*"/>.
```

If the value of the property is “all”, then all products defined for that segment will be generated, including those define for all segments. If the value of the property is “all only”, then all products defined for all segments will be generated for the specified segment.

## 15.3 Examples

Example files were installed as part of the Install Notes in the directory:

```
<configuration dir>/exampleAdapterConfigFiles
```

It includes two module configuration files, a workflow file, a module instance descriptor file, and a workflow descriptor file.

### 15.3.1 Example 1

This first example generates a product created as part of the *Designing and Building Test Procedure* and is from the file

```
<configuration dir>/exampleAdapterConfigFiles/GraphGen_Test1_Product.xml.
```

The `exportTimeSeriesActivity` section was pulled from an arbitrarily selected module configuration file corresponding to model RSNELEV.

---

```
<?xml version="1.0" encoding="UTF-8"?>
<generalAdapterRun xmlns="http://www.wldelft.nl/fews"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.wldelft.nl/fews http://chps1/schemas/generalAdapterRun.xsd">
  <general>
    <description>GraphGen Test 1 Product</description>
    <rootDir>%REGION_HOME%/Models/graphgen</rootDir>
    <workDir>%ROOT_DIR%/work</workDir>
    <exportDir>%ROOT_DIR%/input</exportDir>
    <exportDataSetDir>%ROOT_DIR%</exportDataSetDir>
    <exportIdMap>IdExportSACSMA</exportIdMap>
    <importDir>%ROOT_DIR%/output</importDir>
    <importIdMap>IdImportSACSMA</importIdMap>
    <dumpFileDir>%GA_DUMPFILEDIR$</dumpFileDir>
    <dumpDir>%ROOT_DIR%</dumpDir>
    <diagnosticFile>%ROOT_DIR%/output/diag.xml</diagnosticFile>
    <timeZone>
      <timeZoneOffset>-08:00</timeZoneOffset>
    </timeZone>
  </general>
  <activities>
    <startUpActivities>
      <makeDir>
        <dir>%ROOT_DIR%/output</dir>
      </makeDir>
      <makeDir>
        <dir>%ROOT_DIR%/work</dir>
      </makeDir>
      <makeDir>
        <dir>%ROOT_DIR%/products</dir>
      </makeDir>
    </startUpActivities>
    <exportActivities>
      <exportRunFileActivity>
        <exportFile>%ROOT_DIR%/run_info.xml</exportFile>
        <properties>
          <string key="baseOutputDir" value="%ROOT_DIR%/products"/>
          <string key="products.TestProcedure" value="TestCase1"/>
        </properties>
      </exportRunFileActivity>
    </exportActivities>
    <executeActivities>
      <executeActivity>
        <command>
          <className>ohd.hseb.graphgen.adapter.GraphGenModelAdapter</className>
        </command>
        <arguments>
          <argument>%ROOT_DIR%/run_info.xml</argument>
        </arguments>
        <timeOut>300000</timeOut>
      </executeActivity>
    </executeActivities>
  </activities>
</generalAdapterRun>
```

---

### 15.3.2 Example 2

The second example generates all AHPS products delivered with the installation for the segments ARGW1, and ARLW1. It is from the file

<configuration dir>/exampleAdapterConfigFiles/GraphGen\_Test2\_Product.xml.

---

```
<?xml version="1.0" encoding="UTF-8"?>
<generalAdapterRun xmlns="http://www.wldelft.nl/fews"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.wldelft.nl/fews http://chps1/schemas/generalAdapterRun.xsd">
  <general>
    <description>GraphGen Test 2 Product</description>
    <rootDir>%REGION_HOME%/Models/graphgen</rootDir>
    <workDir>%ROOT_DIR%/work</workDir>
    <exportDir>%ROOT_DIR%/input</exportDir>
    <exportDataSetDir>%ROOT_DIR%</exportDataSetDir>
    <exportIdMap>IdExportSACSMA</exportIdMap>
    <importDir>%ROOT_DIR%/output</importDir>
    <importIdMap>IdImportSACSMA</importIdMap>
    <dumpFileDir>%GA_DUMPFILEDIR$</dumpFileDir>
    <dumpDir>%ROOT_DIR%</dumpDir>
    <diagnosticFile>%ROOT_DIR%/output/diag.xml</diagnosticFile>
    <timeZone>
      <timeZoneOffset>-08:00</timeZoneOffset>
    </timeZone>
  </general>
  <activities>
    <startUpActivities>
      <makeDir>
        <dir>%ROOT_DIR%/output</dir>
      </makeDir>
      <makeDir>
        <dir>%ROOT_DIR%/work</dir>
      </makeDir>
      <makeDir>
        <dir>%ROOT_DIR%/products</dir>
      </makeDir>
    </startUpActivities>
    <exportActivities>
      <exportRunFileActivity>
        <exportFile>%ROOT_DIR%/run_info.xml</exportFile>
        <properties>
          <string key="baseOutputDir" value="%ROOT_DIR%/products"/>
          <string key="products.ARGW1" value="AHPS[a-zA-Z]*/>
          <string key="products.ARLW1" value="AHPS[a-zA-Z]*/>
        </properties>
      </exportRunFileActivity>
    </exportActivities>
    <executeActivities>
      <executeActivity>
        <command>
          <className>ohd.hseb.graphgen.adapter.GraphGenModelAdapter</className>
        </command>
        <arguments>
          <argument>%ROOT_DIR%/run_info.xml</argument>
        </arguments>
        <timeOut>300000</timeOut>
      </executeActivity>
    </executeActivities>
  </activities>
</generalAdapterRun>
```

---

# Appendix A: The Mathematics Underlying the Graphics Generator

This appendix presents important mathematical concepts employed by the Graphics Generator.

## A.1 Time Series Aggregation

An aggregation is defined by an aggregation period (start time and end time), time step, and aggregation calculation (specified by an aggregator plug-in). Beginning at the start time, the aggregation is performed for each selected time series by doing the following:

1. Define a working subperiod as being the current start time plus one step.
2. Pick out all values from the time series within the subperiod (including end points).
3. Perform the aggregator plug-in calculation based on the selected plug-in.
4. Add the computed value to a resulting time series with a time equal to the subperiod's end time.

If a missing value is present within a subperiod, it is up to the plug-in to determine how to behave; typically, the aggregated value will be set to missing. Multiple aggregations can be performed, with the results of the first aggregation being used as input to the second aggregation, second as input to the third, and so on.

## A.2 Computing Empirical Distributions

An empirical distribution is calculated for a particular time step as follows:

1. Collect values from all time series at that time step. This creates a set of size  $N$ .
2. Sort the values from smallest to largest.
3. To the  $i^{\text{th}}$  value in the sorted set ( $i = 1, 2, \dots, N$ ) assign the probability  $i/(N + 1)$ .

When the process above is completed, each value in the set in Step 1 will be assigned a probability.

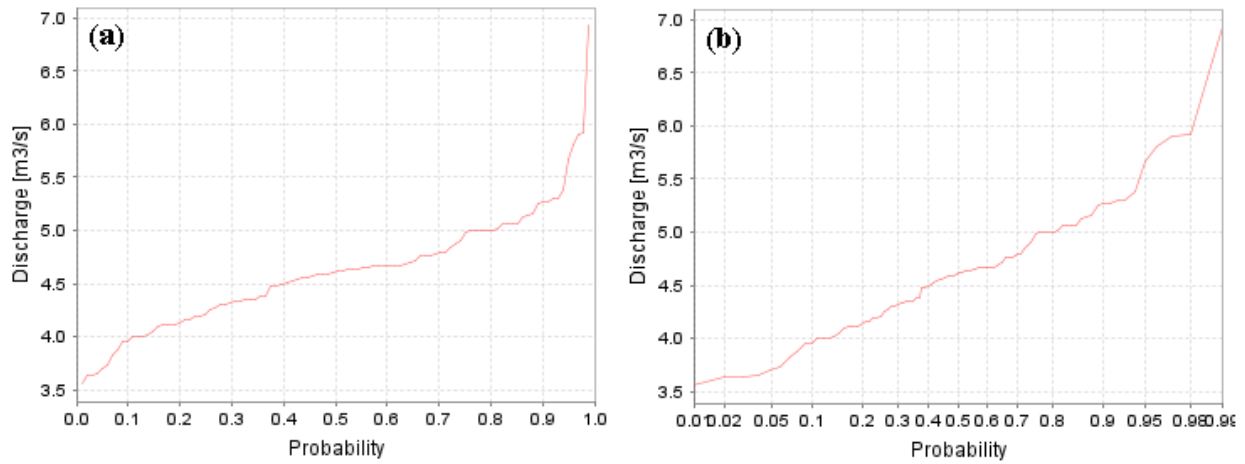
## A.3 Plotting Data Against a Normalized Probability Axis

A normalized probability axis is used to display the probabilities of a distribution such that, if the distribution were normal, the probability points would appear as a line. Given a set of distribution plotting points,  $\{(x_i, p_i): x_i \text{ is a value, } p_i \text{ is a probability, and } i = 1, \dots, N\}$ , determining the value at which to plot the point along a normalized probability axis follows this process:

1. Calculate the standard normal distribution value for each probability:  $z_i = Q^{-1}(p_i)$ , where  $Q$  is the cumulative distribution function of a standard normal variate.
2. Plot the points  $\{(x_i, z_i)\}$ .

3. Tick marks along the normalized probability axis are fixed to the values  $\{Q^{-1}(0.01), Q^{-1}(0.02), Q^{-1}(0.05), Q^{-1}(0.1), Q^{-1}(0.2), Q^{-1}(0.3), Q^{-1}(0.4), Q^{-1}(0.5), Q^{-1}(0.6), Q^{-1}(0.7), Q^{-1}(0.8), Q^{-1}(0.9), Q^{-1}(0.95), Q^{-1}(0.98), Q^{-1}(0.99)\}$ .
4. Label the tick marks according to the probability used.

Below is an example showing a non-exceedance function plotted against a standard linear probability axis in plot (a) and a normalized probability axis in plot (b):



## Appendix B: Instructions for Adding a Plug-In

