Product Manual

Software

RTMC Pro

Real-Time Monitor and Control Software

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1. RTMC Pro Real Time Monitoring and Control Software

RTMC is an application used to graphically display data from a LoggerNet datalogger network or RTDAQ datalogger. Available components include status bars, digital displays, charts, gauges, tables, and alarms. In addition, RTMC can be used to remotely control a datalogger and its peripherals by toggling ports and flags with switch components, and it can be used to set input locations or variables in a datalogger with value setter components. Various command button components exist that can run/open files, execute CoraScript commands (used to interact with the communications server), and link to websites. Aesthetic layout components such as labels, images, group boxes, panels, bevels, shapes, and gradients are also available.

Two versions of RTMC are available. A standard RTMC Development version ships with LoggerNet and RTDAQ. RTMC Pro has many enhancements over the standard version. RTMC Pro contains more graphical components than RTMC. For example, more alarms (multi-state), alarm events (email, FTP, run/open), switches (lever, rocker, rotary), charts (XY and scope), gauges (rotary, compass), and layout components (group box, bevel, panel) are available. For components that exist in both versions, more properties have been exposed in RTMC Pro resulting in more design control. RTMC Pro also includes run/open button, hotspot, snapshot, and alarm log capabilities. In LoggerNet, you also have the ability to add data files, LNDB databases, HTTP dataloggers, virtual data sources, and additional LoggerNet servers as data sources for RTMC Pro projects. RTMC Pro also comes with the CSI Web Server and Web Publisher which allow you to publish your project to the web through either a PC website or through a web-enabled datalogger like a CR6 or a CR1000 with an NL121 attached.

> Note: A project that is created with the standard RTMC Development version can be converted to RTMC Pro format. However, once a project is converted to RTMC Pro format, it cannot be opened in standard RTMC.

RTMC's main window is divided into a Workspace, Project Tree, and Component Toolbox. The Workspace, in the center of the RTMC screen, is where the components will be placed for the display. As each component is selected from the Component Toolbox and added to the Workspace, it will show up in the Project Tree.

Adding Components to the Workspace

Click an item on the Component Toolbox (see below), and then click within the Workspace to add the component to the display. Different components can be chosen by clicking the arrow on each tab to display the components available for each component type. When an item is selected from the Component Toolbox, the cursor will change to a cross to indicate the selection (✛). If you decide not to insert the component, press the component's button in the toolbox again to return the cursor to its normal state.
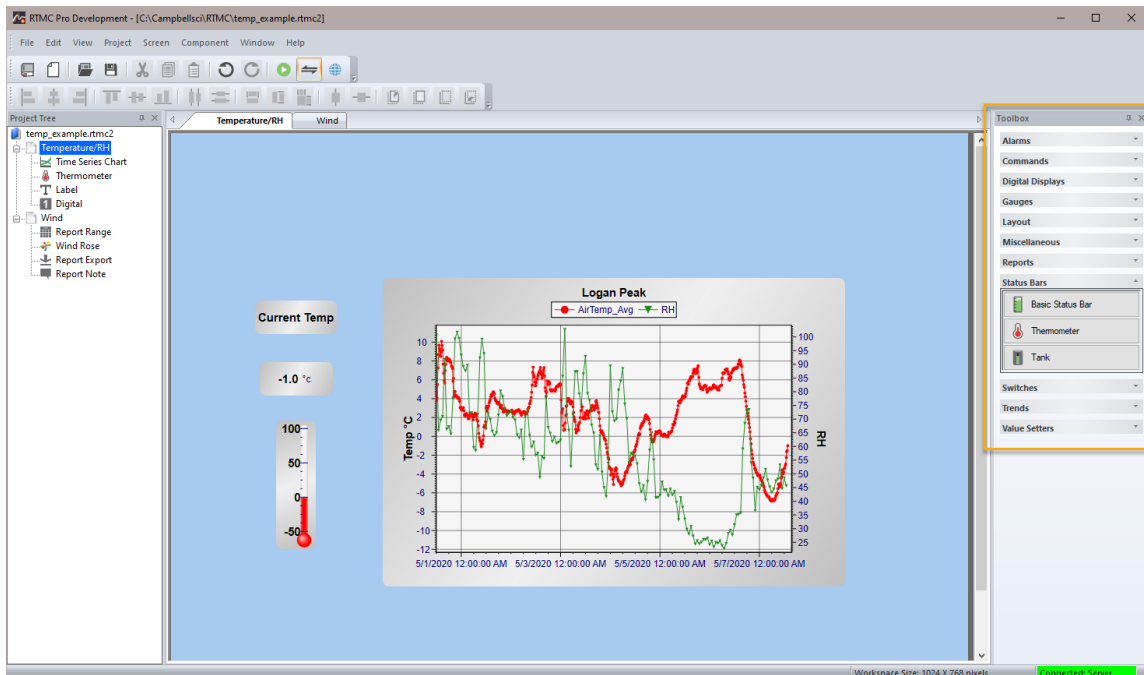
For more information, see Component Toolbox (p. 9).

Adding Tabbed Screens

When a new project is started in RTMC, it has only one screen on which to place components. However, more screens can be added. Each screen will appear in the project tree and as a tabbed page in the workspace. A new screen can be added using the **Project | Add New Screen** menu or by selecting an icon from the Standard Toolbar. Navigate between the screens using the tabs at the top of the workspace.

The Add Screen icon is highlighted below.
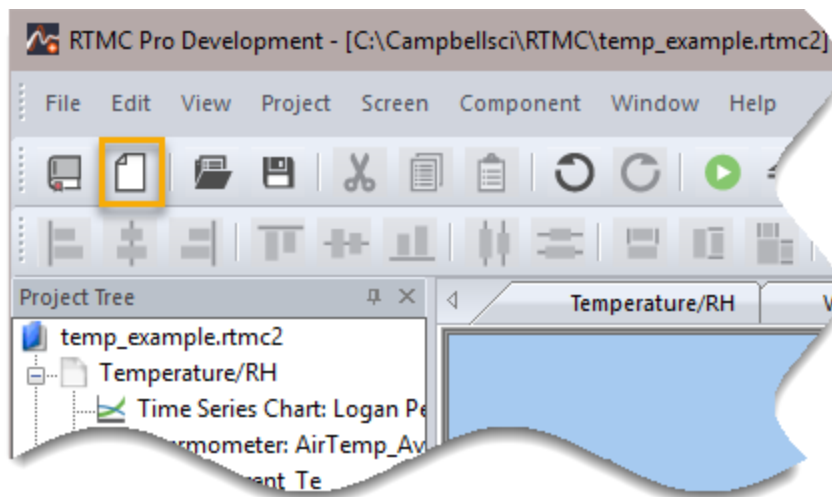
The order in which the screens appear can be changed by selecting **Project | Change Screen Order** from the menu. A dialogue box with all the screen names listed is displayed. Highlight a screen name and use the up or down arrow buttons to change the order of the screens.

Execution Modes

Development Mode - The development mode is used when creating projects to be displayed by RTMC. The development mode is launched when RTMC Pro Dev is selected from the LoggerNet or RTDAQ toolbar. It can also be started by choosing All Apps | Campbell Scientific | RTMC Pro Development from the Windows Start menu.

Run-time Mode - The run-time mode is used to display a completed project. The run-time mode is launched when RTMC Run-time is selected from the LoggerNet or RTDAQ toolbar. In LoggerNet, it can also be started by choosing **All Apps | Campbell Scientific | RTMC Run-time** from the Windows Start menu or by Saving and Running the project within the development mode (File | Save and Run Project or the ▶ icon.

> Note: In RTDAQ, you must be connected to a datalogger for the RTMC Run-time icon on the RTDAQ toolbar to be enabled. Also, the option to Save and Run Project and the associated button are not available when running the development mode of RTMC from RTDAQ.

Data Displayed by RTMC

LoggerNet - RTMC displays data from LoggerNet's binary data cache, not from a data file. (Note, however, that RTMC Pro does have the ability to add data files as data sources. See Project | Manage Data Sources (p. 26) for more information.) The data cache is updated during scheduled or manual data collection in LoggerNet. In RTMC, when associating a data value from a table with a component, a table represented with a red X indicates the table is not being collected in

LoggerNet. This is because scheduled collection is not enabled for the datalogger, the table is not included for collection, or the schedule has been paused from the Status Monitor.

For instance, in the example below, the Public, Status, and DataTableInfo tables are not being collected from the Logan datalogger.
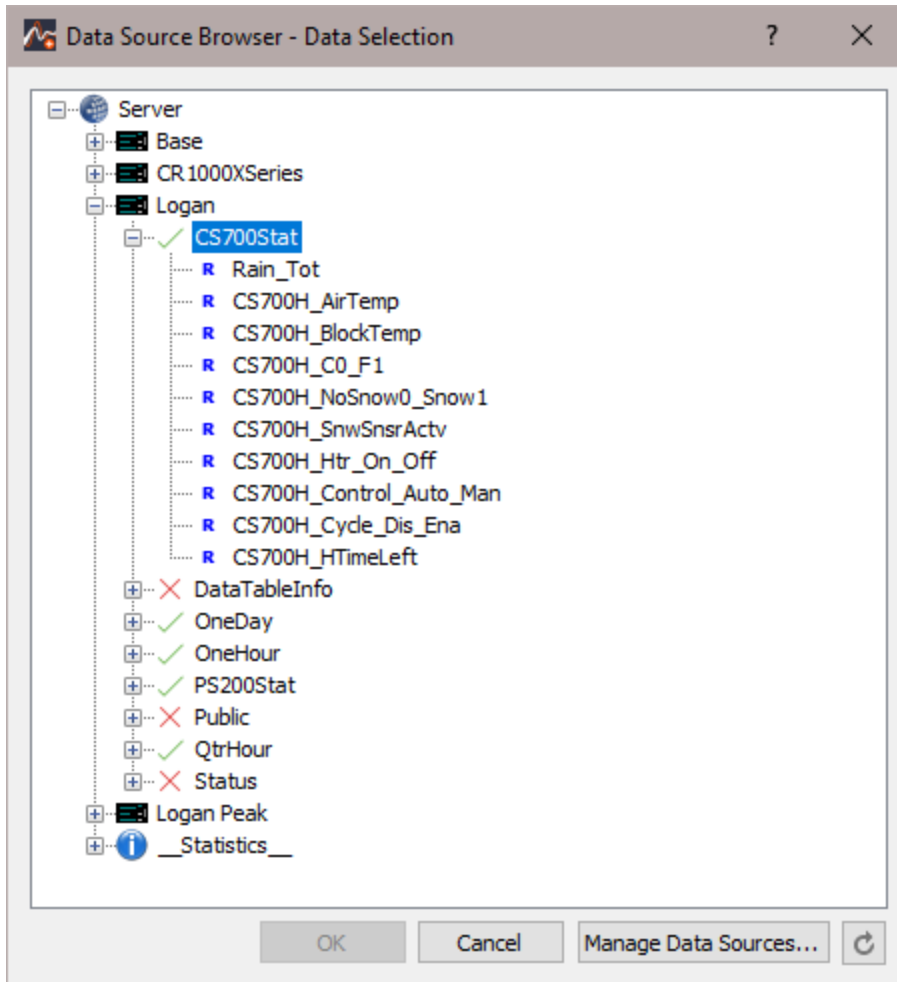
In this instance, if a data value from the Public, Status, or DataTableInfo table is associated with a component, that component will likely not be updated when RTMC is run. Scheduled collection can be enabled and tables can be included for data collection in LoggerNet's Setup window.

In RTMC Pro, you can also set up data collection from the Project | Configure Override Scheduled Collection (p. 27) menu item. This data collection will be in addition to any scheduled collection setup in LoggerNet's Setup window. Using this option will not generate green check marks next to the table in the Data Source Browser. (Green check marks indicate only that the table is set up for scheduled collection in LoggerNet.) However, components will still be updated when RTMC is run.

Data displays will be updated no more frequently than data is being collected from the datalogger.

Input locations, public variables, ports, and flags will show only the current value in the datalogger -- the datalogger does not keep historical records for these values. A "snapshot" of these values will be updated only when data is collected.

RTDAQ – In RTDAQ, RTMC projects are limited to a single station. This station must be specified when a new project is opened. Thus when components are added to a project, only the specified station's tables and fields will be shown in the Data Source Browser. When associating a data value from a table with a component, the station's table will be represented with a green check mark when RTDAQ is connected to the station and monitoring the table through a real-time window (field monitor, table monitor, graph, etc.). A table will be represented with a red X when RTDAQ is not monitoring the table.
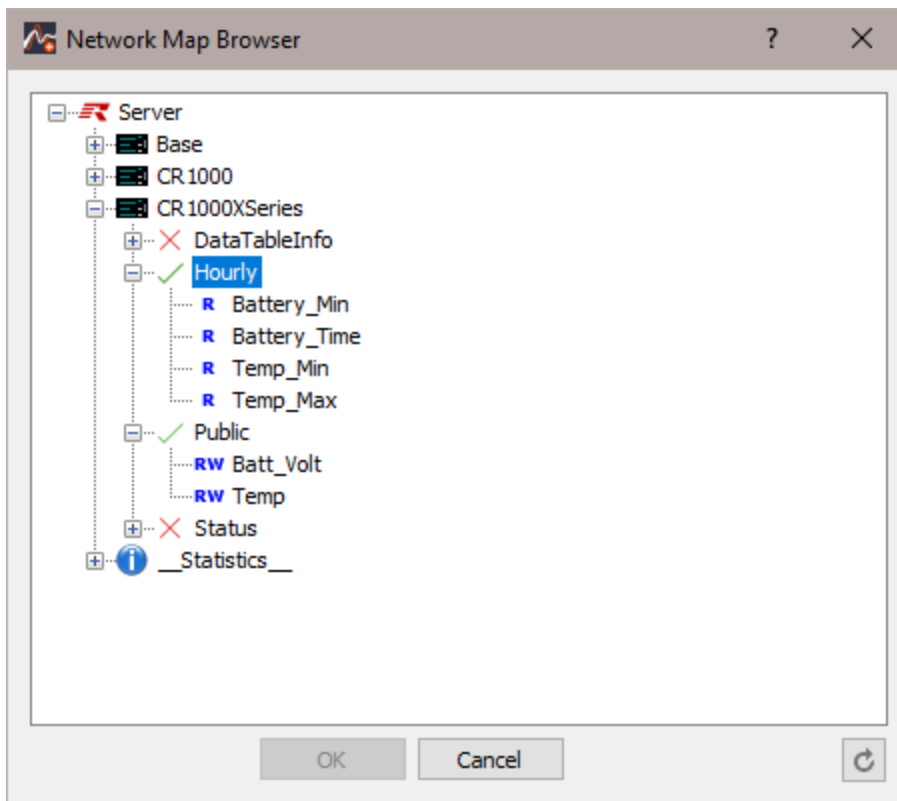
When RTDAQ is connected to the station, RTMC will perform a manual poll to update the project data every second. Thus, RTMC data displays will only be updated when RTDAQ is connected to the station.

In RTMC Pro, you can override this one second collection from the Project | Configure Override Scheduled Collection (p. 27) menu item.

2. What's New?

RTMC Pro 5.0 includes the following enhancements from 4.3:

- All components have been updated.
- Increased performance in Development and Run-Time.
- Screen Colour Themes
- New Components
  - Interpolation Map
  - Multi-State Image
  - Line, Curved Line, and Arc Line

Note: Components look different and some defaults have changed. Therefore, when moving a project developed in an older version of RTMC Pro into RTMC Pro 5.0, it may be necessary to manually make some adjustments to your components.

3. Project Tree

The Project Tree lists the project, each screen, and all of the components for each screen in a tree-type structure. As an example, look at the following Project Tree:
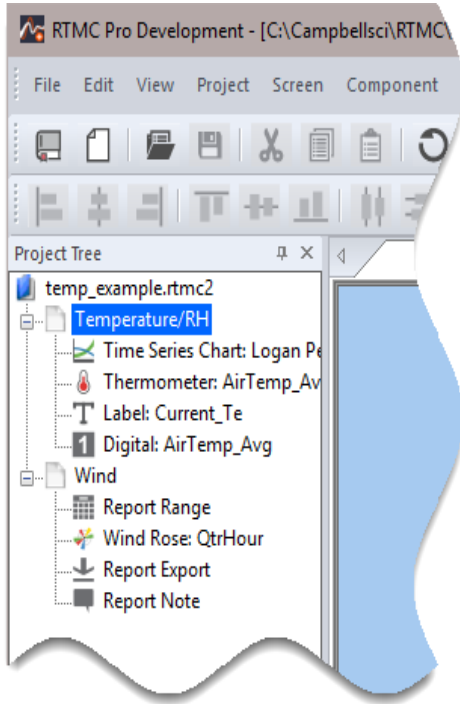
Note that when you first add a new component to a screen, it has a default name that reflects the component type; e.g., "Thermometer". You can provide a meaningful name for the component by selecting the component in the Project Tree, pressing F2, and typing in a new name (alternately, you can select the component in the Project Tree, right-click, and select **Rename Component**). RTMC does not allow duplicate component names. If a second thermometer is added it will be named "Thermometer1". When a component is selected in the Project Tree, it will also be selected in the Workspace.

To move between the different screens of a project, select the screen name in the Project Tree or the tab above the workspace.

4. Workspace

The Workspace is the large section in the center of the RTMC window. Your finished project will reflect the layout of the Workspace when it is run.

The Workspace Configuration dialogue box can be used to determine the size of the Workspace and the Run-time screen.

To place a component in the Workspace, select an item from the Component Toolbox. Your cursor will look similar to ┼. With this cursor, click in the Workspace where you want the component placed. The component will be dropped onto the Workspace and the Properties window for that component will be displayed.

Once the properties are set and you have pressed **OK**, you can move or resize the component as desired. To move a component, click on it and hold the mouse button while dragging it to a new location. To resize a component, click somewhere on its outer border and drag the image larger or smaller. Note that if you resize an object, you may need to adjust some of its properties so that scale values, bars that depict the data, etc., are the correct size and position for the new image. The aspect ratio of a component can be locked or unlocked prior to resizing it by right-clicking on the component and enabling/disabling the Lock Aspect Ratio option.

One RTMC project can contain multiple tabbed windows. A tabbed window is created by adding a new screen (**Project | Add New Screen** or press the icon on the Standard Toolbar. To navigate between screens in development mode, select a screen in the Project Tree.
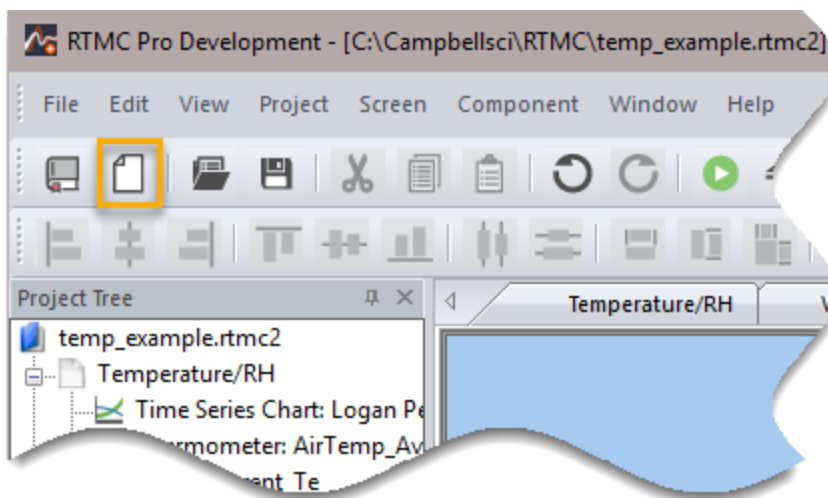
For more information on manipulating the components on your Workspace, see Component Selection and Manipulation (p. 17).

5. Component Toolbox

Components are the objects that are used to display data and create the graphical layout of the project. To add a component to the Workspace, click on an item in the Component Toolbox, then click anywhere in the Workspace. The component's Properties window is automatically displayed when the component is first placed in the Workspace. The Properties window is used to set colours, scale values, define text, etc., and to assign the data value to be displayed by the component.
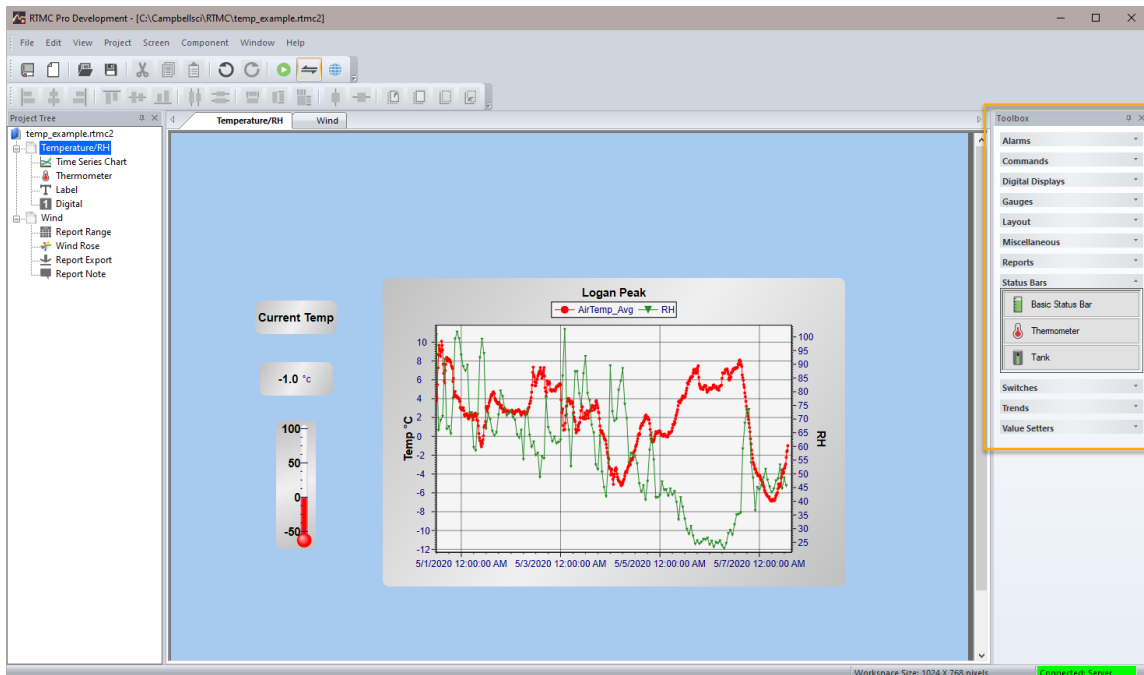
After a component's properties have been set, select **OK** to apply the changes and close the Properties window. Once closed, the Properties window can be displayed by double-clicking the component. If you make changes to a component's properties but then decide to reject those changes, press the **Cancel** button to return the properties to the last applied state. If **Cancel** is selected when a component is first placed in the Workspace (and **OK** has not been pressed), the component will be removed from the screen.
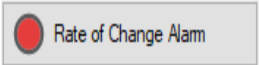
> Notes: In LoggerNet, RTMC displays data from the data cache (and not from a collected data file). Data must be collected from the datalogger for the data cache to be updated, and therefore, for the RTMC displays to be updated. Typically this is done by setting up a schedule in LoggerNet's Setup window. Data displays will be updated no more frequently than data is being collected from the datalogger.

In RTDAQ, when RTDAQ is connected to the datalogger, RTMC performs a manual poll every second to update project data. Therefore, RTDAQ must be connected to the datalogger for the RTMC displays to be updated.

⚠️An exclamation point in a red circle at the upper right of a component indicates a problem with the linked data value. Hover your mouse pointer over the box for a few seconds to display a hint about the error RTMC has detected.

The following components are available in RTMC Pro.

Component	Description
Basic Alarm	Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.
Numeric Alarm	Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.
Rate of Change Alarm	Provides visual and/or audible notification that the rate of change of a data value has exceeded a defined limit. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.
No Data Alarm	Provides visual and/or audible notification that no data has been received from a selected table for a specified period of time. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open)

Comm Status Alarm
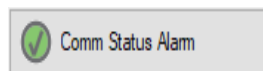
and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.

Provides visual and/or audible notification when scheduled collection is disabled in the Setup Screen, the schedule is paused from the Status Monitor, or communication has failed a sufficient number of times to put the datalogger into a Primary or Secondary Retry mode (the retry mode used is based on the Condition property for the component). An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.
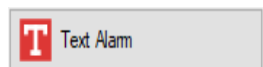
Note that if RTMC is launched from RTDAQ, a Comm Status Alarm will only be triggered when an RTDAQ real-time display is started or stopped. This is because RTDAQ uses scheduled collection to temporary collect areas in order to update the real-time displays.

Text Alarm

Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be run or opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.

Multi-State Alarm
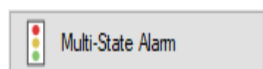
Provides visual and/or audible notification of the state of a data value. Default states include Off, Warning and Critical. These can be changed and additional states can be added. An image, sound file, email, and/or run/open can be defined for each state. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.
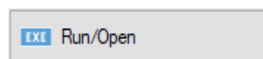
Run/Open

Provides a button that will run/open a specified file (*.exe, *.bat, *.doc, etc.) when pressed.
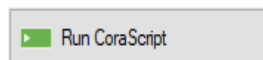
Run CoraScript

Provides a button that will execute a specified CoraScript command when pressed. CoraScript is a set of commands that can be used to interact with the communications server.
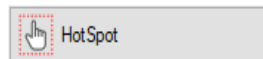
HotSpot

Provides a hotspot that will jump to a specified RTMC screen or open a

web browser to a specified web address when pressed. In RTMC-RT the hotspot will be invisible. The only indication of a hotspot will be the changing of the cursor when hovering over the hotspot. A label, button, or other component can be used to indicate what the hotspot will do when clicked.
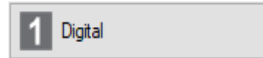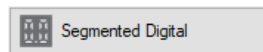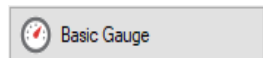
Digital	Depicts the selected data value as a numeric value, text string or Boolean.
Time	Depending upon the option chosen, displays the server time, server time at last data collection, station time, station time of last record stored, PC time, or a time stored in the data tables (such as time of maximum or minimum).
Segmented Digital	Depicts the selected data value as a numeric value, text string or Boolean.
Segmented Time	Depending upon the option chosen, displays the server time, server time at last data collection, station time, station time of last record stored, PC time, or a time stored in the data tables (such as time of maximum or minimum).
Basic Gauge	Displays the selected data value on a gauge. In run-time mode, max and min pointers can be reset by right-clicking the component.
Rotary Gauge	Displays the selected data value on a rotary gauge.
Compass	Provides an eight-point compass on which to display data.
Windsock	Displays wind speed and wind direction from a datalogger table in the form of a windsock.
Label	Displays a static text string that can be used to label other components or simply add text to the project.
Image	Places an image on the display.
Multi-State Image	Places an image on the display that changes according to a data value..
Group Box	Places a box on the display in order to group components together.
Panel	Places a panel on the display that can be used to group components together.
Shape	Places a circle, ellipse, square, rectangle, rounded rectangle, rounded square, circle pie, isosceles triangle, right triangle, trapezoid, diamond, parallelogram, pentagon, hexagon, octagon, cross, ring, arc, cylinder, cube, folded corner or frame on the display.
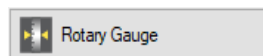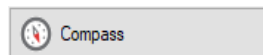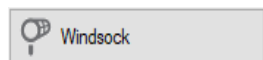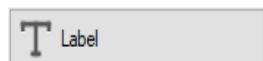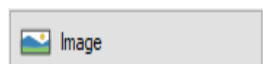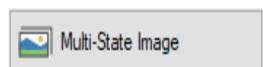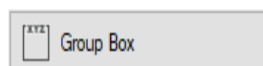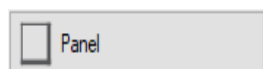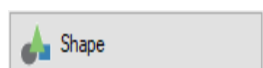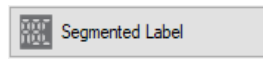
Segmented Label	Displays a static text string that can be used to label other components or simply add text to the project.
Line	Places a straight line on the display.
Curved Line	Places a curved line on the display.
Arc Line	Places an arc line (section of a circle) on the display.
Motor	Provides a motor that can be depicted as on or off based on a data value.
Pipe	Displays a pipe. The flow through the pipe can be determined by a data value. A pipe is horizontal by default. To make a vertical pipe, unlock the aspect ratio and resize it so that it is taller than it is wide.
Pipe Joint	Provides a pipe joint that can be used to connect two pipes.
Valve	Provides a valve that can be depicted as open or closed based on a data value.
Report Range	Provides a button bar that allows the user to customize the date range of their report. It also provides buttons in RTMC Run-time to step through data or jump to a specific date. (See Reports in RTMC (p. 49).)
Report Header	Displays the report range. The user can customize the dates shown and the format used. In run-time mode, the header updates as the report date range changes. (See Reports in RTMC (p. 49).)
Report Note	Allows the user to insert custom notes at run-time before the report is exported. Notes are temporary and are lost when the report is closed. (See Reports in RTMC (p. 49).)
Report Export	Provides options for controlling how reports get exported. Export options include HTML, PDF, PDF(Image), PNG, JPEG, GIF, and BMP. The reports can also be set up so they are printed, emailed or FTP'd when the report is exported. The component also allows you to specify which of the above export options are available in RTMC Run-time. (See Reports in RTMC (p. 49).)
Basic Status Bar	Depicts the selected data value as a single vertical or horizontal bar. In run-time mode, max and min pointers can be reset by right-clicking the component.
Thermometer	Displays the data value on the image of a thermometer. In run-time mode, max and min pointers can be reset by right-clicking the component.
Tank	Displays the data value as the level in a tank.
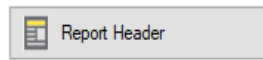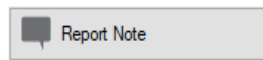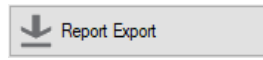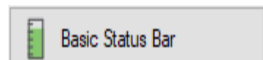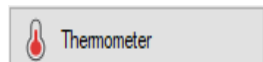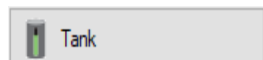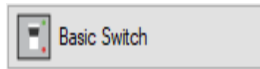
Basic Switch	Indicates the state of a port, flag, input location, or public variable. A 0 is considered Off (false; any non-zero number is considered On (True. In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.
LED Switch	Indicates the state of a port, flag, input location, or public variable by the colour of an LED. A 0 is considered Off (false); any non-zero number is considered On (True). In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.
Lever Switch	Indicates the state of a port, flag, input location, or public variable by the position of a lever. A 0 is considered Off (false; any non-zero number is considered On (True. In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.
Rocker Switch	Indicates the state of a port, flag, input location, or public variable by the position of a rocker. A 0 is considered Off (false; any non-zero number is considered On (True. In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.
Rotary Switch	Indicates the state of a port, flag, input location, or public variable by the position of a rotary dial. The default switch has two positions. A 0 is considered Off (false; any non-zero number is considered On (True. Other positions can be added. In run-time mode, click on a position to change to that state.
Slider Switch	Indicates the state of a port, flag, input location, or public variable by the position of a horizontal or vertical bar. The default switch has two positions. A 0 is considered Off (false; any non-zero number is considered On (True. Other positions can be added. In run-time mode, click on a position to change to that state.
Drop List	Indicates the state of a port, flag, input location, or public variable by displaying an option from a list designated by the user. The default drop list has two options. A 0 is considered Off (false; -1 is considered On (True. Other options can be added. In run-time mode, click on the component to display the list of options and change the value of the variable.
Time Series Chart	Displays one or more time domain series on a chart. The time stamp on the X axis reflects the data timestamp. In run-time mode, a portion of the chart can be "zoomed in on" by dragging a frame around the
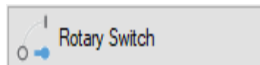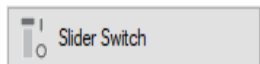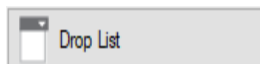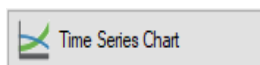
area to be viewed. Right-clicking the chart will bring up a menu that allows the chart to be printed, copied, saved or zoomed to all data. If the Allow Run-time Customization check box is selected in RTMC Pro, this menu will also include a Customize item that allows the Run-time user to change any of the chart's properties.

XY Chart
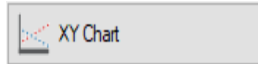
Displays one or more XY series on a chart. The user specifies what will be used for both the X axis data values and the Y axis data values. Each X axis data value is plotted against the Y axis data value with an identical timestamp. In run-time mode, a portion of the chart can be "zoomed in on" by dragging a frame around the area to be viewed. Right-clicking the chart will bring up a menu that allows the chart to be printed, copied, saved, or zoomed to all data. If the Allow Run-time Customization check box is selected in RTMC Pro, this menu will also include a Customize item that allows the Run-time user to change any of the chart's properties.
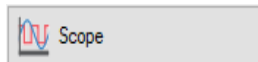
Scope

Displays one or more series on a chart. The time stamp on the X axis reflects the data timestamp. The Scope is similar to the Time Series Chart, but has the appearance of an oscilloscope screen and has the ability to display data at a faster rate. In run-time mode, right-clicking the scope will bring up a menu that allows the scope to be printed, copied, saved, or zoomed to all data. If the Allow Run-time Customization check box is selected in RTMC Pro, this menu will also include a Customize item that allows the Run-time user to change any of the scope's properties.
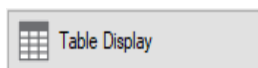
Table Display

Displays the data from a datalogger table in a row and column format. In run-time mode, right-clicking the table will bring up a menu that allows the table to be printed, copied, or exported. It also allows you to remove all data from the table or select the columns being displayed.
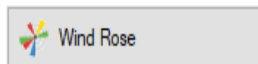
Wind Rose

Displays wind speed and wind direction from a datalogger table in the form of a wind rose.
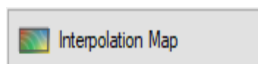
Interpolation Map

Displays a spatial interpolation chart .Similar data points (that is, same type of measurement and same units) from multiple stations are added according to the relative positions of the stations. The component provides a spatial interpolation of the value of the measurement between the stations.
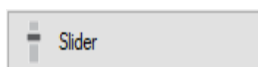
Slider

Depicts the selected data value as a single horizontal or vertical bar. In run-time mode, the data value can also be set to a new value by dragging the slider.
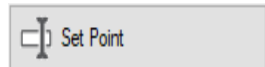
⊏□ Set Point	Like the Digital component, depicts the selected data value as a numeric value, text string or Boolean. However, in run-time mode, a data value can also be set to a new value by double-clicking the component and entering a new value in the resulting dialogue box. In
◉ Value Forwarder	run-time mode, reads a value in a datalogger and writes to another value in that datalogger or a different datalogger. The value that is written can be the value read, a 0 or -1, or a specified constant.
	Note that in RTDAQ, RTMC projects are limited to a single station. Therefore, the value read can only be forwarded to another value in the same datalogger.
◉ Dial	Depicts the selected data value as a pointer on a dial. In run-time mode, the data value can also be set to a new value by dragging the pointer.
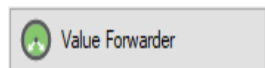
> Note: A description of each field in a component's Properties box can be displayed by pressing F1 or clicking the **?** in the top right-hand corner of the dialogue box while your mouse cursor is within the box.

Expressions

Components that display data values either numerically or graphically can be processed using mathematical expressions. For instance, a temperature reading in degrees Celsius can be processed to display in degrees Fahrenheit using a mathematical expression. For a list of functions and operators that are supported, see Expressions (p. 52).

> Note: When referencing data from separate tables within the same expression, the ValueSynch function should be used to synchronize the data values.

6. Component Selection and Manipulation

A component in your project can be selected by clicking on the component in the Workspace or on the component's name in the Project Tree. Multiple components can be selected by holding the **Ctrl** key while clicking on the components or by using the mouse to click and drag a box around the desired components. You can select all components on the current screen using the Select All item on the Edit menu.

The last component selected will be identified by the dark blue handles and by dark blue highlighting in the Project Tree. The other selected components have handles with blue outlines and are highlighted in light blue in the Project Tree. (The last component selected is important, because many of the component manipulation commands described below are in relation to the last component selected.

Once a component selection has been made, the selected component(s can be manipulated using items from the Component menu as described below. All of the functions available from the Component menu can also be accessed by right-clicking on one of the selected components. Those functions which involve how the components are placed on the Workspace can also be accessed from the Layout Toolbar. (Note that icons on the Layout Toolbar will only be enabled when their functions are currently applicable based on whether no components are currently selected, one component is currently selected, or multiple components are currently selected.)

Properties - Opens the Properties dialogue box for the selected component.

Delete Selection - Removes the highlighted component(s from the Workspace.

Lock Aspect Ratio - The aspect ratio of a component is the ratio of its width to its height. When this menu item is selected, the aspect ratio of the highlighted component is locked. If the width (or height of the component is changed, the height (or width will automatically be changed to keep the aspect ratio constant. The lock on the aspect ratio can be temporarily overridden by holding down the Ctrl key, while dragging the boundaries of a component to resize it.

Rename - Allows you to edit the name of the selected component. If snapshots are configured, renaming a component will affect the snapshot name.

Manual Resize - Allows you to set the size and position of the selected component. Use the X and Y spin boxes to set the position of the component on the screen. Use the W and H spin boxes to set the width and height of the component.

Cut - Removes the selected component(s) from the screen and places a copy on the Windows clipboard.

Copy - Places a copy of the selected component(s) on the Windows clipboard.

Align - Allows you to align two or more components on a screen. The last component selected will be the basis on which the other components are aligned.

> **Lefts** - The left border of all selected components will be aligned.
>
> **Centers** - All selected components are positioned vertically, with their centers aligned.
>
> **Rights** - The right border of all selected components will be aligned.
>
> **Tops** - The upper border of all selected components will be aligned.
>
> **Bottoms** - The bottom border of all selected components will be aligned.
>
> **Middles** - All selected components are positioned horizontally, with their centers aligned.

Space Evenly - Used to adjust the spacing of three or more components.

> **Across** - Spaces the components horizontally across the page using the left-most and right-most components as the left and right boundaries for the spacing.
>
> **Down** - Spaces the components vertically down the page, using the top-most and the bottom-most components as the top and bottom boundaries for the spacing.

Make Same Size - Allows you to set two or more components to the same height, width, or both. The last component selected will be the basis on which the other components are sized.

Center - Used to center one or more components on the page.

> **Vertical** - Centers the component(s) vertically on the page.
>
> **Horizontal** - Centers the component(s) horizontally on the page.

Order - Lets you choose the order in which the components appear on the display (often referred to as the Z order). Select a component and choose to send it to the back, send backward (one step), bring forward (one step), or bring it to the front of all other components. This order is important when layering transparent components.

Group Selection - Allows you to group two or more components together. They can then be moved, copied, ordered, etc. as a single object.

When a component group is selected, the **Ungroup Selection** menu item will be enabled. You can undo the component grouping by selecting this menu item.

When components are grouped, the properties for each of the components will show up as an item in the Component right-click menu. These menu items can be used to modify the properties for each component.

7. Functions Available from the RTMC Pro Menus

All of the RTMC Pro operations are available from the menus at the top of the RTMC Pro window. Many of the options are also available as buttons on the toolbar, or by right clicking the components or other parts of the window or project tree.

7.1 File Menu

7.1.1 File | New Project

Closes an open project and provides a blank Workspace in which to create a new project.

7.1.2 File | Open

Allows you to open a project which has been saved to disk.

7.1.3 File | Save

Saves the current project.

7.1.4 File | Save As

Allows you to save an existing project under a new file name.

7.1.5 File | Run Project

Launches RTMC-RT and runs the current project.

7.1.6 File | Save and Run Project

Saves the current project, launches RTMC-RT and runs the current project.

> Note: This option is not available when RTMC is run from inside RTDAQ.

7.1.7 File | Publish to Web

Opens the Web Publisher which allows you to publish your project to the web. The project can be published to either a PC website using the included CSI Web Server or to a web-enabled datalogger like a CR6 or a CR1000 with an NL121 attached.

See the Web Publisher's help file for more information on publishing your project to the web.

> Note: The Web Publisher can also be opened from the RTMC Pro toolbar by pressing the Publish to Web button (🌐).

7.1.8 File | Exit

Closes RTMC. You will be prompted to save any unsaved changes to the active project before RTMC closes.

7.1.9 File | Recent Files List

Provides a list of the last five projects open in RTMC. Select a project from the list to open it.

7.2 Edit Menu

7.2.1 Edit | Cut

Removes the selected component from the screen and places a copy on the Windows clipboard.

7.2.2 Edit | Copy

Places a copy of the selected component on the Windows clipboard.

7.2.3 Edit | Paste

Places a copy of the Windows clipboard content on the active screen. (Note that only valid XML code can be pasted into RTMC.)

7.2.4 Edit | Undo

Reverses the last change that was made.

7.2.5 Edit | Redo

Reverses a change that was made to the Workspace using the **Undo** feature.

7.2.6 Edit | Find and Replace

Allows you to find all occurrences of a designated string and replace them with a different string. Some instances where this may be useful are if a datalogger name in your network map has changed or a variable name in the datalogger program has changed.

The user determines whether the find and replace applies to the entire project, only the current screen, or only the current component.

> Note: In RTDAQ, when replacing a datalogger name and choosing to look in Entire Project, the new datalogger name will automatically become the station for the project. This new station will be shown whenever the Data Source Browser is accessed.

7.2.7 Edit | Select All

Selects and highlights all components on the active screen.

7.2.8 Edit | Clear Selection

Clears the selection of components currently highlighted on the active screen.

7.2.9 Edit | Preferences

> Note: The settings in the Preferences dialogue box are global for the Development environment. They are not saved within each project. Preferences are also available in RTMC Run-time. Preferences are not global between the two environments (Development and Run-time). They each save their own set of global preferences.

Working Directory

Sets the working directory for RTMC files. Type in a directory or use the button to the right of the field to browse.

Show Component Summaries

Determines whether component summaries are shown when you hover over a component on the screen. Check the box to make component summaries visible. If the box is not checked, component summaries will not be displayed.

Grid Options

Show Grid

Determines whether a grid is visible on the screen. Check the box to make the grid visible. If the box is not checked, the grid will not be visible.

Width

Determines the distance between vertical grid lines.

Height

Determines the distance between horizontal grid lines.

Graphics Options

Max Frames Per Second

Determines the maximum number of times the RTMC screens will be updated per second.

Disable Animation

Determines whether animation is disabled when a data value changes. This disables the smooth transition between values on gauges, status bars, etc. When the data value changes, the component will jump to the new value. Disabling animation greatly enhances performance when dealing with fast data or large, complex projects.

Check the box to disable animation. If the box is not checked, animation will be enabled.

7.2.10 Edit | Customize

Opens the Customize (p. 66) dialogue box which allows you to customize RTMC's toolbars and menus.

7.3 View Menu

All of the View menu items are toggles. When a check mark appears to the left of the menu item, it is enabled. When the check mark is absent, the option is disabled. These options are toggles— if an option is off (unchecked, select it once to turn it on (checked and vice versa.

7.3.1 View | Full Screen Mode

When selected, the RTMC Workspace expands to fill the entire computer screen. This provides more space to work with in designing your RTMC project. In this mode, you must use the right-click menus to add components and perform other functions available from RTMC's toolbars.

Press the Esc key to exit this mode.

7.3.2 View | Use Live Data

LoggerNet - When selected, RTMC Pro uses the data that has been collected by LoggerNet and stored in LoggerNet's data cache. Therefore, if LoggerNet is running and data is being actively collected from the datalogger network, the values displayed by the components will be updated

as data is collected. However, run-time events (audio, email, run/open, alarm acknowledgement, switch state changing, value changing, value forwarder, etc.) will not be active. When Use Live Data is not selected, RTMC Pro does not use the data stored in LoggerNet's data cache. Therefore, the values displayed by the components will not be updated until RTMC-RT is launched.

RTDAQ - When selected, RTMC Pro performs a manual poll to update the project data every second if RTDAQ is connected to the datalogger. Therefore, if RTDAQ is connected to the datalogger, the values displayed by the components will be updated every second. However, run-time events (audio, email, run/open, alarm acknowledgement, switch state changing, value changing, value forwarder, etc.) will not be active. When Use Live Data is not selected, RTMC Pro does not perform manual polls to update project data. Therefore, the values displayed by the components will not be updated until RTMC-RT is launched.

This menu item can also be toggled off or on by selecting an icon on the tool bar. The icon has a different appearance, depending on whether or not Use Live Data is currently off or on. When Use Live Data is off, the icon will appear as ⇌. When Use Live Data icon is on, the icon will appear as ⇌ .

7.3.3 View | Show Project Tree

When selected, the Project Tree is displayed on the left side of the RTMC. The Project Tree can also be repositioned on the screen by grabbing its upper margin and dragging it to a new location or by pressing the Maximize button at the top right of its margin. By default, the Project Tree display is enabled.

7.3.4 View | Show Toolbox

When selected, the Component Toolbox is displayed on the right of the RTMC screen. The Component Toolbox can also be repositioned on the screen by grabbing its upper margin and dragging it to a new location or by pressing the Maximize button at the top right of its margin. By default, the Component Toolbox display is enabled.

7.3.5 View | Show Layout Toolbar

When selected, the Layout Toolbar is displayed at the top of the RTMC screen. By default, the Layout Toolbar display is enabled.

The Layout Toolbar gives quick access to the Align, Space Evenly, Make Same Size, Center, and Order menu items on RTMC's Component menu. Icons on the Layout Toolbar will only be enabled when their functions are currently applicable based on whether no components are

currently selected, one component is currently selected, or multiple components are currently selected.

7.3.6 View | Show Tabs

When selected, tabs are displayed at the top of the RTMC workspace to allow the user to switch between screens. By default, tabs are shown when RTMC is first opened. When tabs are not shown, you can switch between screens by selecting a screen from the Project Tree.

7.3.7 View | Show Standard Toolbar

When selected, the Standard Toolbar is displayed at the top of the RTMC screen. By default, the Standard Toolbar display is enabled.

7.3.8 View | Show Status Bar

When selected, the Status bar is displayed at the bottom of the Workspace. The workspace size is shown on the Status bar, along with a hint line and the name of the server to which RTMC is connected. By default, the Status Bar display is enabled.

7.3.9 View | Show Grid

When selected, a grid is displayed for the workspace background, to help align components on the screen. By default, the grid is not enabled when RTMC is first opened.

7.4 Project Menu

Project Menu options work with the whole project or workspace.

7.4.1 Project | Configure Workspace

The workspace size, in pixels, is listed at the bottom of the Workspace on the hint line. The Workspace Configuration dialogue box can be brought up by double-clicking on the workspace size or choosing the Project | Configure Workspace menu item. From this Workspace Configuration dialogue box, size options for both the development Workspace and the Run-time screen can be set:

Development Sizing Options

Size - Choose a size from the drop-down list for the development Workspace. If you choose Custom, you will be asked to specify the Width and Height in Millimetres, Inches, or Pixels

Orientation - Select Portrait or Landscape orientation.

Run-time Options

Auto Size - The size of an RTMC screen is set automatically by dragging the boundaries of the RTMC screen to a new size. The components will resize to match the new screen size. The aspect ratios of the components will be maintained, only if **Lock Aspect Ratio** is selected.

Fixed Size - The screen size is fixed. It is determined by the size set in the development mode.

> Note: When snapshots are configured (see Project | Configure Snapshot & FTP (p. 27)), the snapshot images will be the same size that they are when viewed in RTMC Run-time. Therefore, if the Run-time window is not set to Fixed Size, the snapshot images that are output will be a different size whenever the Run-time window is resized.

7.4.2 Project | Manage Data Sources

When RTMC is run from LoggerNet, this option opens the Manage Data Sources (p. 36) dialogue box that allows the user to specify additional LoggerNet server(s, data file(s, LNDB database(s, HTTP dataloggers, and/or virtual data sources to be used as data sources in RTMC. Each LoggerNet server, data file, LNDB database, HTTP datalogger, and virtual data source specified will be added to the Data Source Browser that is used to select data for RTMC components.

When run from RTDAQ, RTMC does not allow you to specify additional servers, data files, LNDB databases, HTTP dataloggers, or virtual data sources as data sources. The only data source is LocalHost. Therefore, the Project | Manage Data Sources option opens the Server Data Source Properties (p. 37 box.

7.4.3 Project | Configure Alarm Log

This option opens a dialogue box that allows an alarm log to be configured for all alarms that are generated. Options include enabling alarm logging, log directory, base file name, number of alarm log files kept, size of alarm log files, and whether a text entry is required for alarm acknowledgement.

The alarm log will be an XML document. See Alarm Log Structure for more information about the XML structure of the alarm log.

7.4.4 Project | Configure Auto Tabbing

When multiple screens have been set up in RTMC, this option will enable automatic switching from tab to tab in run-time mode, based on a defined interval (in seconds. If a screen is interacted with, a button appears below the menu ( ) that can be used to resume tabbing.

7.4.5 Project | Configure Snapshot & FTP

This option opens a dialogue box that allows the configuration of a snapshot. A snapshot is a *.png file of the current RTMC state. It can be configured to include selected screens or only selected components. For a snapshot of selected screens, a file will be saved for each screen with a default filename of screenname.png. For a snapshot of only select components, a file will be saved for each component with a default filename of screenname.componentname.png. A snapshot will be saved to the designated directory at the specified interval. It can also be transferred to a designated FTP address. Only the most current snapshot will be kept. It will be overwritten each time a new snap shot is saved.

> Note: The snapshot images will be the same size that they are when viewed in RTMC Run-time. Therefore, if the Run-time window is not set to Fixed Size (see Project | Configure Workspace (p. 25) for Run-time sizing options), the snapshot images that are output will be a different size whenever the Run-time window is resized.

> Note: FTP log files are stored in *<working directory>*\Logs (by default, C:\CampbellSci\RTMC\Logs). FTP.log provides an ongoing summary of all FTP transactions. When it reaches 1 MB, it will be renamed to FTP.log.bk and a new log file will be started. FTPLastTx.log provides more detailed information on the most recent FTP transaction. It is overwritten each time there is a new FTP transaction.

7.4.6 Project | Configure Override Scheduled Collection

RTMC displays data from LoggerNet's binary data cache. By default, the data cache is updated only during scheduled or manual data collection in LoggerNet. However, the Configure Override Scheduled Collection menu item can be used to add to the data collection that is being done by LoggerNet. This will not change the scheduled collection set up in LoggerNet. It will cause additional collection to occur at the specified interval. This can be useful if you wish to display data values that are not being collected by LoggerNet or if you wish to display data at a faster rate than it is being collected by LoggerNet.

Devices

Lists the stations in the network map. Click on a station to modify its Settings. A green check mark by a station name indicates that scheduled collection is currently overridden. A red X by a station name indicates that scheduled collection is not currently overridden.

Settings

Enable Scheduled Collection Override

Select the check box to enable scheduled collection override. Clear the check box to disable scheduled collection override.

In LoggerNet, this data collection will not change the scheduled collection specified in LoggerNet's Setup window. It will cause additional collection to occur at the specified interval. It will collect the station's tables with data values that are being displayed by components in the RTMC project.

In RTDAQ, this will override RTDAQ's automatic one second polling to update the project data.

Collection Interval

Sets the interval at which data will be collected for the selected station. Use the arrows to the right of the field to increase or decrease the value, or type in a number directly. Then use the drop-down menu to choose Milliseconds, Seconds, Minutes, Hours or Days.

This field is enabled only when the Enable Scheduled Collection Override check box is selected.

7.4.7 Project | Configure Email Profiles

This options opens the Email Profile Setup dialogue box. Email profiles allow you to easily use the same SMTP Server, Username, Password, From, To, CC, and BCC fields for multiple components. Alternately, you can select to use Campbell Scientific's Email Relay service to send the email. This Email Relay service requires access to public internet and DNS. Once an email profile has been set up, you simply select the name of the desired profile in the **Profile** field of each component's **Email Setup** dialogue box.

If a project is set up in RTMC Pro to send emails for alarms and/or reports, the email profiles can be edited from RTMC Run-time. This is done from RTMC Run-time's **Edit | Email Profile** menu item. Select **Globally Change All** to set all alarms and reports in the project to use a certain email profile. Select **Edit Profiles** to manually change individual profiles. Select **Restore Defaults** to go back to the default email profiles defined in the project file. Note that all email profile changes made in RTMC Run-time are temporary. They will not persist, once RTMC Run-time is closed and opened again.

7.4.8 Project | Load as Template

The Load as Template menu item enables you to easily use the same project for multiple stations.

When a project designated as "Load as Template" is loaded in RTMC-RT the following dialogue box will appear:
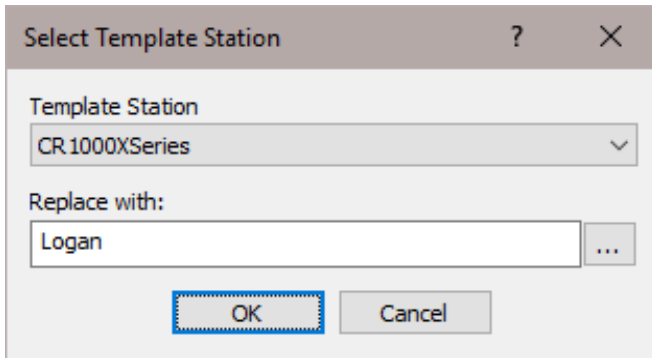
The **Template Station** drop-down list will contain all of the stations used in your template project. After selecting a station from the drop-down list, you can open the Data Source Browser by pressing the button to the right of the **Replace with** field. From the Data Source Browser, you can select a station to replace the template station. Each reference to the template station in the project will be replaced by the designated station.

A check mark appears beside this item, when it is enabled. Select the menu item to toggle the check mark off or on.

> Note: Load as Template cannot be used with CSI Web Server.

7.4.9 Project | Add New Screen

Adds a new display screen to the open project.

7.4.10 Project | Change Screen Order

Allows you to change the order in which the tabbed screens appear in the Project Tree and on the tabs in development mode and on the tabs in run-time mode.

7.5 Screen Menu

Screen Menu options work with the tabbed screens in the project. The Screen Menu is also available by right clicking any blank area of the workspace.

7.5.1 Screen Properties

Screen Name

Specifies the screen name that will be used on the screen tab and in the project tree.

Colour Theme

Determines whether the screen will use a light or dark theme.

> Note: Choosing a colour theme will automatically set all the screen properties. If changes are then made to these properties, the Colour Theme drop down will change to a blank name indicating that the properties have been customized.

7.5.1.1 Screen Background

7.5.1.2 Background Colour

Displays a list of colours from which to select a colour to be used for the screen background.

Background Image

Show Image

Determines whether a background image is visible for the screen. Check the box to make the background image visible. If the box is not checked, the background image will not be visible.

Image

Lists the name of the image that will be used for the background. The image is selected by pressing the browse button to the right of the field or by typing in a new file name directly. Valid image types are GIF, BMP, JPG, PNG, and TIF.

RTMC comes with a library of images. If you have created custom images that you want to use, copy them into C:\Campbellsci\Lib\RTMCMediaLib directory.

Position

Select Center, Tile, or Stretch:

Center - The original image size is maintained. The image is centered on the screen.

Tile – The original image size is maintained. It is repeated both vertically and horizontally to fill the screen.

Stretch – The original image is stretched both vertically and horizontally to fill the screen. The aspect ratio is not necessarily maintained.

Component Backgrounds

Default Component Backgrounds

Displays a dialogue box from which you can select the background colour (solid colour, gradient, or transparent), border, and edge.

Text

Sets the default text properties for all components.

Colour

Sets the colour that will be used for the text. Press the browse button next to the field to select a colour.

Size

Sets the size that will be used for the text.

Font

Displays a dialogue box from which you can select the font type, style, size, effects and colour to be used for the data value.

Apply different font for units

Select this check box to set a different font for units using **Units Colour**, **Size**, and the **Unit Font** button. Clear this check box to use the same font for the data values and units.

Apply to All Screens

Applies the specified screen properties to all screens.

7.5.2 Screen | Delete Screen

Removes the active screen from the open project.

> Note: All functions available from the Screen menu can also be accessed by right-clicking any blank area of the workspace.

7.5.3 Screen | Rename Screen

Highlights the active screen name and prepares it for editing.

> Note: All functions available from the Screen menu can also be accessed by right-clicking any blank area of the workspace.

7.5.4 Screen | Duplicate Screen

Creates a duplicate of the active screen. Once the duplicate screen is created, it can be modified as needed. This allows you to easily create multiple similar screens, for example, screens that display the same information for different stations.

> Note: All functions available from the Screen menu can also be accessed by right-clicking any blank area of the workspace.

7.5.5 Screen | Paste

Places a copy of the Windows clipboard content on the active screen. (Note that only valid XML code can be pasted into RTMC.)

> Note: All functions available from the Screen menu can also be accessed by right-clicking any blank area of the workspace.

7.5.6 Screen | Insert New

Provides a drop-down list of components that can be added to the screen.

> Note: All functions available from the Screen menu can also be accessed by right-clicking any blank area of the workspace.

7.6 Component Menu

The Component Menu is used to set the component properties, placement and alignment. The Component Menu is also available by right clicking any of the components in the workspace. Many of the Component Menu's items (Align, Space Evenly, Make Same Width, Center, and Order are also available from the Layout Toolbar.

7.6.1 Component | Properties

Opens the Properties dialogue box for the selected component.

7.6.2 Component | Hover Caption

Allows you to enter a caption that will be displayed when the mouse hovers over the component in Run-time mode.

7.6.3 Component | Delete Selection

Removes the highlighted component from the Workspace.

7.6.4 Component | Lock Aspect Ratio

The aspect ratio of a component is the ratio of its width to its height. When this menu item is selected, the aspect ratio of the highlighted component is locked. If the width (or height of the component is changed, the height (or width will automatically be changed to keep the aspect ratio constant. The lock on the aspect ratio can be temporarily overridden by holding down the Ctrl key, while dragging the boundaries of a component to resize it.

When enabled, a check mark appears beside this item in the Component menu. Select the menu item to toggle the check mark off or on. By default, Lock Aspect Ratio is off for all components.

7.6.5 Component | Rename Component

Highlights the selected component name and prepares it for editing. If snapshots are configured, renaming a component will affect the snapshot name.

7.6.6 Component | Manual Resize

Allows the user to set the size and position of the selected component. Use the **X** and **Y** spin boxes to set the position of the component on the screen. Use the **W** and **H** spin boxes to set the width and height of the component. Use the **Angle** spin box to set the rotation of the component.

7.6.7 Component | Cut

Removes the selected component from the screen and places a copy on the Windows clipboard.

7.6.8 Component | Copy

Places a copy of the selected component on the Windows clipboard.

7.6.9 Component | Paste

Places a copy of the Windows clipboard content on the active screen. (Note that only valid XML code can be pasted into RTMC.)

7.6.10 Component | Align

Allows you to align two or more components on a screen. Select each component by holding the **Ctrl** key and clicking the components with the primary mouse button, and then choose one of the alignment options from the menu. (Alternately, you may select components by clicking on their names in the Project Tree with the **Ctrl** key held down or by using the mouse to click and drag a box around the desired components.) The last component selected will be the basis on which the other components are aligned. The last component selected will be identified by the dark blue handles and by dark blue highlighting in the Project Tree. The other selected components have handles with blue outlines and are highlighted in light blue in the Project Tree.

Lefts - The left border of all selected components will be aligned.

Centers - All selected components are positioned vertically, with their centers aligned.

Rights - The right border of all selected components will be aligned.

Tops - The upper border of all selected components will be aligned.

Bottoms - The bottom border of all selected components will be aligned.

Middles - All selected components are positioned horizontally, with their centers aligned.

Note that these functions are also available from the Layout Toolbar.

7.6.11 Component | Space Evenly

Used to adjust the spacing of three or more components. Select each component by holding the **Ctrl** key and clicking the components with the primary mouse button, and then choose one of the spacing options from the menu. (Alternately, you may select components by clicking on their names in the Project Tree with the **Ctrl** key held down or by using the mouse to click and drag a box around the desired components.) **Across** will space the components horizontally across the page using the left-most and right-most components as the left and right boundaries for the spacing. **Down** will space the components vertically down the page, using the top-most and the bottom-most components as the top and bottom boundaries for the spacing.

Note that these functions are also available from the Layout Toolbar.

7.6.12 Component | Make Same Size

Allows you to set two or more components to the same height, width, or both. Select each component by holding the **Ctrl** key and clicking the component with the primary mouse button, and then choose one of the options from the menu. (Alternately, you may select components by clicking on their names in the Project Tree with the **Ctrl** key held down or by using the mouse to click and drag a box around the desired components.) The last component selected will be the basis on which the other components are sized. The last component selected will be identified by the dark blue handles and by dark blue highlighting in the Project Tree. The other selected components have handles with blue outlines and are highlighted in light blue in the Project Tree.

Note that these functions are also available from the Layout Toolbar.

7.6.13 Component | Center

Used to center one or more components on the page. **Vertical** will center the component(s) vertically on the page. **Horizontal** will center the component(s) horizontally on the page.

Note that these functions are also available from the Layout Toolbar.

7.6.14 Component | Order

Allows you to choose the order in which the components appear on the display (often referred to as the Z order). Select a component and choose to send it to the back, send backward (one step),

bring forward (one step, or bring it to the front of all other components. This order is important when layering transparent components.

Note that these functions are also available from the Layout Toolbar.

7.6.15 Component | Group Selection

Allows you to group components together. They can then be moved, copied, ordered, etc. as a single object. Select the components to be grouped by holding the **Ctrl** key and clicking the components with the primary mouse button. Then choose the Group Selection item from the Component menu or the Component right-click menu. You must have at least two components selected for this menu item to be enabled.

When a component group is selected, the Ungroup Selection menu item will be enabled. You can undo the component grouping by selecting this menu item.

When components are grouped, the properties for each of the components will show up in the submenu displayed when Properties is selected from the Component menu or the Component right-click menu. These menu items can be used to modify the properties for each component.

7.7 Window Menu

If there are multiple screens in the project, the Window menu will allow you to change between the screens using the menu.

7.8 Help Menu

7.8.1 Help | RTMC Development Help

This menu item provides access to help for all of the features of RTMC.

7.8.2 Help | Keyboard Map

This menu item opens the Keyboard Map dialogue box from which you can print RTMC's keyboard shortcuts or copy them to the Windows clipboard.

8. Manage Data Sources

This dialogue box is opened from the Project | Manage Data Sources menu item. It allows the user to specify communications server(s), data file(s), LNDB database(s), HTTP dataloggers, and/or virtual data sources to be used as data sources in RTMC. Each communications server, data file, LNDB database, HTTP datalogger, and virtual data source specified will be added to the Data Source Browser that is used to select data for RTMC components.

To add a communications server press the **Add** button and select **Add Server Data Source**. The Server Data Source Properties (p. 37 will open requiring you to specify the name that will be used for the communications server, the server address, the username, and password.

To add a data file press the **Add** button and select **Add File Data Source**. The File Data Source Properties (p. 38 will open which allows you to set the name that will be used for the data file in the Data Source Browser, the data file and label file to be used, how often the data file will be queried for new data, and how much data will be brought in when the data file is initially queried by RTMC.

To add an LNDB database press the **Add** button and select **Add Database Source**. The Database Data Source Properties (p. 40 will open which allows you to set the name that will be used for the database in the Data Source Browser, the type and name of the database to be used, and how often the database will be queried for new data.

To add an HTTP datalogger press the **Add** button and select **Add HTTP Datalogger Sourc**e. The HTTP Datalogger Source Properties (p. 46 will open which allows you to set the name that will be used for the HTTP datalogger in the Data Source Browser, the web address, username and password of the HTTP datalogger to be used, and how often the HTTP datalogger will be queried for new data.

To add a virtual datalogger source press the **Add** button and select **Add Virtual Data Source**. The Virtual Data Source Properties (p. 47 will open which allows you to set up "scratch" variables to use in your project that are not stored in one of your other data sources. This is especially useful if you have only database and/or data file data sources in your project, but you need a place to write variables to be used in your project. (In server data sources and HTTP datalogger data sources, you can accomplish the same thing by writing to values in the Public table.

A data source can be removed by selecting it and then pressing the **Remove** button. The **Edit** button can be used to bring up the Data Source Properties dialogue box and make modifications. Note that if you change the name of a communications server, the change will be made to all references to that server in the project.

If a project contains only one data source, the status bar at the bottom right of the RTMC window will indicate the data source and connection state (connected or disconnected. If a project contains multiple data sources, the Status Bar will say **Data Source Status**. The background will be green if RTMC is able to connect to all of the data sources and red if there is a problem with at least one of the data sources. Double-clicking on **Data Source Status** will bring up the Manage Data Sources dialogue box. The data source(s) to which RTMC is having trouble connecting will be indicated with a red X as shown below. You can select the data source from the list, press the **Edit** button, and modify the settings so that RTMC is able to connect to the data source.
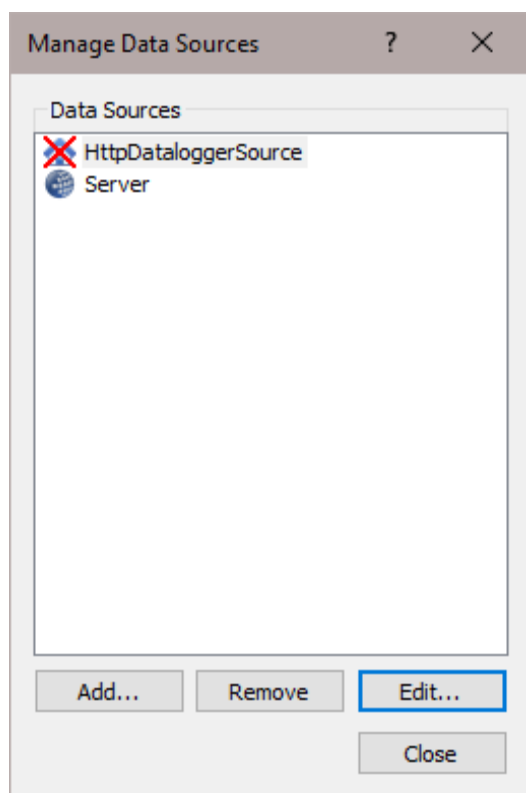
Note: When run from RTDAQ, RTMC does not allow you to specify additional servers, data files, LNDB databases, HTTP dataloggers, or virtual data sources as data sources. The only data source is LocalHost.

8.1 Server Data Source Properties

Source Name

Designates the name that will be used for the communications server in the Data Source Browser and on the status bar.

Server Address

This is the hostname or TCP/IP address of the computer running the communications server. This must be the valid name of an existing computer or a TCP/IP address in the form XXX.XXX.XXX.XXX for an IPv4 address or [XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX] for an IPv6 address. If the communications server resides on the same computer as RTMC, you can simply type in LocalHost for the server address. By default, LoggerNet's port number is 6789. If this default port number is used, it does not need to be specified in RTMC Pro. Otherwise, it is specified after Server Address, separated by a colon. An example would be 192.168.4.32:3000, where 3000 is LoggerNet's port number.

Username

 Your username on the communications server.

Password

Your password for the communications server.

The **Username** and **Password** fields are required only if your server administrator has enabled security on your system.

You can save the login information by selecting the **Remember username and password** check box.

> Notes: When running RTMC from RTDAQ, the server connection is always to LocalHost. You cannot change the server address.

> If LoggerNet Security is enabled and your project will be published to the Web using CSI Web Server, you must select the Remember username and password checkbox. You will not be prompted for the LoggerNet Security password when viewing your project from the web. Therefore, if the username and password have not been saved with the project, you will not be able to perform any functions that require the username and password.

8.2 File Data Source Properties

Source Name

Designates the name that will be used for the data file in the Data Source Browser. By default, the filename is used.

Data File

The data file to be used. Type in the name directly or press the button to the right of the field to browse to the data file.

The following data file formats are supported in RTMC:

ASCII Table Data, Short Header (TOACl1

ASCII Table Data, Long Header (TOA5

ASCII Mixed Array, Comma Separated (requires FSL or DLD file

Binary Table Data (TOB1

Binary Table Data, PC Card (TOB2

Binary Table Data, PC Card (TOB3

CSIXML Data File

The following data file formats are not supported in RTMC:

ASCII Table Data, No Header

ASCII Mixed Array, Printable

Binary Mixed Array

Label File

This field is used only for data files from array-based dataloggers. The label file (*.FSL or *.DLD to be used to provide labels for the data values. (The *.FSL and *.DLD files are created when a datalogger program is compiled in Edlog or ShortCut. Type in the name directly or press the button to the right of the field to browse to the label file. If a label file is not specified, the data source will be shown with a red X in the Manage Data Sources dialogue box. A label file must be specified to correct the problem.

Query Interval

Specifies how often RTMC will query the data file for new data. Use the arrows or type in a number directly and then choose Milliseconds, Seconds, Minutes, Hours, or Days from the drop-down list.

Back Fill Entire File

When this box is selected, the entire data file will be brought in when initially queried by RTMC. When this box is not selected, the amount of data to be brought in is specified in the **Back Fill Offset** field.

Back Fill Offset

Indicates how much data, in KB, will be brought in when the data file is initially queried by RTMC.

8.3 Database Data Source Properties

The Database Data Source Properties dialogue box comes up when adding a database source from the Project | Manage Data Sources dialogue box. This dialogue box is used to set up the database source for your project.

> Note: RTMC Pro requires the database metadata provided by LNDB. Therefore, RTMC Pro only supports databases created using LNDB

Source Name

Designates the name that will be used for the database in the Data Source Browser.

Type

The type of database. Choose a type from the drop-down list.

The following database types are supported in RTMC:

- SQL Server Compact
- SQL Server
- MySQL
- PostgreSQL
- Oracle

Query Interval

Specifies how often RTMC will query the database for new data. Use the arrows or type in a number directly and then choose Milliseconds, Seconds, Minutes, Hours, or Days from the drop-down list.

The remaining information changes depending on the database type as described below:

SQL Server Compact

The only additional information needed for a SQL Server Compact database source is the database file to be used. Type in the name directly or press the button to the right of the field to browse to the database file.

SQL Server
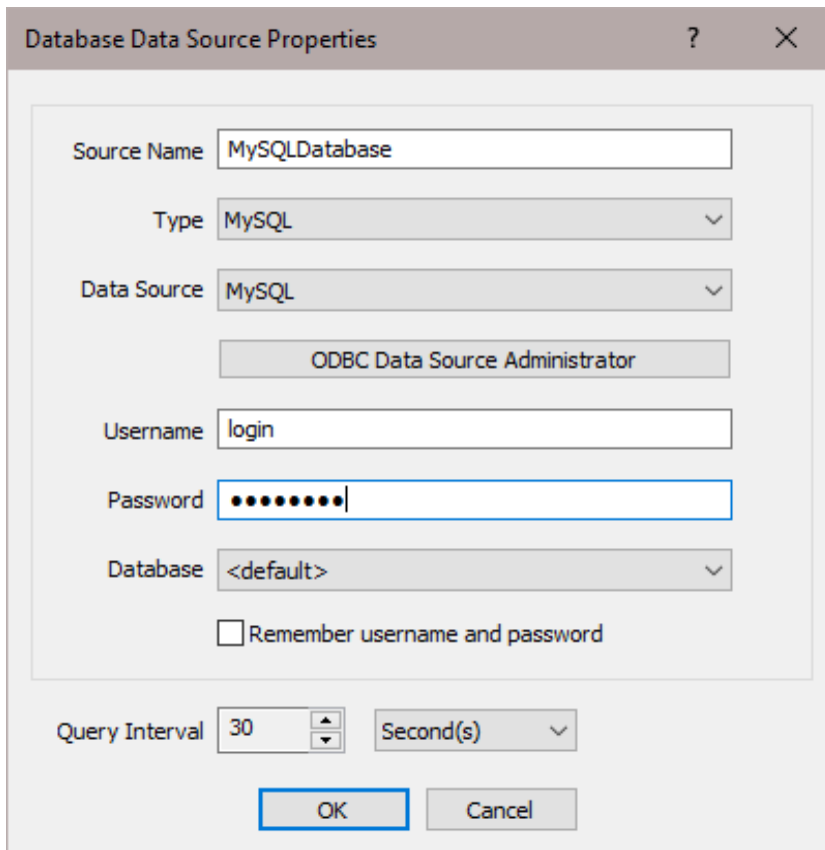
To select a SQL Server database source you must select a SQL Server instance. The list of published SQL Server instances is shown in the **Data Source** combo box. You can also type into the Data Source combo box, because the desired server might not be published. Windows Authentication or SQL Server Authentication can be selected. Windows Authentication does not require a username and password, but rather uses Windows user accounts to authenticate valid users. SQL Server Authentication requires a login ID and Password and is independent of Windows user accounts. You can select the <default> database or select a specific database from the **Database** combo box.

The **Remember username and password** checkbox can be selected to save the username and password. If this check box is not selected and you are using SQL Server Authentication, you will be required to enter the username and password each time a project is opened that uses this database source.

Notes: If you are using Windows Authentication and your project will be published to the Web using CSI Web Server, you will need to run the CSI Web Server under a Windows user account that has rights to access the database. This can be done from the Windows Control Panel | Administrative Tools | Services. Right-click on the CSI Web Server item in the list and select Properties. On the Log On tab, select This account and enter an account (domain\user) and password for a user with rights to access the database.

If you are using SQL Server Authentication and your project will be published to the Web using CSI Web Server, you must select the **Remember username and password** checkbox. You will not be prompted for the SQL Server username and password when viewing your project from the web. Therefore, if the username and password have not been saved with the project, you will not be able to perform any functions that require the username and password.

MySQL
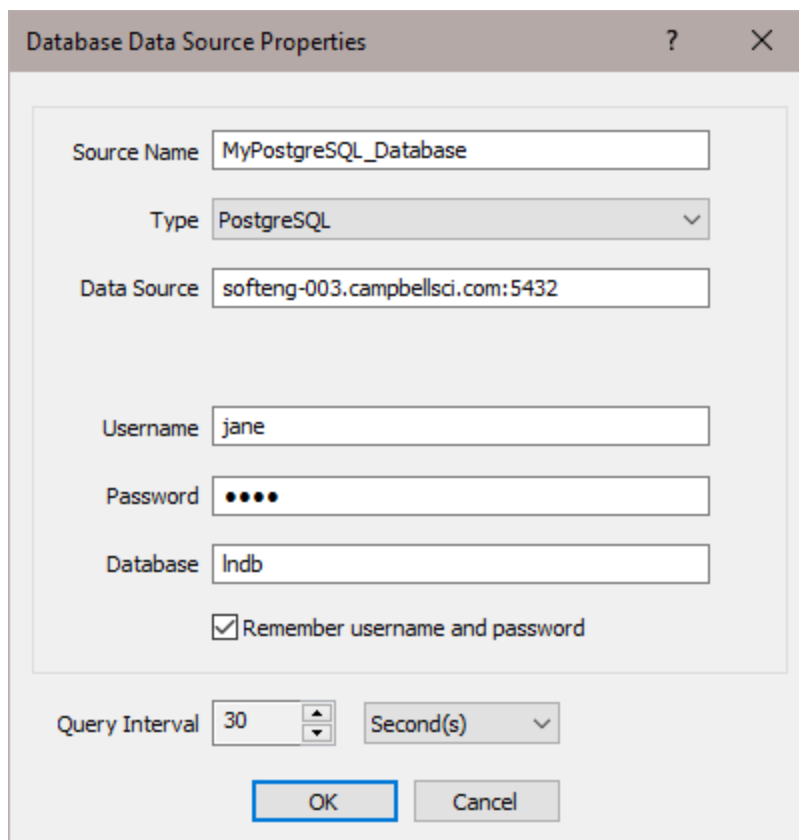
The MySQL connection is an ODBC connection. You must use the Windows ODBC Data Source Administrator to configure the database connection. Currently only system data sources are supported and show in the **Data Source** combo box. The **Username** and **Password** may be

optional. They will be set to blank in the connection string. It has been found that when set to blank, the login id and password configured in the ODBC Data Source Administrator are used. You can select the <default> database (default as configured in the data source) or select a different database.

The **Remember username and password** checkbox can be selected to save the username and password. If this check box is not selected and the username and password were not configured in the ODBC Data Source Administrator, you will be required to enter the username and password each time a project is opened that uses this database source.

> Note: If your project will be published to the Web using CSI Web Server, you must select the **Remember username and password** checkbox. You will not be prompted for the username and password when viewing your project from the web. Therefore, if the username and password have not been saved with the project, you will not be able to perform any functions that require the username and password.

PostgreSQL
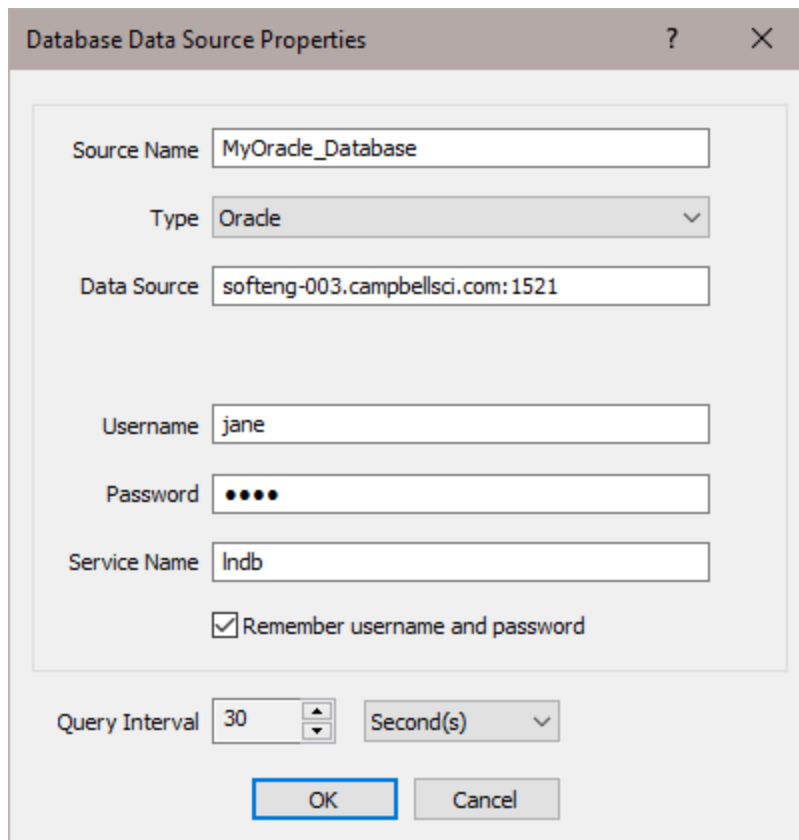
To configure a connection to a PostgreSQL database you must enter a **Data Source** (hostname:port), **Username**, **Password**, and **Database**. The default port for PostgreSQL is 5432.

The **Remember username and password** checkbox can be selected to save the username and password. If this check box is not selected, you will be required to enter the username and password each time a project is opened that uses this database source.

> Note: If your project will be published to the Web using CSI Web Server, you must select the **Remember username and password** checkbox. You will not be prompted for the username and password when viewing your project from the web. Therefore, if the username and password have not been saved with the project, you will not be able to perform any functions that require the username and password.

Oracle

To configure a connection to an Oracle database you must enter a **Data Source** (hostname:port), **Username**, **Password**, and **Service Name**. Note that the hostname must be a server name or IP. address; localhost cannot be used. The default port for Oracle is 1521.

The **Remember username and password checkbox** can be selected to save the username and password. If this check box is not selected, you will be required to enter the username and password each time a project is opened that uses this database source.

Note: If your project will be published to the Web using CSI Web Server, you must select the **Remember username and password** checkbox. You will not be prompted for the username and password when viewing your project from the web. Therefore, if the username and password have not been saved with the project, you will not be able to perform any functions that require the username and password.

8.4 HTTP Datalogger Source Properties

The HTTP Datalogger Source Properties dialogue box comes up when adding an HTTP datalogger source from the Project | Manage Data Sources dialogue box. This dialogue box is used to set up the HTTP datalogger source for your project.

Source Name

Designates the name that will be used for the HTTP datalogger in the Data Source Browser.

Datalogger Web Address

Specifies the IP address of the HTTP datalogger. The address can be a domain name or IP address in the form XXX.XXX.XXX.XXX for an IPv4 address or [XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX] for an IPv6 address. If you are using a port other than the default port (80 for http, 443 for https, you need to specify it using a colon followed by the port. For example, campbellsci.com:8080, 192.168.1.1:1234, or [2620:24:8080:8600:85a1:fcf2:2172:11bf]:8080.

Notes: If the datalogger has only HTTPS enabled with HTTP disabled, it must be specified by adding https:// in front of the IP address.

CR1000/CR3000/CR800 series dataloggers require OS 28 or later to support IPv6 addresses.

Datalogger Web Username

This is the username that should be used when accessing the HTTP datalogger.

Note: Usernames and passwords are controlled by the .csipasswd file on the datalogger. Device Configuration Utility (DevConfig) must be used to create a .csipasswd file for a datalogger. The .csipasswd file is created by connecting to the datalogger in DevConfig and then pressing the **Edit .csipasswd File** button on the **Net Services** tab.

Datalogger Web Password

This is the password for the specified username.

Query Interval

Specifies how often RTMC will query the HTTP datalogger for new data. Use the arrows or type in a number directly and then choose Milliseconds, Seconds, Minutes, Hours, or Days from the drop-down list.

8.5 Virtual Data Source Properties

The Virtual Data Source Properties dialogue box comes up when adding a virtual data source from the Project | Manage Data Sources dialogue box. This dialogue box is used to set up a virtual data source for your project. The virtual data source lets you create a custom table that you can read from and write to. This is especially useful if you have only database and/or data file data sources in your project, but you need a place to write variables to be used in your project. (In server data sources and HTTP datalogger data sources, you can accomplish the same thing by writing to values in the Public table.) The virtual data source table you create is a single record table much like the Public table. It does not store historic data.

> Note: The state of virtual variables is saved between RTMC Run-time sessions. The state of virtual variables is also saved between sessions, when viewing your project using CSI Web Server. The state of virtual variables is tracked separately for RTMC Run-time and for CSI Web Server (i.e., a change made to a virtual variable in RTMC Run-time will not affect the value of the variable in CSI Web Server).

Source Name

Designates the name that will be used for the virtual data source in the Data Source Browser and on the status bar.

Output Interval

Specifies how often the virtual data source will report a new record. The virtual data source will stay on an even interval. When a virtual data source value is set by RTMC, a new record will also be generated. Therefore, if you have an output interval of 1 minute, you will get records at 12:00:00, 12:01:00, 12:02:00, etc. However, if you then set a value at 12:02:37, you will have records at 12:00:00, 12:01:00, 12:02:00, 12:02:37, 12:03:00, 12:04:00, etc.

Column Name

Clicking on an empty cell in the column name list will allow you to add new columns. You can also add a new column by pressing the '+' button at the bottom of the dialogue box. To delete a

column, select the column and then press the '-' button at the bottom of the dialogue box. Each column represents a value in each record generated by the virtual data source.

Default Value

Each column defaults to a value of 0. You can also initialize the column value to be a fixed value (e.g., 1234, a string (e.g., $"This is a string", a predefined constant (e.g., PI, or a simple expression that does not use variables (e.g., EXP(5.

Examples

See the online help for examples of using a virtual data source to set an alarm threshold at run-time, set a multiplier and offset at run-time, and select which values to plot at run-time.

9. Reports in RTMC

RTMC supports report generation. In order to designate a screen in your RTMC project as a report, you must place a Report Range component on it. The Report Range component lets you configure the data that will be displayed in the report. It also gives you RTMC Run-time options for stepping through data as described below. Once you place the Report Range component and specify the range of data for your report, you can start placing the display components you want in the report.

When you have finished designing your report, you need to specify how you want to export it. The Report Export component lets you configure how the report screen will be exported. You can choose to have the report exported by running a batch file and/or on demand from RTMC Run-time. For both batch export and RTMC Run-time, you can choose from a variety of file formats in which to export the report. You can also select events (Email, FTP, Print) to be triggered when the report is exported. In a batch export, all of the selected file formats will be exported and all of the selected events will be triggered when the batch export is executed as described below. In RTMC Run-time, all of the selected file formats and events will be available by clicking on the Report Export component.

Once you have your report range defined and export options set up, you are ready to run your report. If batch exporting is enabled, you will need to set up a batch file or scheduled task that runs the project. In the LoggerNet Task Master, you can set up a scheduled task to execute the file C:\Program Files (x86)\Campbellsci\RTMC\RTMC_Run-time.exe with the command line option --run_report="C:\Campbellsci\RTMC\YourProjectFile.rtmc2". When this task is run, YourProjectFile.rtmc2 will be loaded into RTMC Run-time in the background. Any report screens set up for batch export will collect data and the report will be exported in the specified format(s). For an explanation of the data that will be contained in the report based on the report interval and the time the report is run, see Report Ranges.

An example of setting up a report task in the LoggerNet Task Master is shown below:
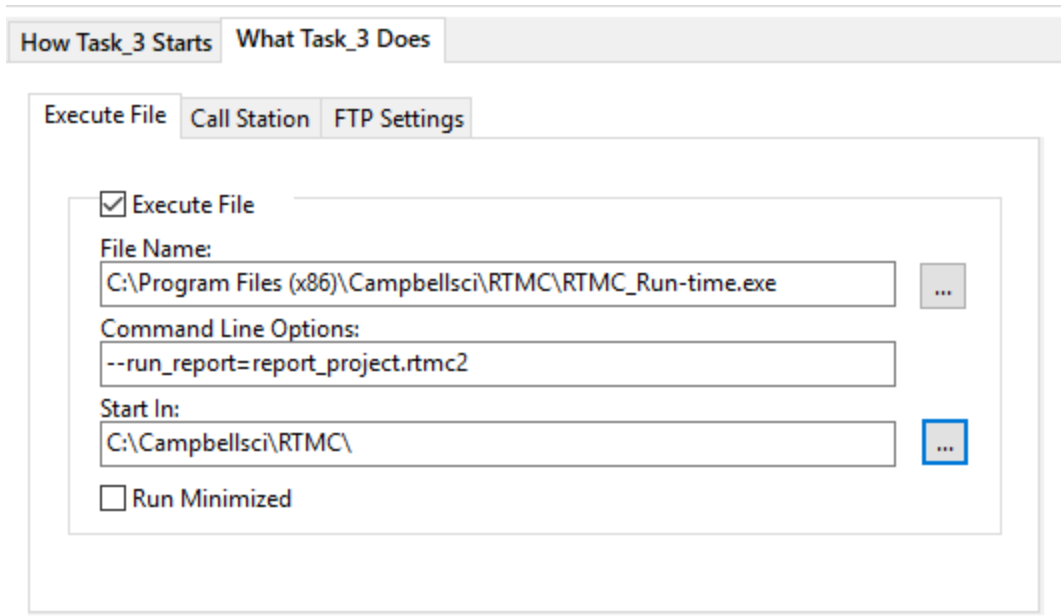
Below is an example of running the same report from a command line:

"C:\Program Files (x86)\Campbellsci\RTMC\RTMC_Run-time.exe" --run_report="C:\CampbellSci\RTMC\report_project.rtmc2"

In addition to setting the range of your report, the Report Range component also has run-time options for interactive reports. There is a **Jump** button () that will allow you to jump to a specific begin date, end date, or custom range. There are also **Step Forward** () and **Step Backward** () buttons that allow you to step through the data. The step size is determined by the interval specified in the Report Range component. The **Play** button () automatically advances through the report. It is similar to repeatedly pressing the **Step Forward** button. The **Live** () button is also available to jump to the current interval. For an explanation of the data that will be displayed by the **Live**, **Step Forward** and **Step Backward** buttons based on the report interval and the current PC time, see Report Ranges. Note that much of this run-time functionality can be enabled/disabled in the RTMC Range component in RTMC Pro.

There are two additional report components in RTMC: the Report Note and the Report Header. The Report Note component allows the user to insert custom notes at run-time before the report is exported. Notes are temporary and are lost when the report is closed. The Report Header component displays the report range. The user can customize the dates shown and the format used. In RTMC Run-time, the header updates as the report range changes. (Note that if you choose to display the header in the Report Range component, a Report Header component may be unnecessary.)

RTMC projects can mix real-time and reporting screens. For example, you can have a real-time data screen, a daily report screen, a monthly report screen, and a real-time control screen all in the same project. The Report Range component on a screen only affects the data being displayed on that screen. Your real-time screens (i.e. those without a Report Range component) won't be affected by stepping through historic data on a report screen.

See RTMC Pro's online help for an example of a report.

> Notes: When viewing a report in RTMC Run-time, some components behave differently than on a normal RTMC screen. If you are looking at historical data, alarms cannot be acknowledged and you will not be able to toggle variables or set values with sliders or set points. These functions can only be performed when you are viewing data in the current interval. Also, alarm events (i.e., audio, run/open, send email) are always disabled on a report screen.

> When viewing a report using the CSI Web Server, all report components will function as described above, except for the Report Export component. You will only be able to export PNG files, and export events (Email, FTP, Print) are not supported.

10. Expressions

Components that display data values either numerically or graphically can be processed using expressions. These expressions can include simple mathematical expressions, functions to manipulate strings, or more complex functions that deal with the state of a data value over time.

For instance, a temperature reading in degrees Celsius can be processed to display in degrees Fahrenheit using a simple mathematical expression. This is done by first selecting the data value in the **Select Data** field, and then entering the mathematical expression after the defined data value. Using the above example, if the data value is defined as "Server:CR5000.TempData.Temp1" ("*Source:datalogger.table.variable*"), you would enter

"Server:CR5000.TempData.Temp1" * 1.8 + 32

to convert the temperature reading from degrees Celsius to degrees Fahrenheit.

Instead of typing the expression directly into the **Select Data** field, you can press ⬜ next to that field to bring up the Expression Builder (p. 62).

Strings

As shown above, double quotes are used in RTMC to enclose the name of a data value (or source, datalogger, or table depending on the component). Therefore, when defining a literal string, a dollar sign is used as a prefix. This indicates to RTMC that you are defining a literal string rather than a data value. For example, to search for the position of the sequence abc in the data value mystring, you would use the following expression:

InStr(1, "Server:CR1000.hourly.mystring", $"abc")

Statistical Functions and Start Options

Expressions can also use Statistical Functions, some of which involve the state of a data value over a period of time. For instance, you can return the maximum value of a data value over the past 24 hours using the expression:

MaxRunOverTime("Server:CR1000.QtrHour.Temp",Timestamp
("Server:CR1000.QtrHour.Temp"),nsecPerDay)

When RTMC-RT is launched it begins processing with the newest record by default. Therefore, using the above expression, a component will not immediately display the maximum value over the past 24 hours. Rather, it will display the maximum value since RTMC-RT was launched. The 24-hour maximum will only be displayed after it has been running for 24 hours. In order to get a

24 hour maximum immediately, you can use a "Start Option Function" to cause RTMC to begin processing data at an earlier point. For example,

StartRelativeToNewest(nsecPerDay,ordercollected); MaxRunOverTime ("Server:CR1000.QtrHour.Temp",Timestamp("Server:CR1000.QtrHour.Temp"),nsecPerDay)

would begin displaying a 24 hour maximum immediately, provided that the data is available in the communications server's data cache.

Aliases

If a data value is used multiple times in an expression, the expression can be simplified by declaring an alias for the data value at the first of the expression, in the form:

Alias(alias_name, data_value)

For example,

StartAtOffsetFromNewest(5,OrderCollected);IIF(ABS(("Server:CR1000.MyTable.Value"-ValueAtTime("Server:CR1000.MyTable.Value",TimeStamp ("Server:CR1000.MyTable.Value"),30*nsecPerSec,0))>10 AND ABS(ValueAtTime ("Server:CR1000.MyTable.Value",TimeStamp("Server:CR1000.MyTable.Value"),30*nsecPerSec,0)-ValueAtTime("Server:CR1000.MyTable.Value",TimeStamp ("Server:CR1000.MyTable.Value"),60*nsecPerSec,0)))>10,1,0)

can be replaced by:

Alias(X,"Server:CR1000.MyTable.Value");StartAtOffsetFromNewest(5,OrderCollected);IIF((ABS(X-ValueAtTime(X,TimeStamp(X),30*nsecPerSec,0))>10 AND ABS(ValueAtTime(X,TimeStamp (X),30*nsecPerSec,0)-ValueAtTime(X,TimeStamp(X),60*nsecPerSec,0)))>10,1,0)

Synchronizing Variables

The ValueSynch function can be used to synchronize data values coming from multiple data sources so that you can display the results of a calculation on those data values in a single component. The Value Synch function takes the form:

ValueSynch(synchronized_name, data_value)

Where synchronized_name is the name of a new variable that will be used in a calculation at the end of the expression and data_value is the name used within RTMC to access the data value, i.e., *Source:datalogger.table.variable.*

For example, if you wish to display the average air temperature of two stations on a chart, the following expression can be used to synchronize the timestamps of the stations and then calculate the average air temperature:

ValueSynch(air_temp_1,"Server:CR1000_1.SECOND.air_temp");ValueSynch(air_temp_2,"Server:CR1000_2.SECOND.air_temp"); (air_temp_1 + air_temp_2) / 2

Notes: Timestamps are truncated to seconds prior to synchronization. Therefore, synchronizing sub-second data is not recommended as the results will be unpredictable.

If the timestamps of the stations are not the same (for example, if one datalogger is a few minutes behind the other), the component will display the exclamation point indicating no data, until the data sources have common timestamps and, therefore, can be synchronized.

RTMC will buffer up to 100,000 points of a data value while waiting for a common timestamp from the other datalogger(s). Once the buffer reaches 100,000 data points the oldest data value will be removed from the buffer, each time a new data value is collected.

All of the functions available in RTMC are described below. For details on a function, see the online help.

Notes: Spaces must be used to delimit the predefined constants and functions. Operators allow but do not require spaces.

An expression can include data values from multiple dataloggers.

An expression must include a data value from a data source (i.e., LoggerNet server, database, data file, http datalogger, or virtual data source).

10.1 Operators

	Description
( )	Prioritizes an expression
*	Multiply by
/	Divide by
^	Raised to the power of
+	Add
-	Subtract/Unary negation
=	Equal
< >	Not equal
>	Greater than
<	Less than

>=	Greater than or equal to
<=	Less than or equal to

10.2 Order of Precedence

- Anything inside parentheses ( )
- Exponentiation ^
- Negation (unary) -
- Multiplication *, division /
- Modulo (remainder) MOD
- Addition +, subtraction -

When consecutive operators have the same priority, the expression evaluates from left to right. This means that an expression such as **a-b-c** is evaluated as **(a-b)-c**.

10.3 Predefined Constants

The following constants are defined for convenience within numeric expressions:

Constant	Description
e	2.718282
PI	3.141593
True	-1
False	0
NOPLOT	NAN
NAN	NAN (not a number)
INF	INF (non-finite number)

10.4 Predefined Time Constants

These predefined time constants can be useful as a parameter for the Statistical Functions, where the interval parameter must be specified in nanoseconds.

Constant	Description
nsecPerUSec	Number of nanoseconds in a microsecond
nsecPerMSec	Number of nanoseconds in a millisecond

nsecPerSec	Number of nanoseconds in a second
nsecPerMin	Number of nanoseconds in a minute
nsecPerHour	Number of nanoseconds in an hour
nsecPerDay	Number of nanoseconds in a day
nsecPerWeek	Number of nanoseconds in a week

10.5 Predefined Reset Options

These predefined reset options are used as a parameter for the Statistical Functions with a reset parameter.

Constant	Description
RESET_HOURLY	Reset whenever there is a change in the hour in the value's timestamp
RESET_DAILY	Reset whenever there is a change in the day in the value's timestamp
RESET_WEEKLY	Reset whenever the day of the week is less than the day of the week of the newest timestamp stored (Sunday marks the beginning of the week) or when the difference between the current timestamp and the newest timestamp stored exceeds seven days.
RESET_YEARLY	Reset whenever there is a change in the year in the value's timestamp
RESET_CUSTOM	Reset whenever the doReset parameter is set to a non-zero value.

10.6 Math Functions

See the online help for examples of using each of these functions.

Function	Description
ABS	Returns the absolute value of a number.
ACOS	Returns the arc cosine of a number.
ASIN	Returns the arc sine of a number.
ATN	Returns the arc tangent of a number.
ATN2(y,x)	Returns the arctangent of y/x.
CEILING	Rounds a number up to an integer value.
COS	Returns the cosine of a number.
COSH	Returns the hyperbolic cosine of a number.
CSGN	Changes the sign of a number by multiplying by -1.0.

EXP	Returns e raised to a power.
FIX	Returns the integer portion of a number. If the number is a negative, the first negative integer greater than or equal to the number is returned.
FLOOR	Rounds a number down to an integer value.
FRAC	Returns the fraction part of a number.
FormatFloat	Converts a floating point value into a string.
FormatFloatL	Converts a floating point value into a string and applies any rules associated with the locale of the computer running RTMC.
INT	Returns the integer portion of a number. If the number is a negative, the first negative integer less than or equal to the number is returned.
IsFinite	Determines if a value is finite.
LN	Returns the natural log of a number. (Note that LN or LOG may be used to perform the same function.)
LOG	Returns the natural log of a number. (Note that LN or LOG may be used to perform the same function.)
LOG10	Returns the logarithm base 10 of a number.
MOD	Performs a modulo divide of two numbers.
PWR	Raises a constant to a specified exponent.
RND	Generates a random number.
ROUND	Rounds a number to a higher or lower number.
SGN	Used to find the sign value of a number (-1, 0, or 1).
SIN	Returns the sine of an angle.
SINH	Returns the hyperbolic sine of a number.
SQR	Returns the square root of a number.
TAN	Returns the tangent of an angle.
TANH	Returns the hyperbolic tangent of a number.

10.7 Logical Functions

See the online help for examples of using each of these functions.

Function	Description
AND	Performs a logical conjunction on two numbers.
EQV	Performs a logical equivalence on two numbers.
IIF(x,y,z)	Evaluates an expression and returns one value if true, a different value if false.
IMP	Performs a logical implication on two numbers.
NOT	Performs a logical negation on a number.
OR	Performs a logical disjunction on two numbers.
SelectSwitch	Iterates through the set of predicates and values in the order in which these are specified in its arguments list. It will return the value associated with the first predicate that specifies a non-zero integer value. If no asserting predicate can be found, the function will return the default_value
XOR	Performs a logical exclusion on two numbers.

10.8 String Functions

See the online help for examples of using each of these functions.

Function	Description
Hex	Returns a hexadecimal string representation of an expression.
HexToDec	Converts a hexadecimal string to a float or integer.
InStr	Finds the location of a string within a string.
InStrRev	Finds the location of a string within a string. (Differs from InStr in that it searches from the end of the string rather than from the start of the string.)
Left	Returns a substring that is a defined number of characters from the left side of the original string.
Len	Returns the number of bytes in a string.
LTrim	Returns a copy of a string with no leading spaces.
Mid	Returns a substring that is within a string.
Replace	Used to search a string for a substring, and replace that

	substring with a different string.
Right	Returns a substring that is a defined number of characters from the right side of the original string.
RTrim	Returns a copy of a string with no trailing spaces.
Space	Returns a string value that is filled with a defined number of spaces
StrComp	Compares two strings by comparing the characters in one string to the characters in another.
StrReverse	Returns a copy of a string with the characters in reverse order.
Trim	Returns a copy of a string with no leading or trailing spaces.

10.9 Conversion Functions

See the online help for examples of using each of these functions.

Function	Description
ToDate	Converts a value to a date.
ToFloat	Converts a value to a floating point number.
ToInt	Converts a value to an integer.

10.10 Time Functions

See the online help for examples of using each of these functions.

Function	Description
FormatTime	Produces a string that formats a timestamp in the manner specified.
SystemTime	Returns the current computer time.
SystemTimeGMT	Returns the current GMT (Greenwich Mean Time) system time.
Timestamp	Returns the timestamp associated with the record from which a value is derived.
SetTimestamp	Returns the value specified and sets its timestamp to the timestamp specified.

10.11 Start Option Functions

See the online help for examples of using each of these functions.

Notes: The majority of Start Option Functions are most useful when used with Statistical Functions. This is because when RTMC-RT is launched it begins processing with the newest record by default. Therefore, a Start Option Function must be used to cause RTMC to begin processing data at an earlier point that provides the history required by some Statistical Functions. For example using MaxRunOverTime to display the maximum value over the past 24 hours will initially display the maximum value since RTMC-RT was launched. The 24-hour maximum will only be displayed after it has been running for 24 hours. In order to get a 24-hour maximum immediately, a Start Option Function must be used.

StartAfterNewest and StartAtNewest can be useful with trend components (Time Series Chart, XY Chart, Scope, Table Display, Wind Rose) if you wish to prevent RTMC from backfilling a component with historical data.

ReportOffset is the only Start Option Function that works when your RTMC screen contains a Report Range component. This is because RTMC uses the other Start Option Functions in the background to implement the report functionality which will override any other user-entered Start Option Functions.

Some Start Option Functions behave differently depending on the type of the data source (i.e., LoggerNet server, database, data file, or http datalogger). Click on the function name for more information.

Function	Description
StartAfterNewest	No records are processed until a new record has been collected.
StartAtNewest	Attempts to start processing at the newest record in the table.
StartAtOffsetFromNewest	Attempts to start processing with the record at the specified offset back from the newest record in the table. For example, an offset of one starts processing at the newest record, an offset of two starts processing one record back from the newest record, and so forth.
StartAtRecord	Attempts to start processing at the specified file mark and record number. If the specified record cannot be located, it starts processing at the oldest record since the specified record. If the specified record is beyond what is available, it starts processing at the oldest available record.
StartAtTime	Attempts to start processing at the specified timestamp. If the specified timestamp cannot be located, it starts processing at

	the oldest record since the specified timestamp. If the specified timestamp is beyond what is available, it starts processing at the first record that is subsequently written to the data table (i.e., you will have no backfill).
StartRelativeToNewest	Attempts to start processing with the first record whose timestamp is greater than or equal to the newest record's timestamp minus the specified interval.
ReportOffset	For RTMC project pages where a Report Range component is present, this function will specify an offset, in nanoseconds, that will be subtracted from the report's start time. This function will not have an effect in any other context. This function is useful for a report that contains a statistical function that requires data from before the report's start time.

10.12 Statistical Functions

See the online help for examples of using each of these functions.

Note: Start Option Functions can be useful when using Statistical Functions. This is because when RTMC-RT is launched it begins processing with the newest record by default. A Start Option Function can be used to cause RTMC to begin processing data at an earlier point that provides the history required by some Statistical Functions. For example using MaxRunOverTime to display the maximum value over the past 24 hours will initially display the maximum value since RTMC-RT was launched. The 24-hour maximum will only be displayed after it has been running for 24 hours. In order to get a 24 hour maximum immediately, a Start Option Function must be used.

Function	Description
AvgRun	Returns a running average of up to the last specified number of values.
AvgRunOverTime	Returns the running average of the specified value over time.
AvgRunOverTimeWithReset	Returns the running average of the specified value since the function was reset.
AvgSpa	Returns the average of the specified values.
Last	Stores the specified value and returns the previous value.
MaxRun	Returns the maximum of all values that it has considered.
MaxRunOverTime	Returns the maximum of all values whose timestamps are greater than the newest timestamp minus the specified interval.

MaxRunOverTimeWithReset	Returns the maximum of all values since the function was reset.
MaxSpa	Returns the maximum of the specified values.
MedianRun	Returns the median value of up to the last specified number of values.
MedianRunOverTime	Returns the median value in the set of values whose timestamps are greater than the newest timestamp minus the specified interval.
MinRun	Returns the minimum of all values that it has considered.
MinRunOverTime	Returns the minimum of all values whose timestamps are greater than the newest timestamp minus the specified interval.
MinRunOverTimeWithReset	Returns the minimum of all values since the function was reset.
MinSpa	Returns the minimum of the specified values.
StdDev	Returns the standard deviation of up to the last specified number of values.
StdDevOverTime	Returns the standard deviation of the specified value over time.
StdDevOverTimeWithReset	Returns the standard deviation of the specified value since the function was reset.
Total	Returns the total of all values that it has considered.
TotalOverTime	Returns the total of all values whose timestamps are greater than the newest timestamp minus the specified interval.
TotalOverTimeWithReset	Returns the total of all values since the function was reset.
ValueAtTime	Returns the oldest value in a set of values from a specified time interval.

10.13 Expression Builder

The Expression Builder is opened by pressing ⬚ next to a **Select Data** field. It can be used to create complex Expressions (p. 52) containing functions, start options, aliases, and/or valuesynchs.

The Expresssion Builder tab is used to build the expression. You can type in this window directly, press the **Data Source Browse** button to browse your data sources for a data value to be added to the expression, and use the Functions tab to add function(s) to the expression. Any errors (i.e., undeclared variables, mismatched parenthesis, missing function parameters) in the Expression Builder tab will be indicated in red.

The Raw Source tab can be used to view the raw source including the expression, start option, aliases, and valuesynchs.

Edits can be made on either the Expression Builder tab or the Raw Source tab. Ctrl-Z or right-click | Undo can be used to undo an edit.

Functions

Use the Functions tab to add functions to the expression. Place your cursor where you want the function to be added. Double-click on the function in the list or select the function and press the **Insert Selected** button. The parameters needed by the function will be shown. You will need to edit these to the desired values.

> Note: The predefined time constants (useful as a parameter for the statistical functions where the interval parameter must be specified in nanoseconds) and the reset options (used in statistical functions with a reset) are contained in the function list for easy insertion into a function.

Start Options

Use the **Start Options** tab to select a start option function to be used in the expression. Once the Start Options tab has been selected, click on Function under Start Options. A drop-down arrow will appear that can be used to select one of the start option functions.
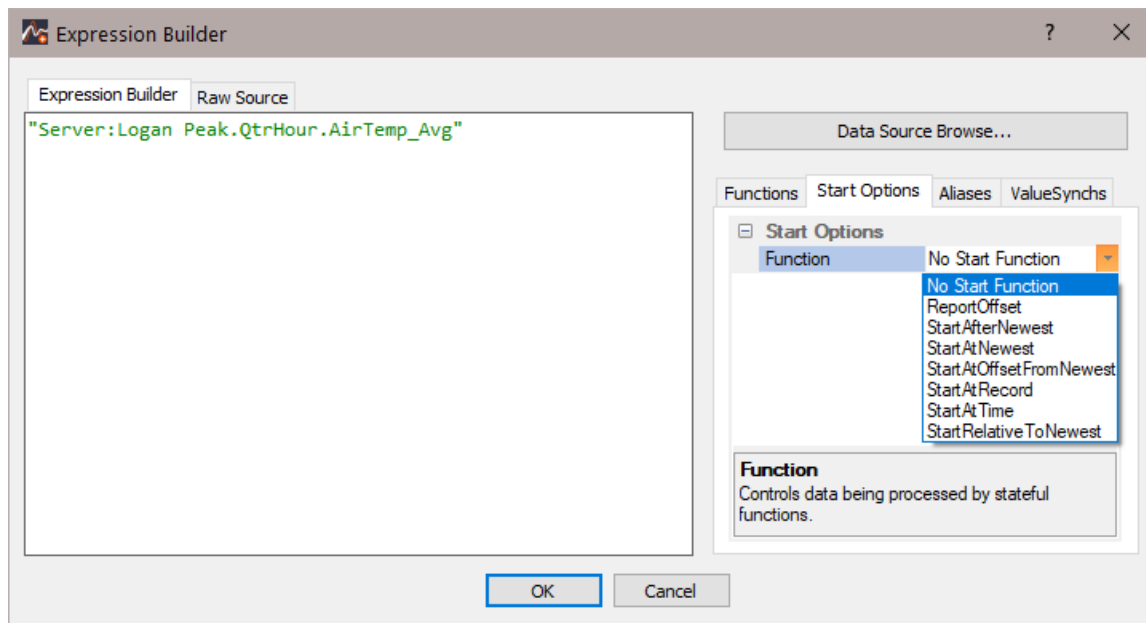
After a start option has been selected, the required parameters will be shown.

Clicking on an *order_option* parameter provides a drop-down arrow that can be used to select the desired order option.

Clicking on an *interval* parameter provides a drop-down arrow that can be used to select one of the predefined time constants. After selecting one of the predefined time constants, you can click

in the edit box and modify the value. For example, you can choose nsecPerMin, and then click in the box to modify this to 30*nsecPerMin. Note that one of the predefined time constants does not have to be used. You can type in an interval directly.

All other parameters must be typed in directly.

Aliases

If a data value is used multiple times in an expression, the expression can be simplified by declaring an alias for the data value. Use the **Aliases** tab to declare aliase(s) to be used in the expression.

On the Aliases tab, select the New button ( ) to add an alias. Select an alias and press the Delete button ( ) to delete an alias. Use the arrow buttons to move an alias up or down in the list. Selecting an alias and then clicking on the alias name will allow you to edit the alias name. Selecting an alias, clicking on the data value field, right-clicking, and choosing **Browse...** will bring up a Data Source Browser window that can be used to browse to the data value to be aliased.

Once a data value has been aliased, the alias can be used in place of the data value in the expression as shown below. The alias is inserted into the expression by typing it directly, double-clicking on the alias, or right-clicking on the alias and selecting **Insert** *alias_name* **into expression**.
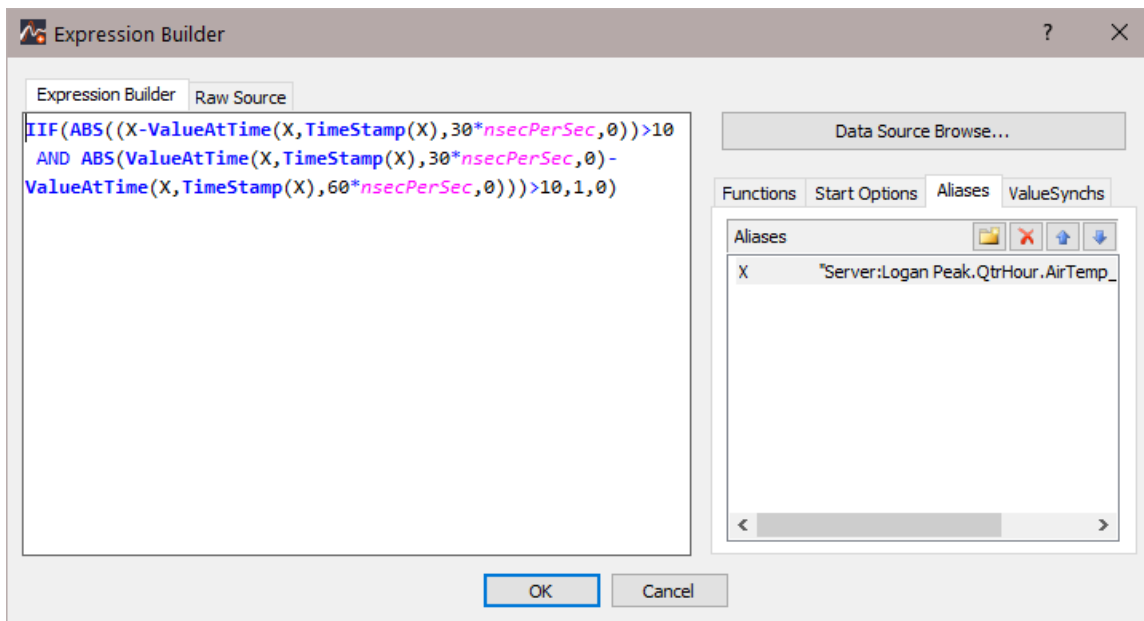
ValueSynch

The ValueSynch function can be used to synchronize data values coming from multiple data sources so that you can display the results of a calculation on those data values in a single component.

On the ValueSynch tab, select the New button ( ) to add a data value to be synchronized. Select a value in the list and press the Delete button ( ) to delete a data value from the ValueSynch. Use the arrow buttons to move a value up or down in the list. Selecting a value and then clicking on the variable name will allow you to edit the variable name. Selecting a value, clicking on the data value field, right-clicking, and choosing **Browse...** will bring up a Data Source Browser window that can be used to browse to the data value to be synchronized.

Once a data value has been added to the ValueSynch, the synchronized variable name is used in the place of the data value in the expression as shown below. The synchronized variable name is inserted into the expression by typing it directly, double-clicking on the variable, or right-clicking on the variable and selecting **Insert** *value_sync_name* **into expression**.
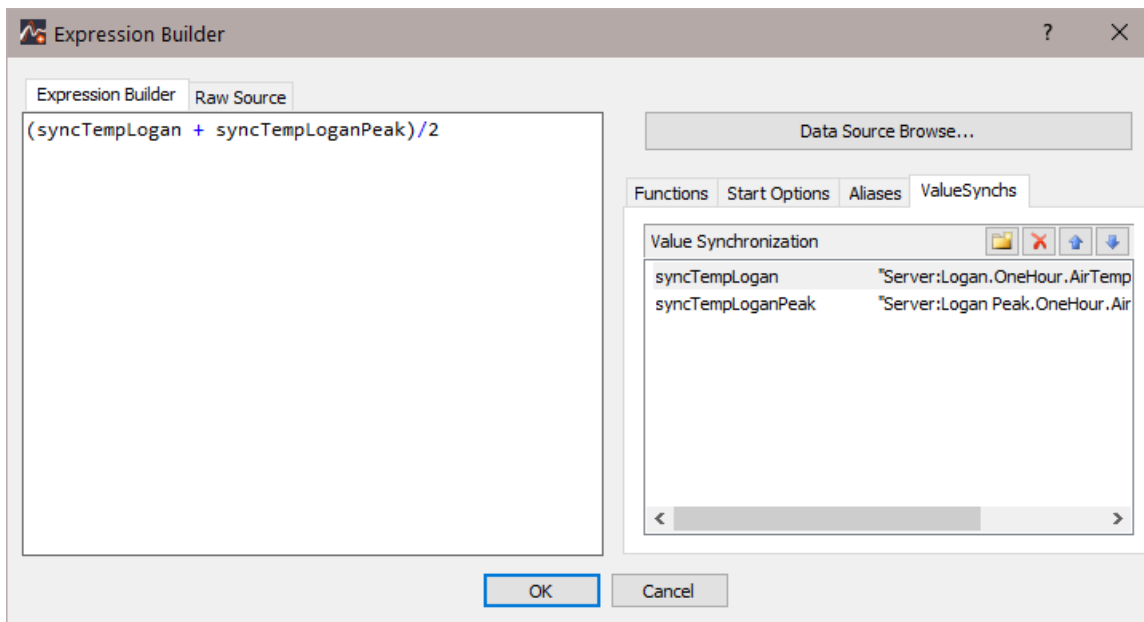
11. Customize

This dialogue box is opened from the Edit | Customize menu item or by right-clicking within the toolbar menu bar and selecting Customize. It can be used to customize RTMC's toolbars and menus.

Commands

The Commands tab allows you to drag and drop any command available from RTMC's menus onto a toolbar. As a menu name is highlighted in the **Categories** column, its menu items will be shown in the **Commands** column. Any command can then be added to the Standard or Layout Toolbar by clicking on the command name and dragging it to the desired position on the toolbar.

With the Customize dialogue box open, buttons can be removed from a toolbar by dragging and dropping them away from any toolbar. Buttons can be moved from one toolbar to another by dragging and dropping them to the desired position.

Toolbars

The Toolbars tab allows you to show or hide the toolbars, reset toolbar buttons to their default configuration, and show text labels on the toolbars. Clear the box next to the Layout Toolbar or Standard Toolbar to hide the toolbar. (Note that the Menu Bar cannot be hidden. Press the **Reset** button to reset only the highlighted toolbar. Press the **Reset All** button to reset the Layout Toolbar, Menu Bar, and Standard Toolbar to their default button configurations. Select the box next to Show text Labels to add text labels to each of the buttons on the highlighted toolbar.

Keyboard

The Keyboard tab allows you to create new keyboard shortcuts for any commands available from RTMC's menus. As each menu name is chosen under **Category**, its menu items will be shown under **Commands**. When a command is highlighted in the **Commands** column, its current keyboard shortcut(s will be shown in **Current Keys**. To add a new keyboard shortcut, type the key sequence in the **Press New Shortcut Key** field. Then press the **Assign** button to assign this shortcut to the currently highlighted command. (Note that if the key sequence entered is already assigned, this will be indicated in the **Assigned to** field. You will need to remove this assignment before assigning the key sequence to a different command. To remove any current keyboard shortcuts, highlight the shortcut under Current Keys and then press the **Remove** button. Pressing the **Reset All** button will reset all keyboard shortcuts to their default values.

> Note: There is only one Accelerator available in RTMC. Therefore, Default is the only available option in the **Set Accelerator for** field.

Menu

The Menu tab allows you to configure the appearance of an open menu.

The **Menu animations** drop-down box determines how a menu is opened when a menu name is pressed. Choose *None* for no animation, *Unfold* to have the menu unfold down and to the right, *Slide* to have the menu slide down, *Fade* to have the menu fade in, or *Default* to use the default animation.

The **Menu shadows** check box determines whether shadows are shown around an open menu. Select the check box to display shadows. Clear the check box to disable shadows.

> Note: Only one menu configuration is available for RTMC. Therefore, Default Menu is the only option available under **Show Menus** for.

> Note: No user-configurable context menus are available in RTMC. Therefore, the right half of the Menu tab is always disabled.

Options

The first two check boxes determine whether screen tips are shown when you hover over icons on RTMC's toolbars and whether shortcut keys are included in the screen tips. Select the **Show Screen Tips on toolbars** check box to show screen tips. Clear the check box to disable screen tips. If screen tips are being displayed, select the **Show shortcut keys in Screen Tips** check box to include keyboard shortcuts in the screen tips. Select the **Large Icons** check box to increase the size of the toolbar icons.

Right-Click Menu

Right-clicking on one of RTMC's menus or buttons with the Edit | Customize dialogue box open, brings up a menu with the following options:

Reset to Default - Resets a button to its default configuration.

Copy Button Image - Copies a button image to the Windows clipboard.

Delete - Deletes the menu or button. (A menu or button that has been deleted can be restored by resetting the menu bar or the appropriate toolbar from the Toolbars tab of the Edit | Customize dialogue box.)

Button Appearance - Opens a dialogue box from which you can choose to display an **Image**, **Text**, or **Image and Text**. Note that you can specify the text to be displayed, but RTMC does not allow you to select a user-defined image. Also note that for a menu, Text Only is the only option available. Therefore, this dialogue box only allows you to change the text that is displayed.

Image - Designates that a button will display only an image.

Text - Designates that a button will display only text. The text that is displayed can be changed from the Button Appearance menu item.

Image and Text - Designates that a button will display an image and text. The text that is displayed can be changed from the **Button Appearance** menu item.

Start Group – Inserts a divider bar before the menu or button.

12. Getting Help

12.1 Tutorial

For help in getting started with RTMC, there is a getting started video provided on the Videos page of our website, http://www.campbellsci.eu/videos.

12.2 Accessing the Help System

There are several ways to access RTMC's help system:

- The help file can be opened by choosing **Help | RTMC Help** from the RTMC menu.
- If the help file is opened, pressing the **Contents** tab will open the Table of Contents.
- If the help file is opened, choosing the **Index** tab will bring up an index. Keywords can be typed in to search for a topic. An in-depth search can be performed by choosing the **Search** tab and typing in a word.
- If a highlighted link takes you to another topic, you can return to the original topic by selecting the **Back** button from the help system's toolbar.
- When working in a dialogue box, you can press **F1** or click the help button (**?**) in the top right-hand corner of the dialogue box for help relative to that dialogue box.

See Also

Campbell Scientific Technical Support (p. 70)

12.3 Troubleshooting

Red Exclamation Point

An exclamation point in a red circle at the upper right of a component indicates a problem with the linked data value. Hover your mouse pointer over the box for a few seconds to display a hint about the error RTMC has detected.

Blue Exclamation Point

A blue exclamation point on a graph indicates that more than 100,000 data points were requested. In this case, RTMC graphs just the first 100,000 data points and then stops. This issue

can be fixed by decreasing the display and/or scrolling range for the graph or by using data from a slower data table.

Non-English Characters

If you are having trouble displaying non-English characters, the issue may be resolved by correcting your Windows Region and Language settings. Use the following steps:

1. Open the Windows Control Panel.
2. Select Region and Language.
3. On the Format tab, select the Format for your location.
4. On the Location tab, select your location.
5. On the Administrative tab, press Change system locale. In the resulting pop-up window, select your current system locale.

12.4 Campbell Scientific Technical Support

If you should need additional assistance with your datalogger hardware or software, contact your Campbell Scientific Partner or Campbell Scientific directly. Contact information is included with the hardware items shipped with your system.

Access Our Website, www.campbellsci.eu

We regularly announce new products, upgrade opportunities, and other technical information on our website. Software demo packages, tutorials, manuals, literature, and application notes are also available. A support request form is available, or you can email your questions directly to support@campbellsci.eu.

RTMC Technical Support Note

LoggerNet - Even though RTMC displays data from the data cache (and not from a collected *.dat file) data must be collected from the datalogger for RTMC's displays to be updated. Typically this is done by setting up a schedule in LoggerNet's Setup window. In RTMC Pro, it can also be done from the Project | Configure Override Scheduled Collection (p. 27) menu item. Data displays will be updated no more frequently than data is being collected from the datalogger.

> **Note**: In RTMC Pro, data files, LNDB databases, and HTTP dataloggers can be added as data sources. See Project | Manage Data Sources (p. 26), for more information.

RTDAQ – When RTDAQ is connected to the station, RTMC performs a manual poll to update the project data every second. In RTMC Pro, you can override this one second interval from the Project | Configure Override Scheduled Collection (p. 27) menu item. Data displays will be updated in RTMC only when RTDAQ is connected to the station.

13. RTMC Run-time

RTMC Run-time allows you to run the real-time graphic display screen that was created in RTMC Pro. In LoggerNet, you can test the operation of the display screen from the RTMC Pro window by clicking the Save and Run button (⏵) on the toolbar. This will start the project window with RTMC Run-time as shown in the window below.
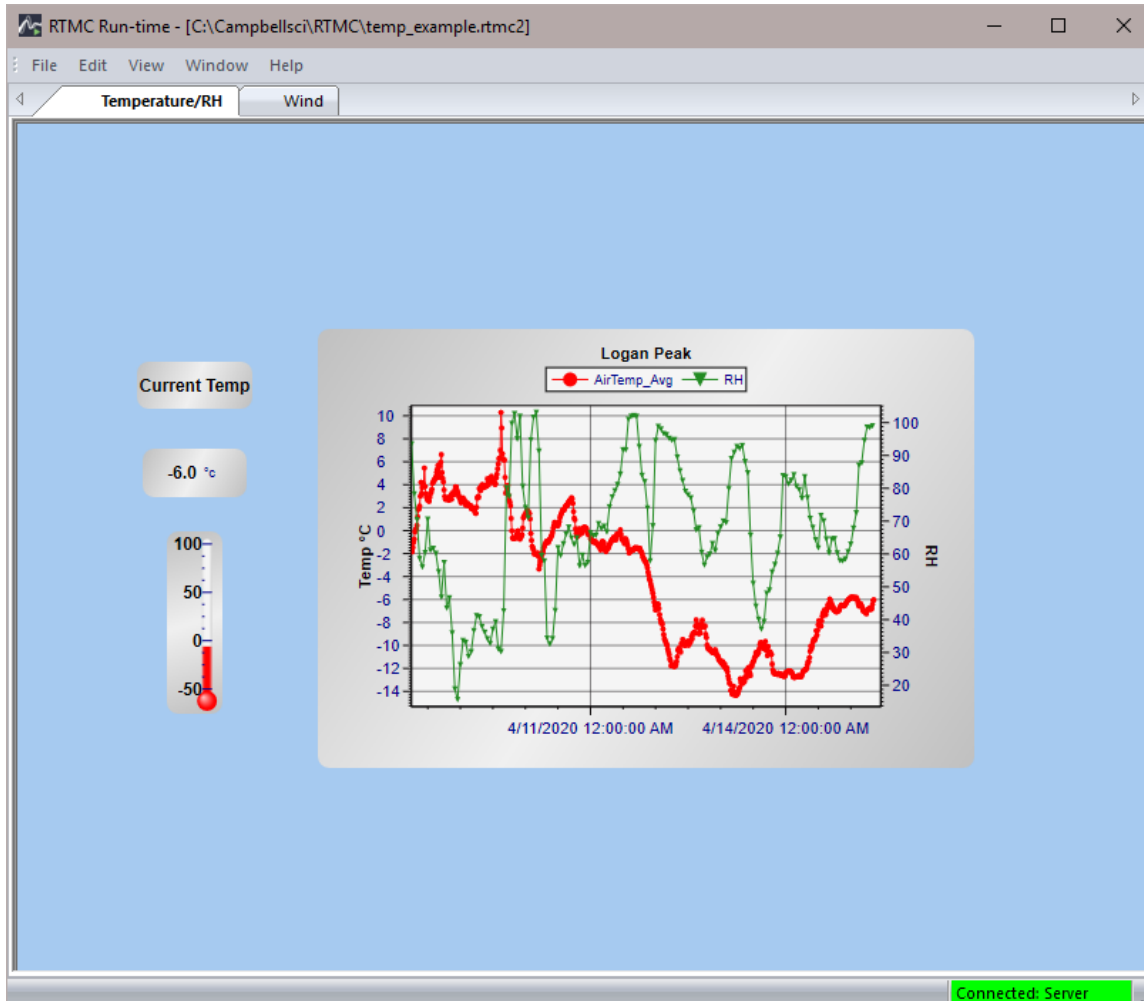
In RTDAQ, you must launch RTMC Run-time from the RTDAQ toolbar, and then open the project you have developed in RTMC Pro. When the run-time display screen is started, the display components will have an exclamation point in a red circle at the upper right until data is received from LoggerNet or RTDAQ. In LoggerNet, if data is not displayed, check to see that the data is being collected. This can be done in the LoggerNet Setup screen. Click on the appropriate station and then choose the **Schedule** tab. Also check the **Data Files** tab to verify the desired table is enabled for scheduled collection. Data Collection can also be set up when the project is

developed in RTMC Pro with the **Project | Configure Override Scheduled Collection** menu item. In RTDAQ, check to see that RTDAQ is connected to the datalogger.

Once a project file has been created, the display screen can be run without starting RTMC Pro. From the Windows Start Menu select **Campbell Scientific | RTMC Run-time**. In the run-time window select **File | Open Project** to select the RTMC Pro project screen to run. If **Remember Username and Password** was not selected in RTMC Pro, it will be necessary to enter them each time the project is run in RTMC Run-time.

In run-time mode, you can print an image of the RTMC display screen by selecting **File | Print Screen**. A new form to be run is selected under **File | Open Project**.

A copy of RTMC Run-time comes with LoggerNet and RTDAQ. When RTMC Pro is installed on a computer, RTMC Run-time will be updated to match the RTMC Pro version. For LoggerNet, if you want to run RTMC Pro projects on remote computers, additional copies of RTMC Run-time can be purchased separately. One copy is required for each computer on which RTMC Run-time will be used. As noted above, when running RTMC Run-time on a remote computer, the host computer must have Remote Connections enabled (LoggerNet Toolbar, **Tools | Options | Allow Remote Connections**).

14. CSI Web Server

The CSI Web Server allows you to view your RTMC projects using a web browser. Included with the CSI Web Server are the CSI Web Server Administrator and the Web Publisher. The CSI Web Server Administrator allows you to configure the web server, check the status of the web server, set up user accounts and passwords, and easily browse to sites running on the web server. The Web Publisher allows you to publish your RTMC project to either a PC website using the CSI Web Server or to an HTTP-enabled datalogger.

14.1 Getting Started

The diagram below shows the basic steps in creating your web content:
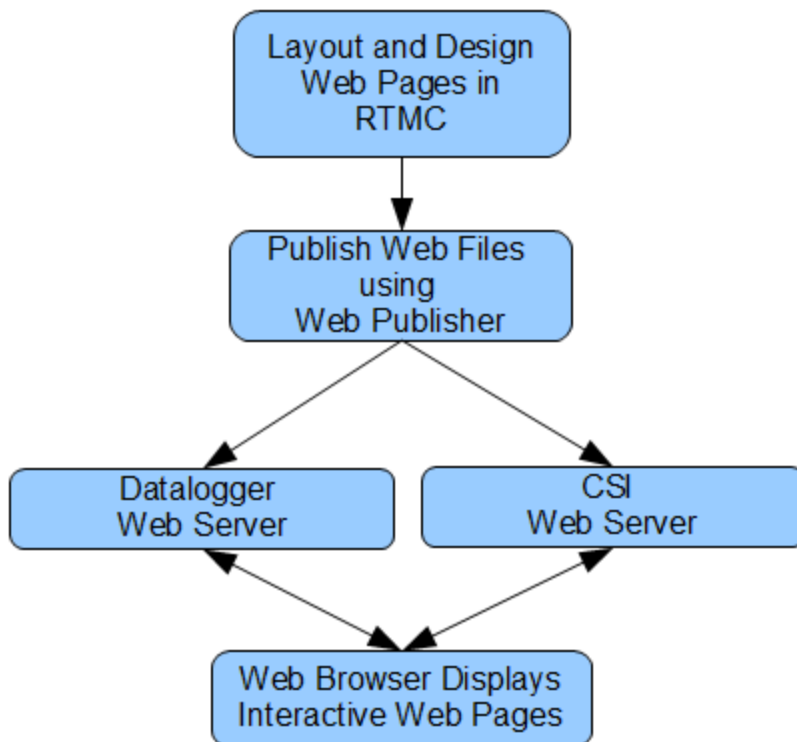
You first use RTMC Development or RTMC Pro Development to create a project containing the display and/or control components that you want to be available from your website. Next, the Web Publisher is used to publish the web files. From RTMC Pro, you can press the Publish to Web button ( ) to bring up the Web Publisher and publish your project. The Web Publisher can also be opened from the Windows Start Menu by selecting **All Apps | Campbell Scientific | Web Publisher**. From the Web Publisher, you can choose to add a PC Websites (p. 77) or a Datalogger

Websites (p. 79) (a datalogger website requires an RTMC Pro project). After filling in the desired settings, press the **Publish Website** button to publish the content.

> Note: If firewalls exist between your web server (i.e., a PC running CSI Web Server or a web-enabled datalogger) and the target audience of your website(s), the firewalls will need to be configured to allow incoming traffic on the port being used by the web server. (The port used by the CSI Web Server is configured through the CSI Web Server Administrator. The port used by a web-enabled datalogger is configured through DevConfig. The default port is 80 for both the CSI Web Server and a web-enabled datalogger.) See your Network Administrator for help in configuring the firewalls.

14.1.1 Supported Operating Systems

RTMC runs on Windows 7, Windows 8, or Windows 10.

14.2 CSI Web Server Administrator

The CSI Web Server Administrator allows you to configure the web server, check the status of the web server, set up user accounts and passwords, and easily browse to sites running on the web server. It can be opened from the Windows Start Menu by selecting **Campbell Scientific | CsiWebAdmin**

14.2.1 Status

The **Status** tab shows the status of the web server and allows you to browse to sites running on the web server.

If the web server is not running, click on the image to start the web server.

When the web server is running, the version of the web server running will be displayed. The protocol, port, and status (e.g., Protocol HTTP, port 80, status Listening) will also be displayed.

A list of sites provided by the web server will be shown. You can click on any site to browse to that site.

The keys icon (🔑) next to each site can be used to create or edit the .csipasswd file for that site. See Web Security (p. 82) for more information about .csipasswd files and how they control users and their website access rights.

The plus icon (➕) next to "Root" creates a new remote folder. You can then use the keys icon next to the new remote folder to create the .csipasswd file for that remote folder before publishing a website to the folder. See Web Publisher (p. 76) for information on publishing a website to the remote folder.

The trash can icon next to each website can be used to remove the website.

> Note: Only sites published to the web server's root directory and immediate subdirectories of the root directory will be shown. Sites cannot be published to deeper subdirectories.

14.2.2 Configuration

14.2.2.1 Edit Root Permissions

The **Edit Root Permissions** button is used to create or edit the root .csipasswd file. It performs the same function as the keys icon next to Root on the **Status** tab, but can be used to edit the root permissions even when the CSI Web Server is not running. See Web Security (p. 82) for more information on the function of the root .csipasswd file.

14.2.2.2 HTTP

The **HTTP** tab controls the root directory and HTTP server port that will be used by the CSI Web Server.

HTML Root Directory – The directory that the web server will use to store/serve web pages, scripts, password files, and source description files

HTTP Server Port – The TCP Port on which the HTTP server will listen for unencrypted connections. You may need to change this port if there is already a web server running on this machine or if your firewall does not allow service on TCP port 80.

14.2.2.3 HTTPS

The **HTTPS** tab can be used to set up the CSI Web Server for encrypted service. This requires a Private Key File and Certificate File obtained from a third party Certificate Authority.

HTTPS Enabled – Specifies whether the web server will attempt to offer an HTTPS (encrypted) service.

Server Name – Specifies the domain name that the server will report when it redirects requests from an unsecure link to a secure one. This will only happen if the HTTPS protocol is enabled and the private key and certificate have valid content. This value should be the Fully Qualified Domain Name (FQDN) for your web server and, depending upon firewalls, proxies, and port-forwarding configurations, may be different from the host machine name.

HTTPS Server Port – Specifies the TCP port on which the HTTPS server will listen for unencrypted connections. You may need to change this port if there is already a web server running on this machine or if your network or personal firewall do not allow service on TCP port 443.

Private Key File – Specifies the name of the PEM encoded file that contains the HTTPS private key. The TLS/SSL stack used by the web server supports only AES128 or AES256 encryption for the private key file.

Private Key Password – Specifies the password used to decrypt the TLS/SSL private key. It will be ignored if a private key is specified that is not encrypted.

Certificate File – Specifies the name of the PEM-encoded file that contains the x509 HTTPS certificate.

14.2.2.4 Log Control

The **Log Control** tab allows you to configure how log files are maintained by the CSI Web Server.

Log File Mode – Controls the way that the web server will write its log files. Select **Disabled** to disable log files, **New Log on Time Intervals** to specify that a new log file will be started on the time interval specified by the Baling Interval, or **New Log after Max Size** to specify that a new log file will be started after the current log file exceeds the size specified by the Maximum Log File Size.

Log Files Directory – Specifies the directory in which the web server will write its log files.

Baling Interval – Specifies the maximum time interval that will be recorded in any one log file when the Log File Mode is set to New Log on Time Intervals.

Maximum Log File Size – Specifies the maximum size (in bytes) that will be recorded in any one log file when the Log File Mode is set to New Log after Max Size.

Maximum Log Files Count – Specifies the maximum number of log files that will be kept by the web server before the oldest is overwritten.

Log HTTP Headers – Controls whether the web server will write the headers of HTTP requests and HTTP responses in its log file.

14.3 Web Publisher

The Web Publisher is a website management tool that lets you customize web content for use with the CSI Web Server or a web-enabled datalogger like the CR1000. Most of the content for each website comes from an RTMC project file (*.RTMC2). In addition, the Web Publisher has display settings that allow you to show other tabs such as data browsing and network status.

14.3.1 Websites

The Web Publisher supports two different kinds of websites: PC websites and Datalogger websites.

PC Website - PC websites run on the CSI Web Server. The CSI Web Server supports any number of websites and lets you control user access rights for each website. PC websites support all of the different data sources supported by RTMC (LoggerNet, Data File, Database, HTTP Datalogger, and Virtual Data Sources).

Datalogger Website - Datalogger websites run on a compatible HTTP-enabled datalogger such as the CR6 or a CR1000 with an NL121 attached. Datalogger websites must be designed by RTMC Pro and can only have one data source. The data source must be an HTTP Datalogger Source.

Press the **Add** button to add a new website. From the pop-up menu, choose whether you wish to add a PC Website or a Datalogger Website.

14.3.1.1 PC Websites

PC websites run on the CSI Web Server. The CSI Web Server supports any number of websites and lets you control user access rights for each website. PC websites support all of the different data sources supported by RTMC (LoggerNet, Data File, Database, HTTP Datalogger, and Virtual Data Sources).

Press the **Add** button and select **Add PC Website** to add a PC Website.

You can press the **Rename** button to rename the website. This will be the name shown in the title bar, when the website is accessed.

PC Web Server Settings

Host Address - Specifies the address where you will be publishing your website. The address can be localhost (that is, the computer running Web Publisher), a domain name, or an IP address in the form XXX.XXX.XXX.XXX for an IPv4 address or [XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX] for an IPv6 address. If you are using a port other than the default port (80 for http, 443 for https), you need to specify it using a colon followed by the port. For example, campbellsci.com:8080, 192.168.1.1:1234, or [2620:24:8080:8600:85a1:fcf2:2172:11bf]:8080.

> Note: If the web server has HTTPS enabled (through the CSI Web Server Administrator), it must be specified by adding https:// in front of the IP address or domain name.

User ID - In order to publish a website to the CSI Web Server, a user account must be created with an access level of "all". The CSI Web Server Administrator is used to do this with the CSI Web Server. A .csipasswd file is created that controls user accounts and passwords that will be able to publish projects to the web server and/or access websites on the CSI Web Server. (See Web Security (p. 82) for more information.)

Password - The password associated with the user ID that has been given "all" access to publish websites to the web server.

Remote Folder - The remote folder controls where a website will be published relative to the web server's root directory. (By default, the web server's root directory is C:\Campbellsci\CsiWebServer. It can be changed from the CSI Web Server Administrator.) On the CSI Web Server, you can create as many websites and folders as you want. Each remote folder must be directly below the web server's root directory (i.e., you cannot publish to *remote_folder\subdirectory*). Clicking on the **Remote Folder** drop down list will show you which folders are currently available.

Website Settings

Send new password file - If a website has been previously created and user rights set up, you may or may not want to overwrite the existing password file for that website.

Edit Password File - Brings up the website .csipasswd file editor. This file is used by the web server to manage user access to the website.

Edit Tracker Code - Tracker codes can optionally be inserted to track website access. All tracker codes are inserted into a <script> </script> block and are automatically inserted in each page of your website. Google Analytics™ web analytics service and many other tracking services are available for free. The available services range from simple hit counters to enterprise-class web analytic solutions.

Disable Web Sockets - By default, web sockets are used to push data from the web server or datalogger as soon as it becomes available. This is the preferred method. However, some networks do not allow web sockets. Selecting this check box will disable web sockets causing data to be polled by the web browser.

RTMC Settings

Project File - The RTMC project file (*.RTMC2) that will be used to generate the website. PC websites support all of the available data sources. When publishing a website, all of the screens, images, and required files are compiled together and automatically copied to the web server.

Default Poll Interval – This setting determines the rate at which data is polled by a web browser on older systems. This setting is somewhat deprecated because of more modern web technologies that have been implemented across many of our products. If you have the latest version of our software, data is now pushed from the web server or datalogger as soon as it becomes available instead of needing to be continually polled.

This functionality is available in:

- CSI Web Server 1.4 or later
- CR1000/CR3000/CR800 Series OS 29 or later
- CR6 Series OS 4 or later

If this functionality is not supported on your system, data will revert to being polled at the **Default Poll Interval**. This means that the browser must ask the web server if it has any new data to be displayed. This setting determines how often new data will be requested. The default poll interval is set to 10 seconds. This setting should be adjusted to provide data at a rate that is suitable for your application. There are many factors that affect how fast data will be able to be polled including the number of users viewing the page, the number of dataloggers being polled, the size of data tables in the dataloggers, the resources available to the web server, the internet browser resources, connection bandwidth, etc.

Display Settings

Hide Navigation Tabs - By default, websites will be displayed with navigation tabs at the top of the web page. These tabs allow users to navigate your website. You can disable these tabs and implement your own navigation system using "Hot Spots" in RTMC Pro.

Show data browse tab - The show data browse tab option will display a **Browse Data** tab on your website. This tab allows you to view data from all of your data sources.

It also provides a mechanism to do custom data queries. Custom data queries let you download data files or view data directly in the browser. Each table in the Browse Data tab will have a **Custom** link next to the table name. Click on the link to open the Custom Data Query window and perform a custom data query.

Show network status tab - The show network status tab option will display a **Network Status** tab on your website. When viewing network status on a CSI Web Server, you will see all of your data sources used by the current website. Databases and Data File sources don't currently display any status information. LoggerNet data sources and HTTP Datalogger Sources display a link. When LoggerNet data sources are clicked, all of the stations in the LoggerNet network are displayed with their collection statistics. When an HTTP Datalogger Source is clicked, you see the datalogger status information.

14.3.1.2 Datalogger Websites

Datalogger websites run on a compatible HTTP-enabled datalogger such as the CR6 or a CR1000 with an NL121 attached. Datalogger websites must be designed by RTMC Pro and can only have one data source. The data source must be an HTTP Datalogger Source.

Press the **Add** button and select **Add Datalogger Website** to add a Datalogger Website.

You can press the **Rename** button to rename the website. This will be the name shown in the title bar, when the website is accessed.

Datalogger Web Server Settings

Host Address - Specifies the address where you will be publishing your website. The address can be a domain name or IP address in the form XXX.XXX.XXX.XXX for an IPv4 address or [XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX] for an IPv6 address. If you are using a port other than the default port (80 for http, 443 for https), you need to specify it using a colon followed by the port. For example, campbellsci.com:8080, 192.168.1.1:1234, or [2620:24:8080:8600:85a1:fcf2:2172:11bf]:8080.

> Notes: If the datalogger has only HTTPS enabled with HTTP disabled, it must be specified by adding https:// in front of the IP address or domain name.

> CR1000/CR3000/CR800 series dataloggers require OS 28 or later to support IPv6 addresses.

User ID - In order to publish a website to a datalogger web server, a root level user must be created. Device Configuration Utility (DevConfig) is used to do this for a datalogger web server. The .csipasswd file controls user accounts and passwords that will be able to publish projects to the web server. In order to publish, a user account needs to be assigned an access level of "all". This user account with "all" access is called the Root User ID. (See Web Security (p. 82) for more information.)

Password - The root password is the password associated with the root user ID that has been given "all" access to publish websites to the web server.

Remote Folder - The remote folder controls where a website will be published relative to the web server's root directory. On the datalogger web server, you are limited on which folders you have available. Currently you can specify /CPU/, /USR/, or /CRD/, if these directories are available. Clicking on the "Remote Folder" drop down list will show you which folders are currently available.

Website Settings

Send new password file - If a website has been previously created and user rights set up, you may or may not want to overwrite the existing password file for that website.

Edit Password File - Brings up the website .csipasswd file editor. This file is used by the web server to manage user access to the website. On datalogger websites, the .csipasswd file is always placed in the /CPU/ drive automatically.

Hide the password file - The .csipasswd file can optionally be hidden on datalogger web servers. Hiding the .csipasswd file is a security measure that will help protect access to user names and

passwords. Once the .csipasswd file is hidden, it will no longer show up in the file system. Republishing the website with this option disabled will cause the .csipasswd file to show up again.

Edit Tracker Code - Tracker codes can optionally be inserted to track website access. All tracker codes are inserted into a <script> </script> block and are automatically inserted in each page of your website. Google Analytics™ web analytics service and many other tracking services are available for free. The available services range from simple hit counters to enterprise-class web analytic solutions.

Disable Web Sockets - By default, web sockets are used to push data from the web server or datalogger as soon as it becomes available. This is the preferred method. However, some networks do not allow web sockets. Selecting this check box will disable web sockets causing data to be polled by the web browser.

RTMC Settings

Project File - The RTMC project file (*.RTMC2) that will be used to generate the website. Datalogger websites require an RTMC Pro project that only contains one data source. The data source must be an HTTP Datalogger Source. When publishing a website, all of the screens, images, and required files are compiled together and automatically copied to the web server.

> Note: The HTTP datalogger source in your RTMC project does not need to be specific to the datalogger that the website is published to (e.g., an RTMC project with an HTTP datalogger source at 192.168.4.14 can be published to a datalogger with an IP address of 192.168.9.99). This allows you to create one RTMC project that can be published to multiple datalogger websites.

Default Poll Interval – This setting determines the rate at which data is polled by a web browser on older systems. This setting is somewhat deprecated because of more modern web technologies that have been implemented across many of our products. If you have the latest version of our software, data is now pushed from the web server or datalogger as soon as it becomes available instead of needing to be continually polled.

This functionality is available in:

- CSI Web Server 1.4 or later
- CR1000/CR3000/CR800 Series OS 29 or later
- CR6 Series OS 4 or later

If this functionality is not supported on your system, data will revert to being polled at the **Default Poll Interval**. This means that the browser must ask the web server if it has any new data to be displayed. This setting determines how often new data will be requested. The default poll interval is set to 10 seconds. This setting should be adjusted to provide data at a rate that is suitable for

your application. There are many factors that affect how fast data will be able to be polled including the number of users viewing the page, the number of dataloggers being polled, the size of data tables in the dataloggers, the resources available to the web server, the internet browser resources, connection bandwidth, etc.

Display Settings

Hide Navigation Tabs - By default, websites will be displayed with navigation tabs at the top of the web page. These tabs allow users to navigate your website. You can disable these tabs and implement your own navigation system using Hot Spots in RTMC Pro.

Show data browse tab - The show data browse tab option will display a **Browse Data** tab on your website. This tab allows you to view data from HTTP data source.

It also provides a mechanism to do custom data queries. Custom data queries let you download data files or view data directly in the browser. Each table in the Browse Data tab will have a **Custom** link next to the table name. Click on the link to open the Custom Data Query window and perform a custom data query.

Show file browse tab - The show file browse tab option will display a **Browse Files** tab on a datalogger web server. The file browser allows you to traverse the file system of the datalogger. Each folder is displayed with a link as well as some information about the size of the folder and when the folder was last written to. When clicking on a folder, you will see a list of all the visible files in the directory. Each file is a link, so you can click on the file and view it or download it. The size of the file and last write time are also displayed. Clicking on the [..] link will take you back to the root directory list of the datalogger file system.

Show datalogger status tab - The show datalogger status tab option will display a **Datalogger Status** tab on your website. If you are viewing the website on a datalogger web server, you will see the datalogger status. This includes datalogger information, program information, battery information, and card information.

14.4 Web Security

Users and their website access rights are controlled through .csipasswd files. Note that .csipasswd files control access to websites as well as direct access to data sources and dataloggers using the API commands described in the manual.

Each user can be given one of the following access levels:

- **None** – No access is allowed. The account is disabled.
- **Read Only** – Allowed to view data. No values can be changed.

- **Read/Write** – Allowed to view data, make changes to writeable values in a datalogger's Public or Status table or a virtual data source, and set a datalogger's clock.
- **All** – Allowed to view data, make changes to writeable values in a datalogger's Public or Status table or a virtual data source, set a datalogger's clock, use the API FileControl command, and publish websites.

14.4.1 PC Websites

In order to publish a website to the CSI Web Server, a .csipasswd file must be created. The root directory and each remote folder under the root directory can have its own .csipasswd file. This .csipasswd file controls the user accounts and passwords that will be able to publish projects to that directory and controls user access to websites in that directory. In order to publish, a user account needs to be assigned an access level of "all".

If a remote folder does not have its own .csipasswd file, the root .csipasswd file will be used.

For PC Websites, there is a default .csipasswd file which includes two users:

> Username: admin
> Password: admin
> Access Level: All
>
> Username: anonymous
> Password:
> Access Level: Read Only

If a root .csipasswd file has not been created, this default .csipasswd file will be used for the root directory and any remote folder that does not include its own .csipasswd file,

The CSI Web Server Administrator is the preferred method of creating and editing .csipasswd files. They can also be created and edited from the Web Publisher. Both methods are described below.

14.4.1.1 Using the CSI Web Server Administrator

To create the .csipasswd file in the root directory, press the keys icon next to "Root". To create a .csipasswd file for a new remote folder press the + icon next to "Root", enter a name for the site, and press Add Subdirectory. Once the new subdirectory appears under "Root", press the keys icon next to the subdirectory to create the .csipasswd file for that subdirectory. The key icons can also be used later to edit the .csipasswd files.
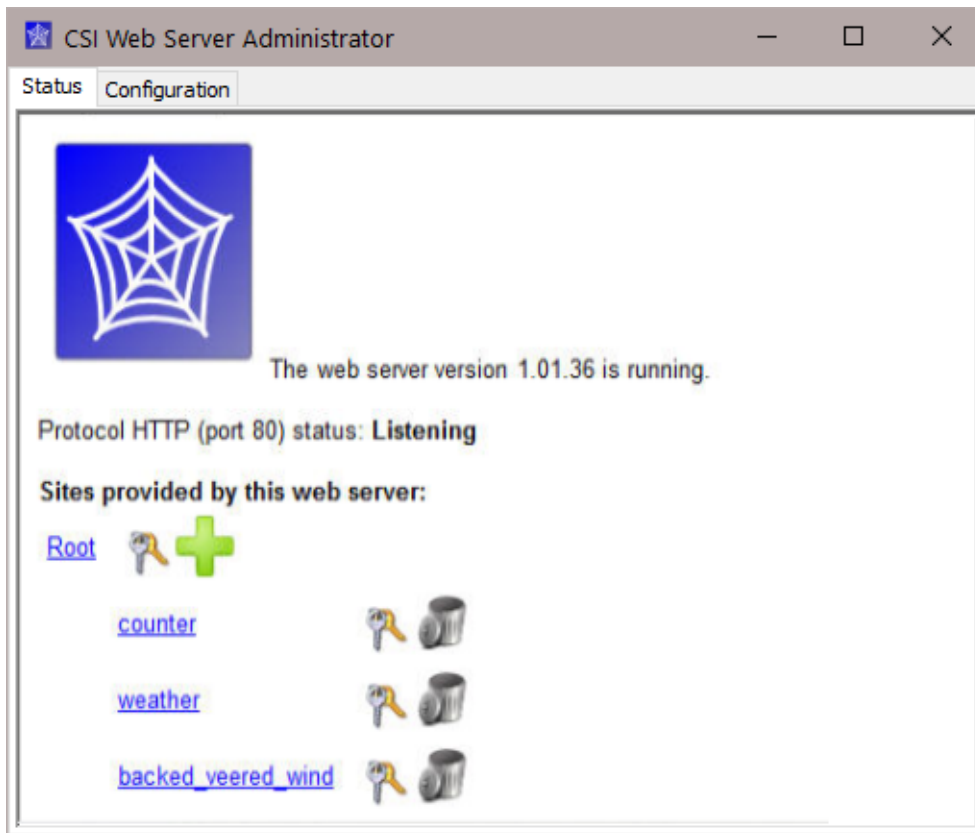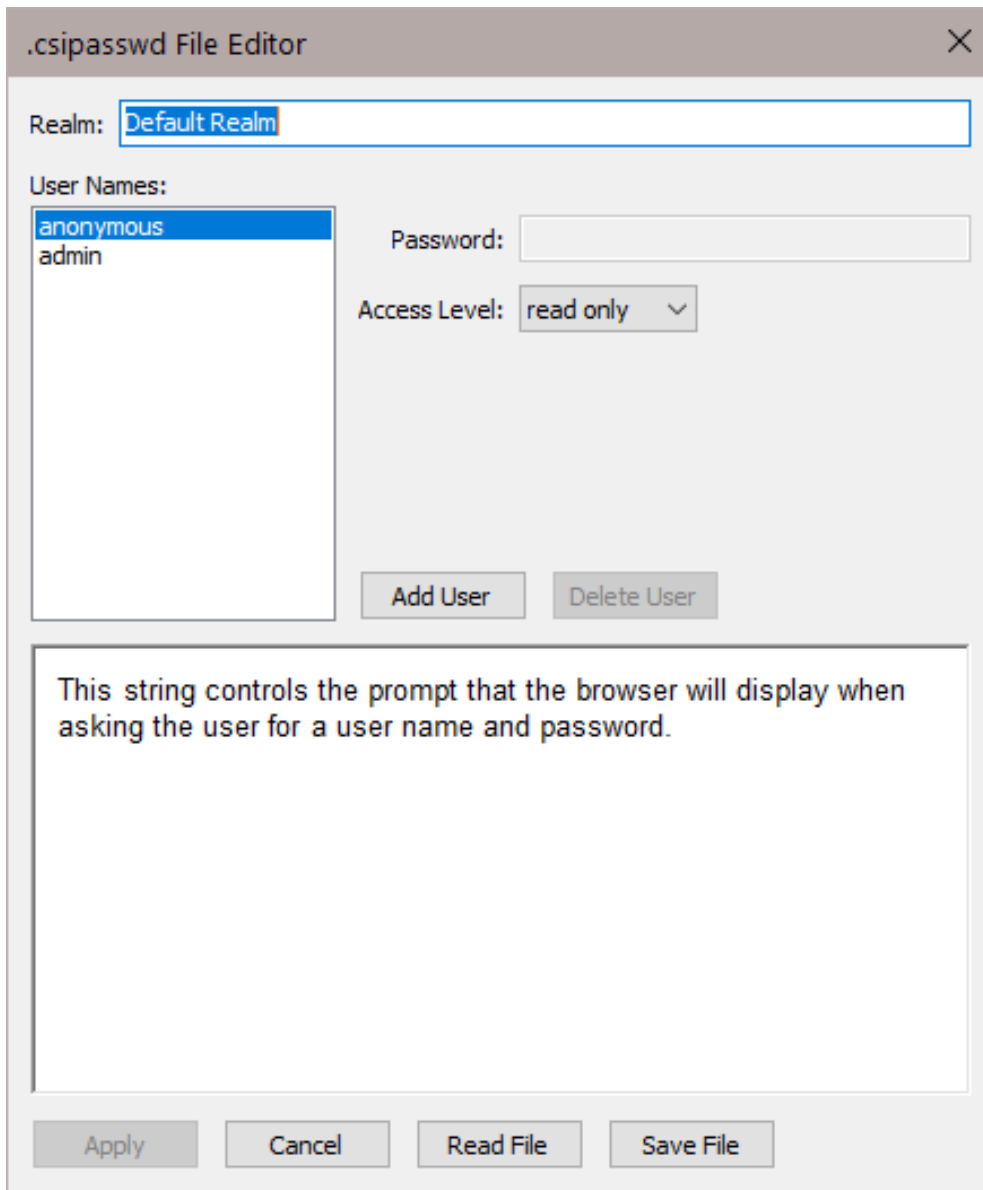
The .csipasswd File Editor dialogue box that is opened when the keys icon is pressed has the following fields:

- **Realm** - The name given to this realm. (A realm is a collection of user names and their access levels.) The name will be used in the prompt the browser displays when asking the user for a user name and password.
- **User Names** - Shows the users that are currently defined in this realm. Press **Add User** to add a new user. Select a user name in the list and press **Delete User** to remove that user.
- **Password** – The password for the selected user.

- **Access Level** – Sets the access level for the selected user.
  - **None** – No access is allowed. The account is disabled.
  - **Read Only** – Allowed to view data. No values can be changed.
  - **Read/Write** – Allowed to view data, make changes to writeable values in a datalogger's Public or Status table or a virtual data source, and set a dataloggers clock.
  - **All** – Allowed to view data, make changes to writeable values in a dataloggers Public or Status table or a virtual data source, set a dataloggers clock, use the API FileControl command, and publish websites.

After defining the desired user names and access levels, click **Apply** to apply the changes. You can also click **Cancel** to discard the changes. Click **Read file** to read a .csipasswd file into the **Website .csipasswd File Editor**. Click **Save File** to save the contents of the **Website .csipasswd File Editor** to a .csipasswd file.

14.4.1.2 Using the Web Publisher

To create or edit a .csipasswd file from the Web Publisher, select a website from the **Websites** list. You will be creating or editing the .csipasswd file for the subdirectory shown in Remote Folder. If the Remote Folder field is blank, the website is being published to the root directory and you will be editing or creating the root .csipasswd file. Select the **Send new password file** check box and then press the **Edit Password File** button to bring up the **Website .csipasswd File Editor**. Define the user names and access levels you want to be available for this website and press the **OK** button. Press the **Publish Website** button to publish the website and send the new password file.

> Notes: If you are creating a root .csipasswd file from the Web Publisher, you will need to enter the default admin user ID and password described above in the User ID and Password field to publish the website and send the new password file. When the website is published again in the future, you will use an "all" access level user ID and password from the root .csipasswd file to publish to the root directory.

> If you are creating a .csipasswd file for a remote folder from the Web Publisher, you will need to enter an "all" access level user ID and password from the root .csipasswd file (or the default admin user ID and password described above if there is no root .csipasswd file) to publish the website and send the new password file. When the website is published again in the future, you will use an "all" access level user ID and password from the remote folder's .csipasswd file to publish to the remote folder.

14.4.2 Datalogger Websites

Device Configuration Utility (DevConfig must be used to create the initial .csipasswd file for a datalogger. The .csipasswd file is created by connecting to the datalogger in DevConfig and then pressing the **Edit .csipasswd File** button on the **Net Services** tab. Define the user names and access levels you want to be available and press the **Apply** button. Pressing the **Apply** button sends the file to the datalogger.

Once a .csipasswd file resides on the datalogger, it can be overwritten from the Web Publisher. Select the datalogger website from the **Websites** list. Select the **Send new password file** check box and then press the **Edit Password File** button to bring up the **Website .csipasswd File Editor**. Define the user names and access levels you want to be available and press the OK button. Press the **Publish Website** button to publish the website and send the new password file.

When you press the OK button on the **Website .csipasswd File Editor** dialogue box in Web Publisher, this file is stored to your computer. When you press the **Publish Website** button, this file will be sent to the datalogger and will overwrite the current .csipasswd file. Note that when you press the **Edit Password File** button, you are editing the file stored on your computer, not the one stored on the datalogger. This file does not contain any changes made using DevConfig. Therefore, if you have made changes to the .csipasswd file from DevConfig, they will be overwritten when you press the **Publish Website** button.

14.5 API Commands

The CSI Web Server supports an HTTP API interface for accessing data from data sources defined in the RTMC projects running on the web server. These commands can also be used to access data directly from dataloggers.

See Web Server/API Commands in the CRBasic Editor help for more information.

15. Acknowledgments

OPENSSL

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This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

cURL

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Scintilla is a free source code editing component. It is used in RTMC in the Expression Builder.

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