

# INSTRUCTION MANUAL



**RTMC Pro**  
Revision: 11/18

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# RTMC Pro

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## 1. Introduction

The RTMC (Real-Time Monitor and Control) Pro software provides the ability to create and run graphical screens to display real-time data as LoggerNet or RTDAQ collects it from the dataloggers. Controls are also provided to view and set datalogger ports and flags, as well as input locations or variables. In LoggerNet, RTMC Pro can combine data from multiple dataloggers on a single display. In RTDAQ, RTMC Pro projects are limited to a single datalogger. As LoggerNet or RTDAQ collects data from the dataloggers, the displays in RTMC Pro are automatically updated.

RTMC Pro is used to create and edit a real-time graphic display screen to display the data collected from the dataloggers. Once the screen is built and saved as a project, \*.rtmc2, the screen can be displayed using RTMC Run-time. This allows graphic display screens to run on other computers with just the RTMC Run-time program.

RTMC Pro is an enhanced version of the standard RTMC Development that ships with LoggerNet and RTDAQ. 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, databases, HTTP dataloggers, virtual data sources, and additional LoggerNet servers as data sources for RTMC Pro projects. See Section 2.5, *Managing Data Sources (p. 30)*, for more information.

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### 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.

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For help in getting started with RTMC, there is a tutorial provided on the Downloads page of our website, [www.campbellsci.eu/downloads](http://www.campbellsci.eu/downloads). The tutorial is done using standard RTMC development, but the same concepts apply to RTMC Pro.

The same RTMC Run-time is used to run projects developed in either RTMC Pro or the standard RTMC Development.

One copy of RTMC Run-time is provided 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, additional copies to run on remote machines can be purchased separately.

Also included with RTMC Pro is the CSI Web Server. This allows you to view your RTMC projects using a web browser. See Section 4, *CSI Web Server (p. 42)*, for more information.

**NOTE**

In LoggerNet, 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. It can also be done from RTMC's **Project | Configure Override Scheduled Collection** menu item.

In RTDAQ, RTMC performs a manual poll to update project data when RTDAQ is connected to the datalogger. Therefore, RTDAQ must be connected to the datalogger for RTMC's display to be updated. You can override the default one-second interval from the **Project | Configure Override Scheduled Collection** menu item.

## 1.1 What's New in RTMC Pro 4.3.2?

RTMC Pro 4.3.2 is mainly a maintenance update focusing on performance improvements and bug fixes. In addition, the ability to send emails through Campbell Scientific's Email Relay service rather than traditional SMTP has been added.

## 2. Development Mode

RTMC Pro is a graphic display editor that allows the user to easily place graphical components on the display screen and associate them with data values.

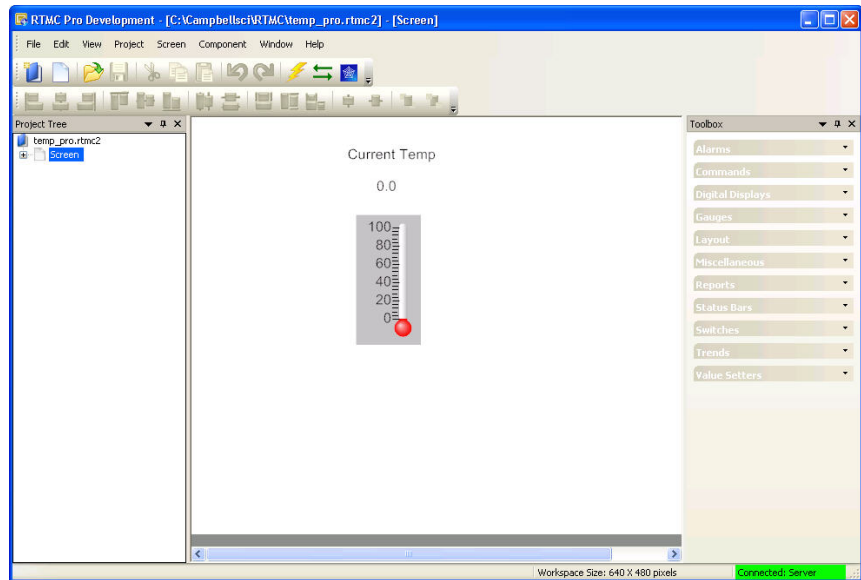
The RTMC Pro window, as shown below, has three sections.

**Project Tree** – The panel on the left shows the hierarchy of the display components and how they are associated with each other. Every component of the display screen is shown in this list and it provides a shortcut to get to any graphical component.

**Project Workspace** – The middle panel is the display screen workspace. The graphic components are placed in the workspace, as they should appear on the final display.

**Component Toolbox** – The toolbox on the right contains the display screen components that can be placed in the workspace. Selecting a component and clicking in the workspace places the component and brings up the Properties window for that component.

RTMC Pro was designed to be easy and straightforward to use. Experiment with different combinations and options to get the display results you are looking for.



As seen in the example screen above, different types of graphical components can be combined to create an attractive real-time display. Company logos, maps, or any image stored in a standard graphic file format can be placed on the screen.

Many images have been included with RTMC Pro. The default directory in which these files are stored is C:\Campbellsci\Lib\RTMCMediaLib. Custom images can be used as well; these should be placed in the media library directory to make them available for RTMC Pro's use.

## 2.1 The RTMC Pro Workspace

The RTMC Pro workspace is a container for holding one or more display screens. As new display screens are added (**Project | Add New Screen**) they appear in the project tree. In RTMC Run-time, each screen will be displayed as a tab. The size of the workspace and the run-time window can be changed by selecting **Project | Configure Workspace**. Refer to Project Menu in Section 2.3, *Functions Available from the RTMC Pro Menus (p. 11)*, for additional information on sizing options.

## 2.2 Display Components

Display components are the objects that are used to display data. Available components for each component type can be displayed by clicking the arrow on each tab in the Component Toolbox. To add a component to the workspace, click an item on the Component Toolbox and then click anywhere in the workspace or click and drag to the desired size. The component's Properties window is automatically displayed when the object is first placed in the workspace. The Properties window is used to customize colours, scale values, text, etc., and to assign the data value to be displayed by the component.

**NOTE**

When a display component is linked to a data value, if **Use Live Data** is active, the value will be automatically updated on the display if data is available. (Refer to View Menu in Section 2.3, *Functions Available from the RTMC Pro Menus (p. 11)*, for more information on **Use Live Data**.)

In LoggerNet, if data collection is not set up for the station, the values will not update and an exclamation point will appear in the upper right corner of the component. Data collection can be set-up through the LoggerNet Setup window or with RTMC's **Project | Configure Override Scheduled Collection** menu item. Input locations, ports and flags for mixed-array dataloggers are collected at the scheduled collection interval or any time a manual collection is done. The Public table must be enabled for scheduled collection to display these values for table-data dataloggers.

In RTDAQ, if RTDAQ is not connected to the station, the values will not update and an exclamation point will appear in the upper right corner of the component.

As changes are made to component properties, they appear on the screen in real-time. After a component's properties have been set, select **OK** to keep the changes and close the Properties window. Once the link to the data value has been applied, if there is data available from LoggerNet or RTDAQ for the component, the value on the display will update, if **Use Live Data** is active.

To make changes in display component settings, the Properties window can be opened by double-clicking the component or right-clicking the component and then choosing Properties from the drop-down menu. 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 work area (and OK has not been pressed), the display component will be removed from the screen.

### Available Components

The following is an overview of the display components available. The online help has detailed information about each of the components and their properties.

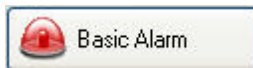
#### All Tabs



**Pointer**

Returns the cursor to a normal selection tool.

#### Alarms Tab



Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be disabled 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 opened. All events (audio, email, run/open) and alarm acknowledgement

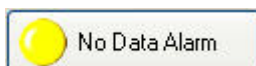
occur only when running the project in RTMC Run-time or CSI Web Server.



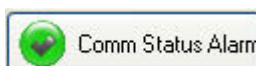
Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be silenced by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified 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.



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 disabled 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 opened. All events (audio, email, run/open) and alarm acknowledgement occur only when running the project in RTMC Run-time or CSI Web Server.



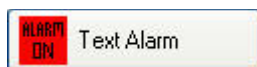
Provides visual and/or audible notification that no data has been received from a selected table for a specified period of time. An audible alarm can be disabled by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified file to be opened. All events (audio, email, run/open) 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 disabled 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 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 temporarily collect areas in order to update the real-time displays.

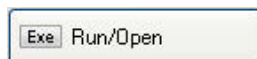


Provides visual and/or audible notification that a data value has exceeded a defined limit. An audible alarm can be disabled by right-clicking the component with your mouse and selecting **Acknowledge Alarm**. An alarm can also cause an email to be sent to a specified email address and/or a specified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

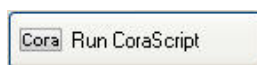


Provides visual and/or audible notification of the state of a data value. Default states include Off, Warning and Critical. These can be changed and additional states can be added. An image, sound file, email, and/or run/open can be defined for each state. An audible alarm can be disabled by right-clicking 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.

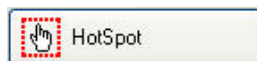
### Commands Tab



Provides a button that will run/open a specified file (\*.exe, \*.bat, \*.doc, etc.) when pressed in run-time mode.

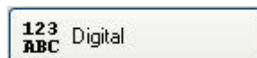


Provides a button that will execute a specified CoraScript command when pressed in run-time mode. CoraScript is a set of commands that can be used to interact with the LoggerNet server. For more information, see RTMC Pro's online help.



Provides a hotspot that will jump to a specified RTMC screen or open a web browser to a specified web address when clicked in the run-time mode. In RTMC Run-time the hotspot will be invisible. The only indication of a hotspot will be the changing of the cursor to a hand (hand icon) when over the hotspot. A label, button, or other component can be used to indicate what the hotspot will do when clicked.

### Digital Displays Tab



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 table (such as time of minimum or maximum).



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).

### Gauges Tab



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.



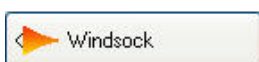
Rotary Gauge

Displays the selected data value on a rotary gauge.



Compass

Provides an eight-point compass on which to display data.



Windsock

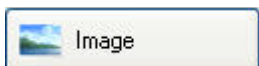
Displays wind speed and wind direction from a datalogger table in the form of a windsock.

### Layout Tab



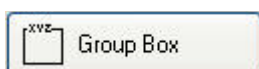
Label

Displays a static text string that can be used to label other components.



Image

Allows you to place a static image on the display.



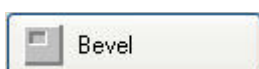
Group Box

Allows you to place a box on the display in order to group components together.



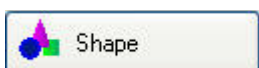
Panel

Places a panel on the display that can be used to group components together.



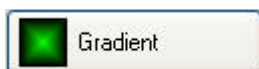
Bevel

Places a beveled edge on the display that can be used to bevel the edges of other components.



Shape

Allows you to place a circle, ellipse, square, rectangle, or rounded rectangle on the display.



Gradient

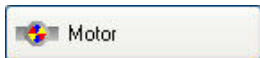
Allows you to place a gradient on the display.



Segmented Label

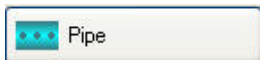
Displays a static text string that can be used to label other components or simply add text to the project.

### Miscellaneous Tab



Motor

Provides a motor that can be depicted as on or off based on a data value.



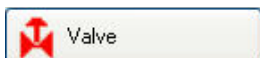
Pipe

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 opened or closed based on a data value.

### Reports Tab



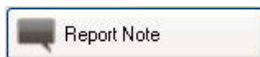
Report Range

Provides a button bar that allows the user to customize the date range of their report. It also provides buttons in run-time to step through data or jump to a specific date.



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.



Report Note

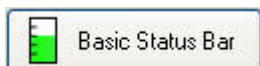
Allows the user to insert custom notes at run-time before the report is exported. Notes are temporary and are lost when the report is closed.



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 setup 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.

### Status Bars Tab



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.

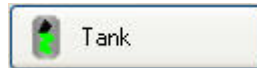


Thermometer

Displays the data value on the image of a thermometer. In run-time mode, max and min

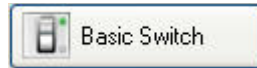


pointers can be reset by right-clicking the component.



Displays the data value as the level in a tank.

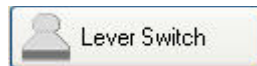
### Switches Tab



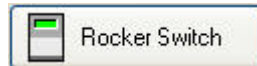
Indicates the state of a port, flag, input location, or public variable. A 0 is considered Off (false); any non-zero number is considered On (True). In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.



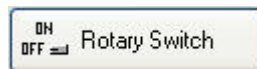
Indicates the state of a port, flag, input location, or public variable by the colour of an LED. A 0 is considered Off (false); any non-zero number is considered On (True). In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.



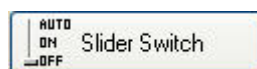
Indicates the state of a port, flag, input location, or public variable by the position of a lever. A 0 is considered Off (false); any non-zero number is considered On (True). In run-time mode, right-click a switch to change its state. The option to change the state of a switch with a double-click or a single-click can be enabled in the Properties window.



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.

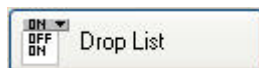


Indicates the state of a port, flag, input location, or public variable by the position of a rotary dial. The default switch has two positions. A 0 is considered Off (false); any non-zero number is considered On (True). Other positions can be added. In run-time mode, click on a position to change to that state.



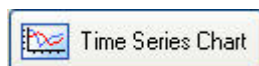
Indicates the state of a port, flag, input location, or public variable by the position of a horizontal or vertical bar. The default switch has two positions. A 0 is considered Off (false); any non-zero number is considered On (True). Other positions can be

added. In run-time mode, click on a position to change to that state.



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.

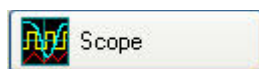
### Trends Tab



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, it is possible to zoom in by clicking and dragging a box around the desired zoom area. Also, in run-time mode, right-clicking the chart will bring up a menu that allows the chart to be printed, copied, or exported.



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, it is possible to zoom in by clicking and dragging a box around the desired zoom area. Also, in run-time mode, right-clicking the chart will bring up a menu that allows the chart to be printed, copied, or exported.



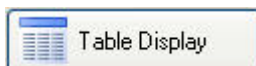
Displays one or more series on a chart. The time stamp on the X axis reflects the data timestamp. The Scope is similar to the Time Series Chart, but has the appearance of an oscilloscope screen and has the ability to display data at a faster rate. In run-time mode, right-clicking the Scope will bring up a menu that allows the Scope to be printed, copied, or exported.



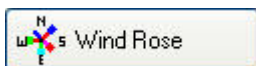
Displays Rainflow data on a chart. In run-time mode, a portion of the chart can be “zoomed in on” by dragging a frame around the area to be viewed. Right-clicking the chart will bring up a menu that allows the chart to be printed, copied, saved, or zoomed to all data. If the **Allow Run-time Customization** 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 Rainflow Chart’s properties.

Note: RTMC Pro does not create rainflow data from time series information. It only displays rainflow data. Rainflow data is created by using

the CRBasic Rainflow or RainflowSample instruction in a CRBasic program Data Table.

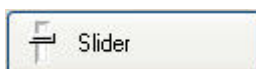


Displays the data from a datalogger table in a row and column format. In run-time mode, right-clicking the table will bring up a menu that allows the table to be printed, copied, or exported.

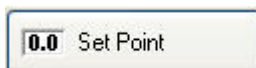


Displays wind speed and wind direction from a datalogger table in the form of a wind rose.

### Value Setters Tab



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.

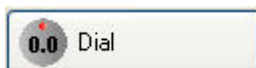


Like the Digital component, depicts the selected data value as a numeric value, text string, or Boolean. However, in run-time mode, a data value can also be set to a new value by double-clicking the component and entering a new value in the resulting dialogue box.



In 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.



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 **Help** button (?) in the top right-hand corner of the dialogue box.

## 2.3 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.

### **File Menu**

**New Project** starts a new RTMC Pro project. The currently opened project will be closed. If there are changes that have not been saved, the user will be prompted to save changes.

**Open** brings up the File Open dialogue to open a previously saved project.

**Save** will save the changes in the current project to the RTMC Pro project file. If this is the first time the project has been saved, a Save As dialogue will open to select the file name and directory for the project file.

**Save As** brings up the Save As dialogue to save the current project with another name or in a different directory.

**Run Project** displays the current project in a run-time window.

**Save and Run Project** saves the changes in the current project and displays it in the run-time window.

### **NOTE**

---

This option is not available when RTMC Pro is run from inside RTDAQ.

---

**Publish to Web** opens the Web Publisher which allows you to publish your project to the web. See Section 4, *CSI Web Server (p. 42)*, for more information.

**Exit** closes RTMC Pro. If there are unsaved changes, the user will be prompted to save changes before exiting.

### **Edit Menu**

**Cut/Copy/Paste** are standard editing operations to add selected objects to the Windows clipboard and paste them into RTMC Pro or other applications.

**Undo** cancels the last change made to the project.

**Redo** repeats the change that was just undone.

**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 if the find and replace applies to the entire project, only the current screen, or only the current component.

**Select All** selects all of the components in the workspace. The components can then be cut, copied, deleted, etc.

**Clear Selection** clears the selection of components currently highlighted on the active screen.

The **Preferences** menu item is used to change some global settings that affect all projects in RTMC Pro. The *Visual Theme* determines the look and feel of the application (i.e., colours, button appearance, etc.). The *Working Directory* is the directory in which to store RTMC Pro project files. By default, this is

C:\Campbellsci\RTMC. Press the **Change Default Font** button to set a new font for components that have text (numeric value text, chart titles and axes labels, etc.).

Component summaries (“tooltips”) are small boxes that are displayed on the screen beside a component when your mouse cursor hovers over the component for a few seconds. The box displays information on the type of component, the data value linked to the component, images used, series plotted, etc. Select the **Show Component Summaries** box to display these hint boxes or clear the box to turn off the display of the information.

The *Grid Options* settings allow you to turn on or disable the display of a grid in the project workspace and lets you set the size of the grid.

With the *Graphics Options* settings, you can control the maximum number of times the RTMC screens will be updated per second, disable animation when a data value changes, and specify whether high quality or high speed is more important. (Disabling animation disables the smooth transition between values on gauges, status bars, etc. When a data value changes, the component will jump to the new value. This greatly enhances performance when dealing with fast data or large, complex projects.)

The **Customize** menu item brings up a dialogue box which allows you to customize RTMC Pro’s toolbars and menus.

### **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.

### **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 project. In this mode, you must use the right-click menus to add components and perform other functions available from RTMC’s toolbar. Press the Esc key to exit this mode.

### **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 .

**Show Project Tree** hides or displays the Project Tree (left pane of the default window).

**Show Toolbox** hides or displays the Component Toolbox.

**Show Layout Toolbar** hides or displays the Layout Toolbar.

**Show Tabs** hides or displays the tabs at the top of the RTMC workspace which allow the user to switch between screens. When tabs are not shown, you can switch between screens by selecting a screen from the **Project Tree**. (Note this menu item is disabled for projects with only one screen.)

**Show Standard Toolbar** hides or displays the Standard Toolbar.

**Show Status Bar** hides or displays the Status bar at the bottom of the screen. The Status Bar provides hints on objects, window size, and the server connection.

**Show Grid** hides or displays a grid background for the workspace.

### ***Project Menu***


Project Menu options work with the whole project or workspace.

**Configure Workspace** allows you to specify the size of both the development workspace and the RTMC Run-time screen. For **Development**, the size of the RTMC Pro workspace is set by choosing a size from the drop-down list. If you choose custom, you will be asked to specify the width and height in millimeters, inches, or pixels. For **Run-time**, when **Auto Size** is selected, the size of an RTMC display is set automatically by dragging the boundaries of the screen to a new size. The components will resize to match the new screen size. The aspect ratio of the components will be maintained only if **Lock Aspect Ratio** is selected. When **Fixed Size** is selected, the screen size is fixed. It is determined by the size set in the development mode.

**Manage Data Sources** opens a dialogue box which allows you to manage the data sources for your RTMC project. See Section 2.5, *Managing Data Sources* (p. 30), for additional information.

**Configure Alarm Log** 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 or time interval of alarm log files, and whether a text entry is required for alarm acknowledgement. The text entry will be included in the log file. It can be used

to log information about who acknowledged the alarm and other comments. The alarm log will be an XML document. See Alarm Log Structure in the online help file for more information about the XML structure of the alarm log.

**Configure Auto Tabbing** lets you enable or disable the automatic switching between project tabs when an RTMC form is run, and set the rate at which a new tab will be displayed. When RTMC is in AutoTab mode, it will display a tab for a set amount of time and then display the next tab. If a screen is interacted with or a different tab is selected, auto tabbing stops and a button appears by the menu, , that can be clicked to resume tabbing.

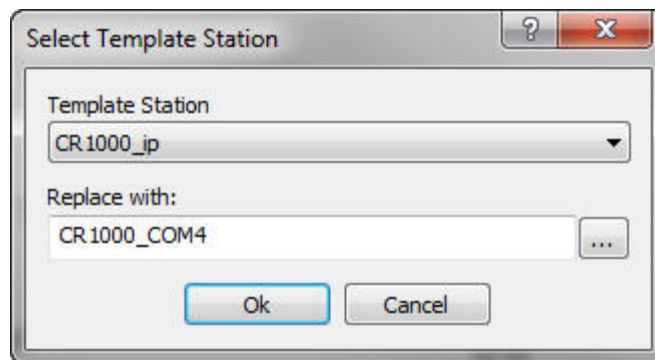
**Configure Snapshot & FTP** opens a dialogue box that allows the configuration of a snapshot of the current RTMC Pro state. A snapshot is a \*.png file of the current state. It can be configured to include selected screens or only selected components. For a snapshot of selected screens, a file will be saved for each screen with a filename of *screenname.png*. For a snapshot of only select components, a file will be saved for each component with a filename of *componentname.png*. A snapshot will be saved in Run-time to the designated directory at the specified interval. It can also be transferred to a designated FTP server on the same interval. Only the most current snapshot will be kept. It will be overwritten each time a new snapshot is saved.

**Configure Override Scheduled Collection** opens a dialogue box that allows the collection interval to be specified. In LoggerNet, this data collection will be in addition to the scheduled collection specified in LoggerNet's Setup window. In RTDAQ, this will override RTDAQ's automatic one second polling to update the project data.

**Configure Email Profiles** opens a dialogue box that allows you to configure email profiles that allow you to easily use the same SMTP Server, Username, Password, From, To, Cc and Bcc fields for multiple alarms and/or Report Export components. Alternatively, 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.

**Load as Template** 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.

**Add New Screen** adds a new screen to the project. Each screen appears in the project tree. In run-time mode, each screen appears as a tabbed page on the display. When the project is run the user can click the tab to bring each screen to the front.

**Change Screen Order** allows you to change the order that the screens will appear. In development mode, this is the project tree order. In run-time mode, it is the order of tabs, left to right.

### **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.

**Screen Properties** brings up the dialogue to choose the background image and colour for the current screen.

**Delete Screen** removes the current screen from the project. If there are components on the screen, they will also be removed.

**Rename Screen** brings up a dialogue to change the name of the current screen. This is the name that appears on the screen tab in run-time mode.

**Duplicate Screen** duplicates the current screen and all of its components on a new screen.

**Paste** is a standard editing operation to paste an object from the Windows clipboard into RTMC Pro.

**Insert New** brings up a submenu allowing you select one of the components to insert on the screen. When the component is added to the screen the Properties window for the new component will come up.

### **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, Centre, and Order) are also available from the Layout Toolbar.

**Properties** brings up the Properties window for the selected component.

**Delete Selection** removes the selected component(s) from the workspace.

**Lock Aspect Ratio** allows you to drag the object to a new size without distorting the look of the component. If the height of a component is changed, the width will automatically be changed as well. By default, Lock Aspect Ratio is off for all components.

**Rename Component** lets you change the name of the component in the list tree. If snapshots are configured, this will affect the name of the snapshot.

**Manual Resize** allows the user to set the size and position of the selected component.

**Cut/Copy/Paste** are standard editing operations to add selected objects to the Windows clipboard and paste them into RTMC Pro or other applications.

**Align** provides some options for lining up a group of components with the first component selected. Select two or more components by using the cursor to click and drag a box around the desired components. Components can also be selected by selecting the first component and then selecting the other components while holding down the <ctrl> key. With the components selected choose one of the alignment options. The components will be aligned based on the last component selected. The last component is identified by the dark blue handles. The other selected components have handles with blue outlines.

---

**NOTE**

Be careful about the alignment you choose. Selecting **Top Align** for a group of components that are arranged vertically will cause all the components to end up on top of each other. This can be fixed by choosing Undo from the Edit menu.

---

**Space Evenly** will evenly distribute the selected components horizontally across or vertically down the page.

**Make Same Size** allows you to set two or more objects to the same overall size, width or height as the first object selected. Select one or more components by using the cursor to click and drag a box around the desired components. The components can also be selected by selecting the first component and then selecting the other components while holding down the <ctrl> key. The last component selected will be the basis on which the other components are sized. The last component is identified by the dark blue handles. The other selected components have handles with blue outlines.

**Centre** will centre the selected component(s) either vertically or horizontally on the page.

**Order** is used to manage the position of graphic objects on the workspace. This is often referred to as Z order. Displays are often a combination of a background graphic and data display objects in front. Objects added to the

workspace are, by default, placed on top of any existing objects. These operations are used to determine the order in which objects are displayed. This is important when layering transparent objects.

**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 grouping by selecting this menu item.

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

### **Window Menu**

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

### **Help Menu**

**RTMC Pro Development Help** provides access to help for all of the features of RTMC Pro.

**Keyboard Map** opens a dialogue box from which you can print RTMC Pro's keyboard shortcuts or copy them to the Windows clipboard.

**About RTMC Pro Development** provides version and copyright information.

## **2.4 Expressions**

RTMC Pro has a built-in expression interpreter that allows the user to scale the data or create displays based on calculations of a data point.

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 the calculator button next to that field to bring up the Expression Builder. See Section [2.4.12, Expression Builder](#) (p. 27).

## 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:CR
1000.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,Order
Collected);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");ValueS
ynch(air_temp_2,"Server:CR1000_2.SECOND.air_temp"); (air_temp_1 +
air_temp_2) / 2
```

#### NOTE

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 RTMC's online help.

#### NOTE

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

#### NOTE

An expression can include data values from multiple dataloggers.

**NOTE**

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

## 2.4.1 Operators

<u>Operator</u>	<u>Description</u>
( )	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

## 2.4.2 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**.

## 2.4.3 Predefined Constants

<u>Constant</u>	<u>Description</u>
e	2.718282
PI	3.141593
True	-1
False	0
NOPILOT	NAN
NAN	NAN (not a number)
INF	INF (non-finite number)

## 2.4.4 Predefined Time Constants

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

<u>Constant</u>	<u>Description</u>
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

## 2.4.5 Functions

The following functions show the use and placement of the numbers the function operates on. The parentheses are not required unless there are two or more parameter values (e.g., ATN2(y,x)).

<u>Function</u>	<u>Description</u>
ABS(x)	Returns the absolute value of a number.
ACOS(x)	Returns the arc cosine of a number.
ASIN(x)	Returns the arc sine of a number.
ATN(x)	Returns the arc tangent of a number.
ATN2(y,x)	Returns the arctangent of y/x.
CEILING(x)	Rounds a number up to an integer value.
COS(x)	Returns the cosine of a number.
COSH(x)	Returns the hyperbolic cosine of a number.
CSGN(x)	Changes the sign of a number by multiplying by -1.0.
EXP(x)	Returns e raised to a power.
FIX(x)	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(x)	Rounds a number down to an integer value.
FRAC(x)	Returns the fraction part of a number.
FormatFloat(x,s)	Converts a floating point value, x, into a string with format defined by the format string, s.
FormatFloatL(x,s)	Converts a floating point value, x, into a string with format defined by the format string, s. Applies any rules associated with the locale of the computer running RTMC.

INT(x)	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(x)	Determines if a value is finite.
LN(x)	Returns the natural log of a number.
LOG(x)	Returns the natural log of a number.
LOG10(x)	Returns the logarithm base 10 of a number.
(x)MOD(y)	Performs a modulo divide of two numbers.
(x)PWR(y)	Raises constant x to the power of y.
RND	Generates a random number.
ROUND(x)	Rounds a number to a higher or lower integer value.
ROUND(x,y)	Rounds a number to a higher or lower number.
SGN(x)	Used to find the sign value of a number (-1, 0, or 1).
SIN(x)	Returns the sine of an angle.
SINH(x)	Returns the hyperbolic sine of a number.
SQR(x)	Returns the square root of a number.
TAN(x)	Returns the tangent of an angle.
TANH(x)	Returns the hyperbolic tangent of a number.

### 2.4.6 Logical Functions

The following functions perform logical operations.

(x)AND(y)	Performs a logical conjunction on two numbers.
(x)EQV(y)	Performs a logical equivalence on two numbers.
IIF(x,y,z)	Evaluates an expression (x) and returns one value if true (y), a different value if false (z).
(x)IMP(y)	Performs a logical implication on two numbers.
NOT(x)	Performs a logical negation on a number.
(x)OR(y)	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(x)	Performs a logical exclusion on two numbers.

### 2.4.7 String Functions

The following functions can be used to manipulate strings. See the online help for information about the parameters required for each function.

<b><u>Function</u></b>	<b><u>Description</u></b>
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 subtracting the characters in one string from 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.

## 2.4.8 Conversion Functions

The following functions perform a type conversion on a value. See the online help for more information.

<b><u>Function</u></b>	<b><u>Description</u></b>
ToDate	Converts a value to a date.
ToFloat	Converts a value to a floating point number.
ToInt	Converts a value to an integer.

## 2.4.9 Time Functions

The following functions involve a timestamp or the system time. See the online help for information about the parameters required for each function.



<u>Function</u>	<u>Description</u>
FormatTime	Produces a string that formats a timestamp in the manner specified.
SetTimestamp	Returns the value specified and sets its timestamp to the timestamp 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.

## 2.4.10 Start Option Functions

The following functions determine when RTMC begins processing data. See the online help for information about the parameters required for each function.

<u>Function</u>	<u>Description</u>
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.
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 in the source table.
StartAtTime	Attempts to start processing at the record that is closest to the specified timestamp.
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.
Report Offset	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 reports start time.

## 2.4.11 Statistical Functions

The following functions involve the state of a data value over a period of time. See the online help for information about the parameters required for each function.

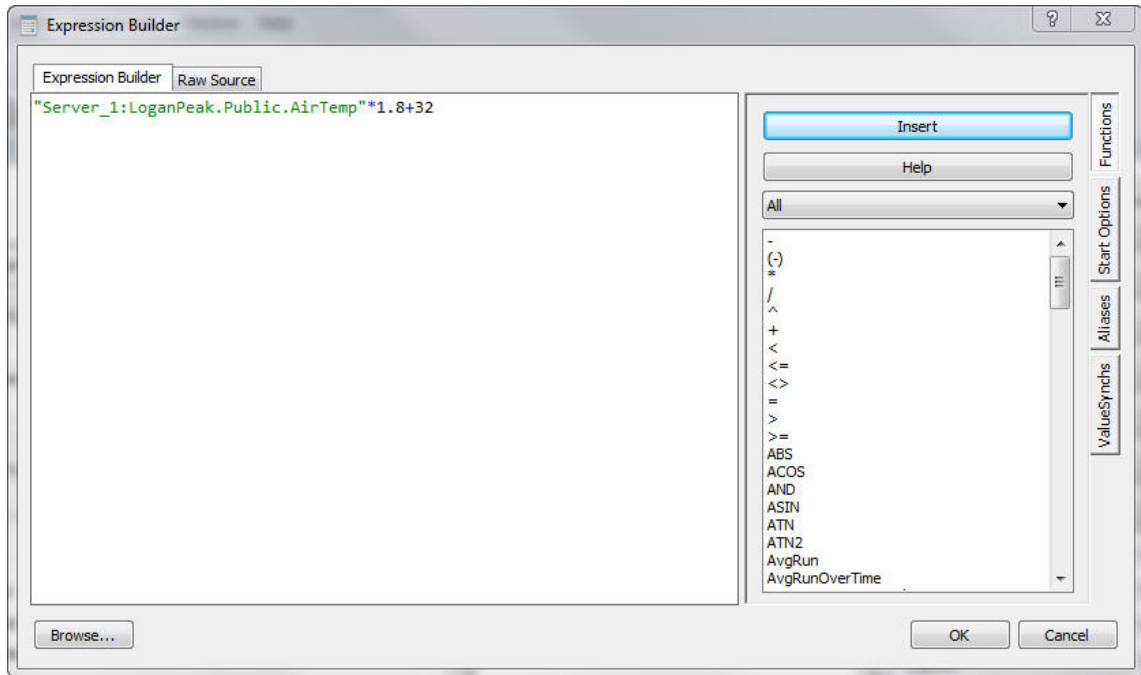
<b><u>Function</u></b>	<b><u>Description</u></b>
AvgRun	Returns a running average of up to the last specified number of values.
AvgRunOverTime	Returns the running average of the specified value over time.
AvgRunOverTimeWithReset	Returns the running average of the specified value since the function was 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.

## 2.4.12 Expression Builder

The Expression Builder is opened by pressing the calculator button next to a **Select Data** field. It can be used to create complex expressions containing functions, start options, aliases, and/or valuesynchs.



The **Expression Builder** tab is used to build the expression. You can type in this window directly, press the **Browse** button at the bottom to browse your data sources for a data value to be added to the expression, and use the **Functions** side 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*

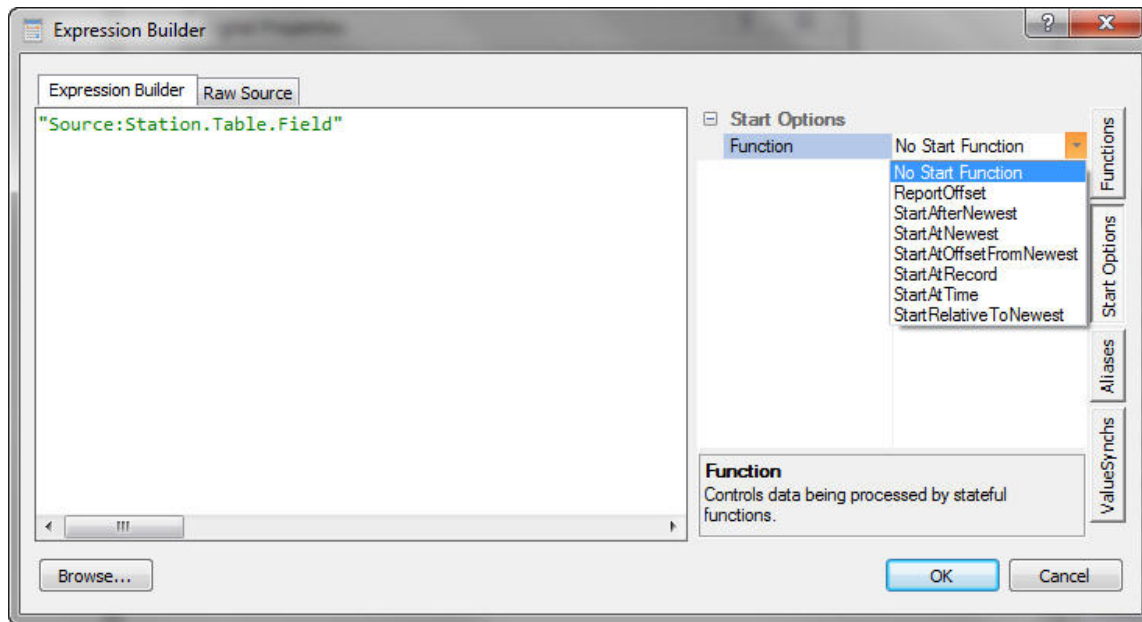
Use the **Functions** side tab to add functions to the expression. Place your cursor where you want the function to be added. Then double-click on the function in the list, select the function and press the **Insert** button, or select the function, right-click, and select **Insert**. The parameters 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** side 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.

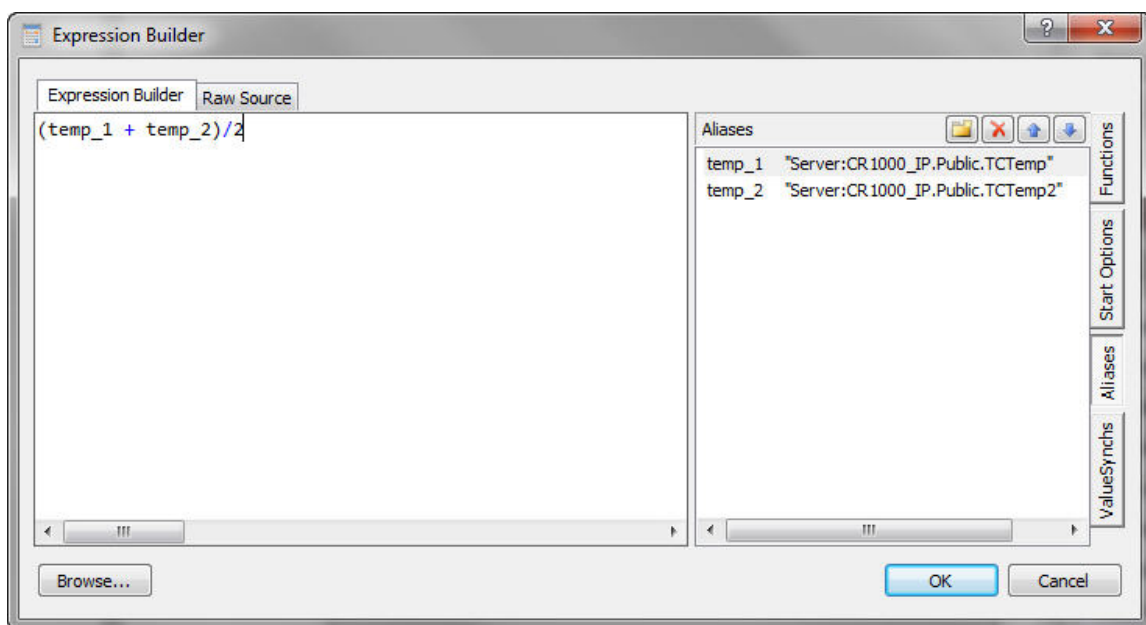
All other parameters must be typed in directly.

**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 alias(s) to be used in the expression.



On the **Aliases** side 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**.

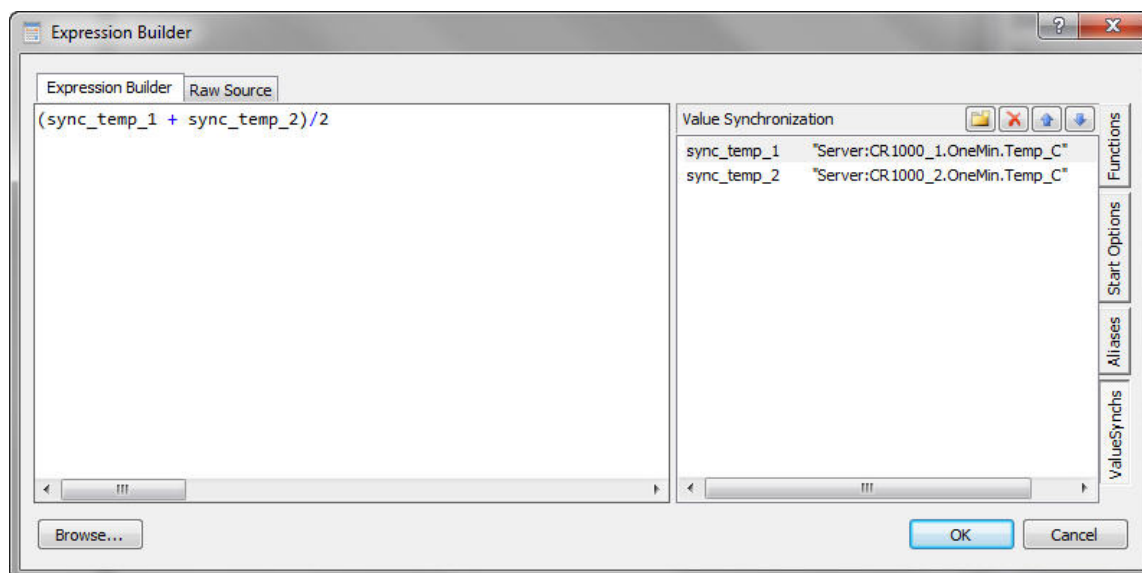


### *ValueSynch*

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** side 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**.



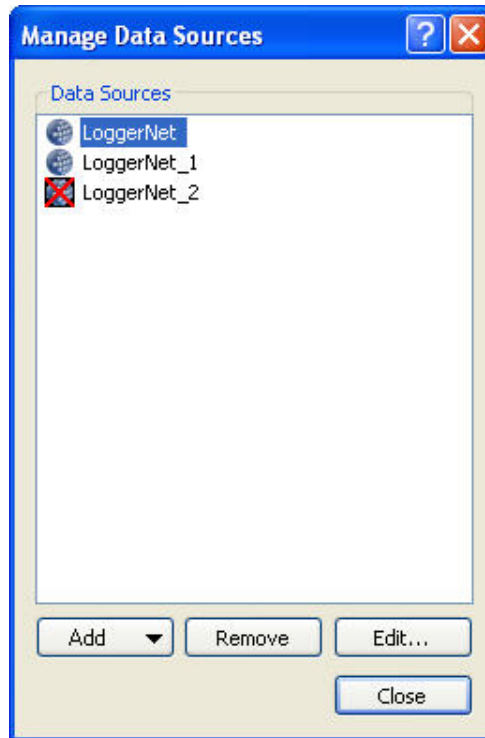
## 2.5 Managing Data Sources

When RTMC is run from LoggerNet, the **Project | Manage Data Sources** menu item allows the user to specify additional communications server(s), data file(s), databases, HTTP dataloggers, and/or virtual data sources to be used as data sources in RTMC. Each communications server, data file, 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.

A server, data file, database, HTTP datalogger, or virtual data source can be added by pressing the **Add** button, selecting the appropriate option and filling out the resulting dialogue box as described below.

A server, data file, database, HTTP datalogger, or virtual data source can be removed by selecting it and then pressing the **Remove** button. The **Edit** button can be used to bring up the Server Data Source, File Data Source, Database Data Source, HTTP Datalogger Source, or Virtual Data Source Properties dialogue box and make modifications. Note that if you change the name of a 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 Pro does not allow you to specify additional data sources. The only data source is LocalHost. Therefore, the **Project | Manage Data Sources** menu item is not available.

### 2.5.1 Server Data Source

To add a server press the **Add** button and select **Add Server Data Source**. A dialogue box will open requiring you to specify the following:

#### 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 software 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. Note that a remote LoggerNet server must have Remote Connection enabled (**Tools | Options | Allow Remote Connections**) for RTMC Pro to be able to display the remote data.

**Username**

Your username on the communications server.

**Password**

Your password for the communications server.

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**NOTE** 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.

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**NOTE** When running RTMC from RTDAQ, the server connection is always to LocalHost. You cannot change the server address.

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**NOTE** 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.

---

## 2.5.2 File Data Source

To add a data file press the **Add** button and select **Add File Data Source**. A dialogue box will open requiring you to specify the following:

**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.

**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 Short Cut.) Type in the name directly or press the button to the right of the field to browse to the label file.*



**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.

**2.5.3 Database Data Source**

To add a database press the **Add** button and select **Add Database Source**. A dialogue box will open requiring you to specify the following:

**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

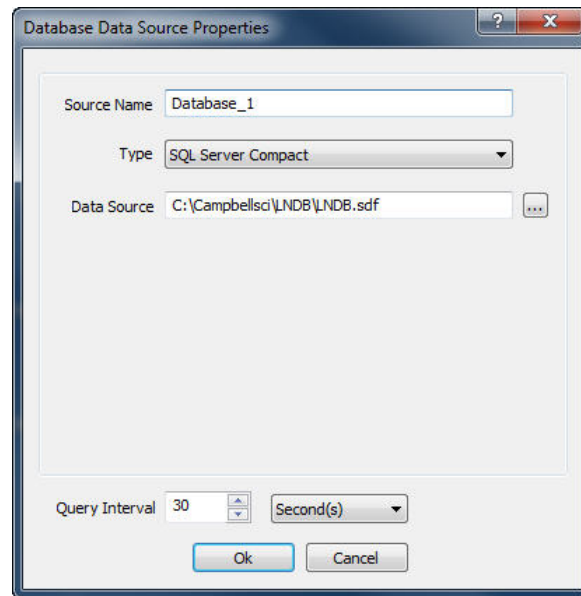
MySQL

**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.

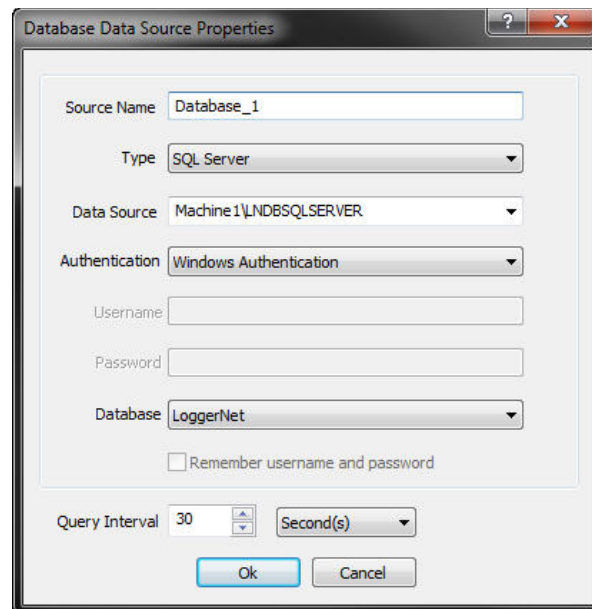
The remaining information changes depending on the database type as described below:

## 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.

#### NOTE

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.

#### NOTE

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 screenshot shows the 'Database Data Source Properties' dialog box. It contains the following fields and controls:

- Source Name:** Text box containing 'Database\_1'.
- Type:** Dropdown menu set to 'MySQL'.
- Data Source:** Dropdown menu set to 'MySQL'.
- ODBC Data Source Administrator:** Button.
- Username:** Text box containing 'login'.
- Password:** Text box filled with dots.
- Database:** Dropdown menu set to '<default>'.
- Remember username and password:** Unchecked checkbox.
- Query Interval:** Spin box set to '30' and a dropdown menu set to 'Second(s)'.
- Buttons:** 'Ok' and 'Cancel' buttons at the bottom.

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.

---

## 2.5.4 HTTP Datalogger Source

To add an HTTP datalogger press the **Add** button and select **Add HTTP Datalogger Source**. A dialogue box will open requiring you to specify the following:

### 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.

---

**NOTE**

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

---



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**NOTE**

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

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### Datalogger Web Username

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

#### NOTE

Username 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.

## 2.5.5 Virtual Data Source Properties

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).

To add a virtual data source press the **Add** button and select **Add Virtual Data Source**. A dialogue box will open requiring you to specify the following:

#### 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 RTMC Pro's online help for examples of using virtual data sources in your project.

## 2.6 Reports in RTMC

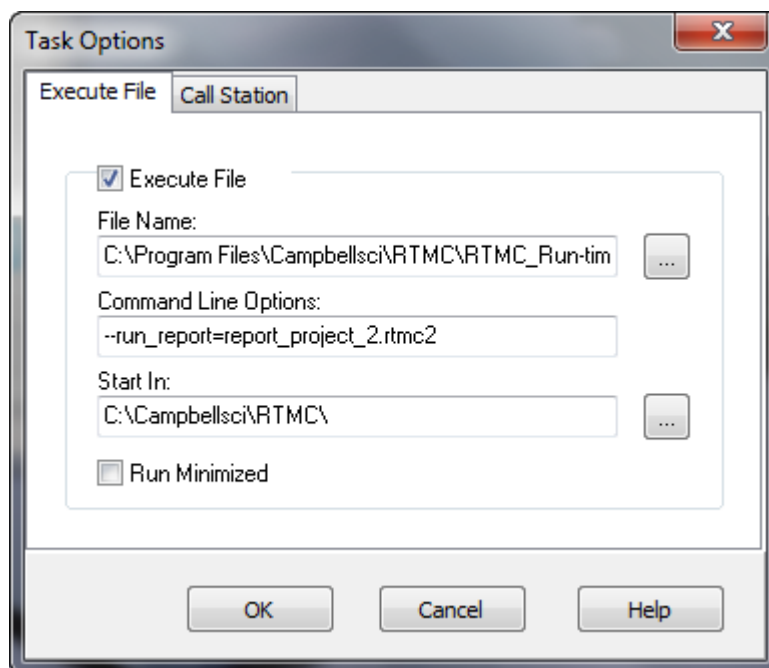
RTMC supports report generation. In order to designate a screen in your RTMC project as a report, you must place a Report Range component on it. The Report Range component lets you configure the data that will be displayed in the report. It also gives you RTMC Run-time options for stepping through data 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\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 in RTMC Pro's online help.





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\Campbellsci\RTMC\RTMC_Run-time.exe"
--run_report="C:\CampbellSci\RTMC\report_project_2.rtc2"
```

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 **Current Interval** () button is also available to jump to the current interval. For an explanation of the data that will be displayed by the **Current Interval**, **Step Forward**, and **Step Backward** buttons based on the report interval and the current PC time, see Report Ranges in RTMC Pro's online help.

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.

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.

---

**NOTE** 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 setpoints. These functions can only be performed when you are viewing live data in the current interval. Also, alarm events (i.e., audio, run/open, send email) are always disabled on a report screen.

---

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**NOTE** 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.


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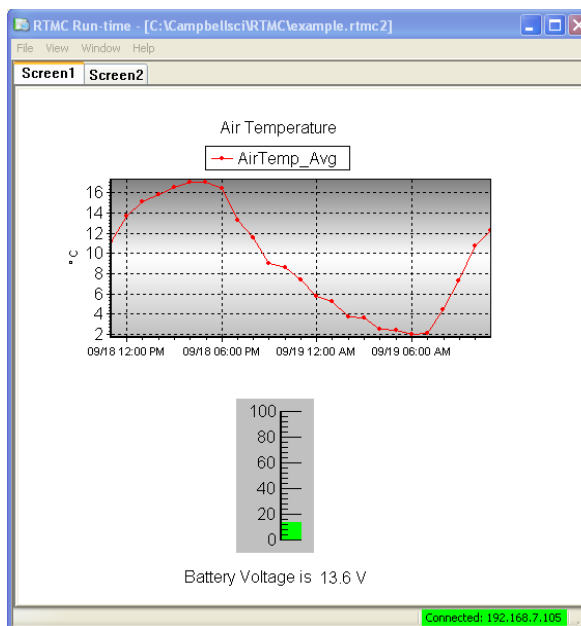
**NOTE** When viewing a report using the RTMC WebServer, you will only be able to look at data for the specified custom range or the current interval depending on the Report Type chosen in the Report Range component. The RTMC WebServer does not support user interaction. Therefore, you will not be able to navigate forward and backward through time, insert notes into the report, or export the report.

---

### 3. 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 using the **File | Save and Run Project** menu or clicking the lightning bolt () 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 box 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 under **All Apps | Campbell Scientific**, click **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.

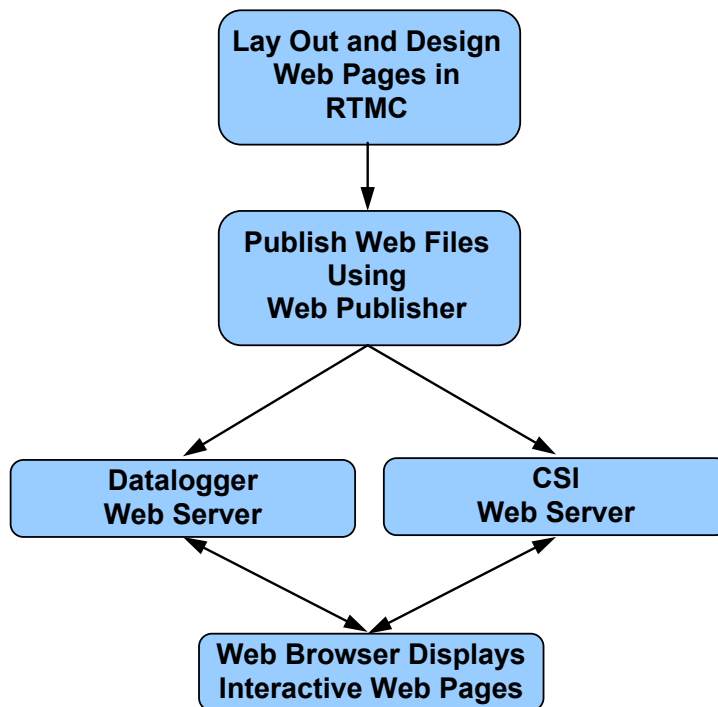
In run-time mode, you can print an image of the RTMC display screen by selecting **File | Print Screen**. A new form to be run is selected under **File | Open Project**.

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**).


## 4. 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.

The following diagram shows the basic steps in creating your web content.



You first use RTMC 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 Website or a Datalogger Website. After filling in the desired settings, press the **Publish Website** button to publish the content.

The CSI Web Server supports the following target browsers at the indicated version or later:

- Chrome 10
- Firefox 4
- Internet Explorer 9
- Opera 11
- Safari 5

**NOTE**


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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.

---

## 4.1 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 **All Apps | Campbell Scientific | CsiWebAdmin**.


### 4.1.1 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 Section 4.3, *Web Security (p. 50)*, 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 Section 4.2, *Web Publisher (p. 45)*, 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**


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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.

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## 4.1.2 Configuration

### 4.1.2.1 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 Section 4.3, *Web Security (p. 50)*, for more information on the function of the root .csipasswd file.

### 4.1.2.2 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.

### 4.1.2.3 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.

### 4.1.2.4 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.

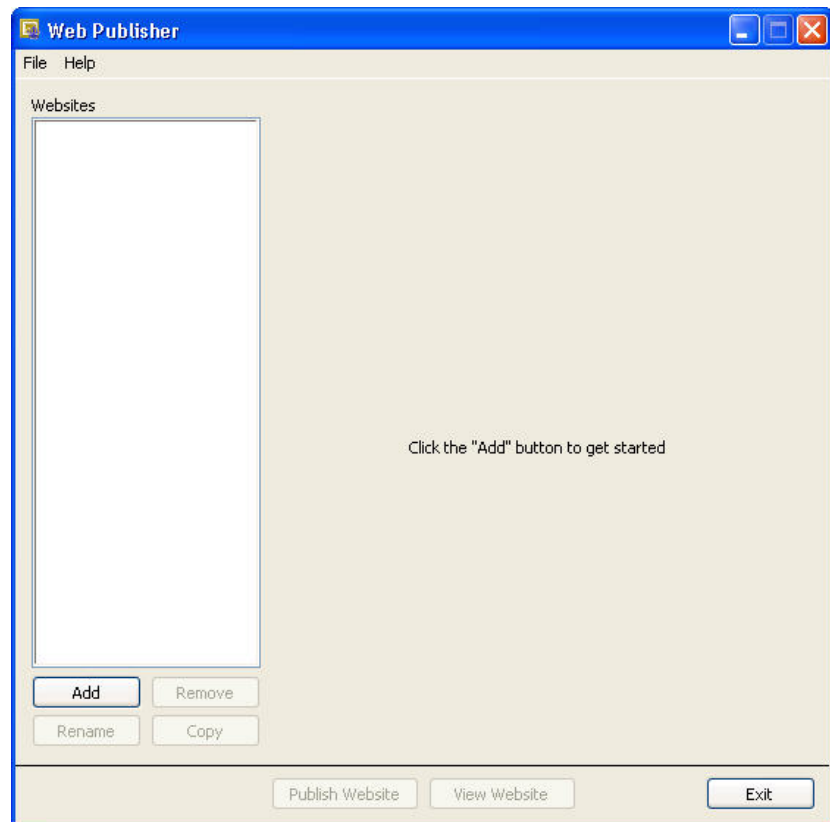
**Maximum Log File Size** – Specifies the maximum size (in bytes) that will be recorded in any one log file when the Log File Mode is set to New Log after Max Size.

**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.

## 4.2 Web Publisher

The Web Publisher allows you to publish your RTMC project to the web. In addition, the Web Publisher has display settings that allow you to show other tabs such as data browsing and network status.



The Web Publisher supports two 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 are websites being run on a compatible datalogger like the CR6 Series, CR800, CR1000, and CR3000. Datalogger websites must be designed by RTMC Pro and can only have one data source. The data source must be an HTTP Datalogger Source.

### 4.2.1 Creating Websites

To create a website, press the **Add** button and select either **Add PC Website** or **Add Datalogger Website**. Fill in the settings as described below. After filling in the desired settings, press the **Publish Website** button to publish the content.

The screenshot shows the 'Web Publisher' application window. On the left, a list of websites contains 'solartracker'. Below this list are buttons for 'Add', 'Remove', 'Rename', and 'Copy'. The main area on the right is divided into three sections: 'PC Web Server Settings', 'Website Settings', and 'RTMC Settings'.  
 - **PC Web Server Settings:** Includes fields for 'Host Address' (localhost), 'User ID' (admin), 'Password' (masked with dots), and a 'Remote Folder' dropdown (solartracker).  
 - **Website Settings:** Includes a checked checkbox for 'Send New Password File', buttons for 'Edit .csipasswd File...' and 'Edit Tracker Code...', and an unchecked checkbox for 'Disable Web Sockets'.  
 - **RTMC Settings:** Includes a 'Project File' field with a file path and a browse button, a 'Default Poll Interval' spinner set to 10 with a unit dropdown set to 'Second(s)', and a 'Display Settings' section with checkboxes for 'Hide Navigation Tabs' (unchecked), 'Show Data Browse Tab' (checked), and 'Show Network Status Tab' (checked).  
 At the bottom of the window are three buttons: 'Publish Website' (highlighted with a blue border), 'View Website', and 'Exit'.

#### *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. (CR1000/CR3000/CR800 dataloggers require OS 28 or later to support IPv6 addresses.)

## NOTE

For datalogger websites, 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.

For PC websites, 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, a root-level user must be created. The CSI Web Server Administrator is used to do this for the CSI Web Server. Device Configuration Utility (DevConfig) is used to do this for a datalogger web server. The .csipasswd file that is created 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. For more information on security, see Section 4.3, *Web Security* (p. 50).

**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. By default, the CSI 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*). On a 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** – (This check box only applies to datalogger websites.) 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.

**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.

**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.

### ***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. Datalogger websites require an RTMC project that only contains one 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 that when publishing to a datalogger website, 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 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. (See the DataQuery command in Section 4.4, *API Commands (p. 54)*, for information on the Data Query Modes available on the Custom Data Query screen.)

**Show file browse tab** – (This check box only applies to datalogger websites.) 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** – (This check box only applies to datalogger websites.) The show datalogger status tab option will display a **Datalogger Status** tab on your website that allows you to view the datalogger status. This includes datalogger information, program information, battery information, and card information.

**Show network status tab** – (This check box only applies to PC websites.) The show network status tab option will display a **Network Status** tab on your website that allows you to 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.

## 4.2.2 Managing Websites

To remove a website, select the website in the **Websites** list and press the **Remove** button.

To rename a website, select the website in the **Websites** list and press the **Rename** button.

The settings from the website that is currently selected in the **Websites** list can be copied to a new website by pressing the **Copy** button. This can be useful

when multiple websites will have similar settings, such as when you want to publish the same RTMC project to multiple dataloggers.

The website that is currently selected in the **Websites** list can be viewed in a web browser by pressing the **View Website** button.

## 4.3 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 Section 4.4, *API Commands* (p. 54).

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.

### 4.3.1 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:

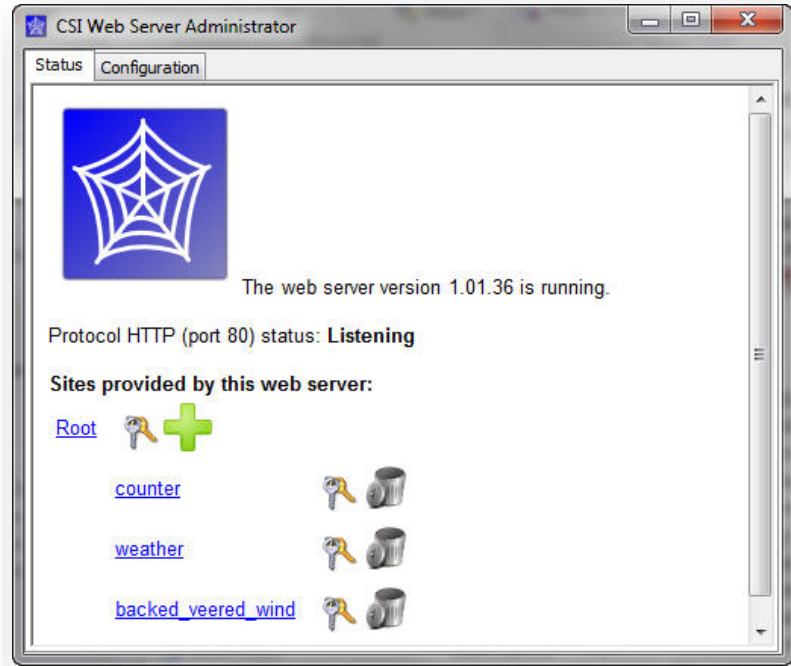
Username: admin  
Password: admin  
Access Level: All

Username: anonymous  
Password:  
Access Level: Read Only

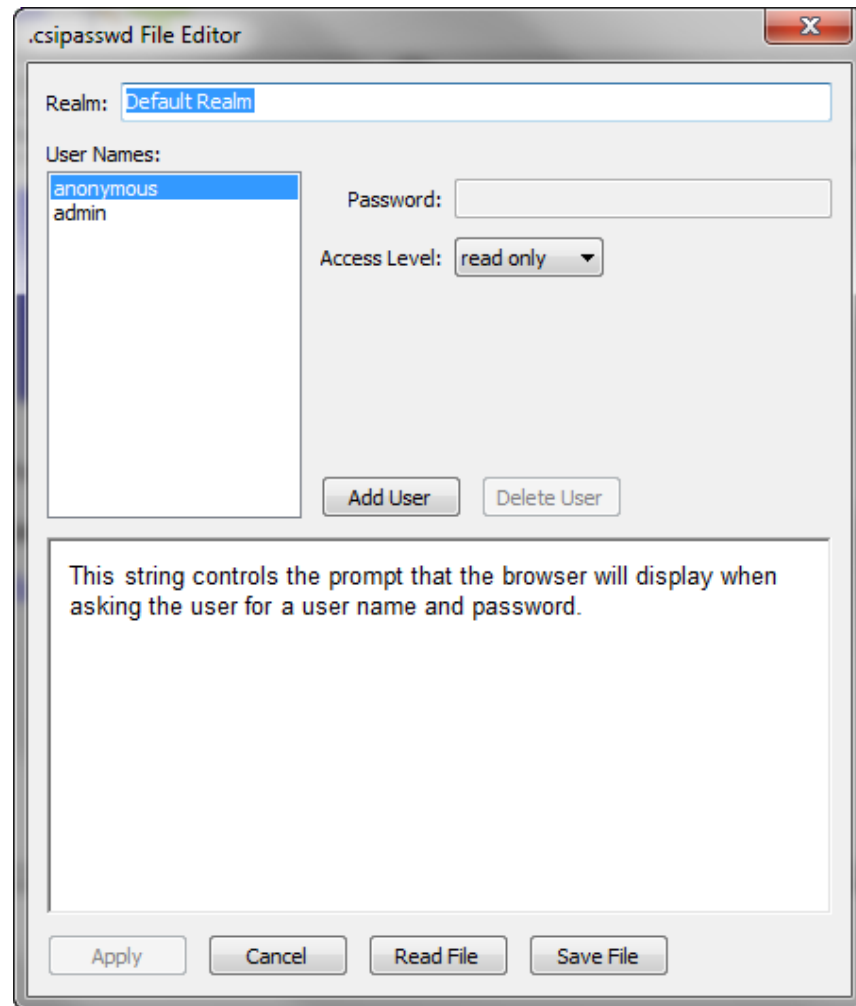
If a root .csipasswd file has not been created, this default .csipasswd file will be used for the root directory and any remote folder that does not include its own .csipasswd file,

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.

#### 4.3.1.1 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 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.

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

#### 4.3.1.2 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.

#### NOTE

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.

### 4.3.2 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.

## 4.4 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 from CR6 Series, CR800, CR1000, and CR3000 dataloggers directly. The CGI-style request syntax is designed to be flexible and easy to use.

### 4.4.1 Command Syntax

Syntax for the commands sent to the web server generally follows the form of:

*URL?command=CommandName&uri=DataSource&arguments*

The DataSource = *source\_name:station\_name.table\_name.field\_name*

For example, Server:CR1000:onemin.TempF

The *station\_name* applies only to LoggerNet Server data sources. If the *field\_name* is not specified, all of the fields in the table will be output. If the *field\_name* refers to an array without a subscript, all of the values associated with that array will be output.

Arguments are appended to the command string using an ampersand (&). Some commands have optional arguments, where omitting the argument results in a default being used. When applicable, optional arguments and their defaults are noted in the descriptions below.

Some commands return a response code indicating the result of the command. These are described below where applicable.

### 4.4.2 Data Access Commands

#### DataQuery

DataQuery allows a web client to poll a data source or datalogger for data. The command returns one or more fields, or one or more records, from a table in the data source or datalogger. DataQuery has the following parts:

URI                      The URI specifies the data source for the query.

When querying through the CSI Web Server, that data source is specified as

*source\_name:station\_name.table\_name.field\_name*. (Note the *station\_name* applies only to LoggerNet Server data sources.)

For example, the data source for the PTemp field in a

CR1000's Public table in a LoggerNet Server data source would be:

Uri=Server:CR1000.Public.PTemp

When querying the datalogger directly, the data source is specified as *table\_name.field\_name*. For example, the data source for the PTemp field in a datalogger's Public table would be:

Uri=Public.PTemp

Note that *field\_name* is optional. If omitted, all values in the table will be returned.

#### Mode

The Mode specifies the timeframe for the data to be returned. Valid options are:

most-recent – Returns the data from the most recent number of records. The number of records is specified by P1.

since-time – Returns all the data since a certain time. The time is specified by P1.

since-record – Returns all the records since a certain record number. The record number is specified using P1.

date-range – Returns the data in a certain date range. The date range is specified using P1 and P2.

Backfill – Returns all the data that has been stored since a certain time interval (for instance, all the data since 1 hour ago). The interval is specified using P1.

#### P1/P2

P1 and P2 are used to set the time parameters for Mode:

most-recent – The maximum number of records to return.

since-time – The start time for the data. Format = YYYY-MM-DD T:HH:MM:SS.MS. Time (T) is optional; if only the date is specified, Time is assumed as midnight. When specifying time, MS is optional.

since-record – The starting record number.

date-range – The start time (P1) and end time (P2) for the data. Format = YYYY-MM-DD THH:MM:SS.MS. Time (T) is optional. If only the date is specified, Time is assumed as midnight. When specifying time, MS is optional.

Backfill – The interval, in seconds, for the backfill (e.g., 3600 would be 1 hour).

#### Format

The Format is the format in which to return the data. Options are HTML, JSON, TOA5, TOB1, XML.

**NOTE**

If a value of json is specified for the format parameter and the web server has a large data set to send, the web server may choose to break the data into multiple requests by specifying a value of true for the more flag in the JSON output. If this flag is set to true, the user will need to send another request to get the additional data.

---

**Examples**CSI Web Server

In these examples, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To return the three most recent values from the PTemp variable in the OneMin table of the CR1000 in the LoggerNet server data source:

`http://192.168.4.14/weather/?command=dataquery&uri=Server:CR1000.o  
nemin.ptemp&format=html&mode=most-recent&p1=3`

- To return all values since Oct 1, 2011, of the TempF variable in the CR1000\_OneMin table of the Database data source:

`http://192.168.4.14/weather/?command=dataquery&uri=Database:CR1000  
_OneMin.TempF&format=html&mode=since-time&p1=2011-10-01`

- To return all values between Sept 1, 2011, and Oct 1, 2011, of the TempF variable in the OneMin table of the DataFile data source:

`http://192.168.4.14/weather/?command=dataquery&uri=DataFile:OneMin.  
TempF&format=html&mode= date-range&p1=2011-09-01&p2=2011-10-01`

- To return all values since Oct 1, 2011, at 10:00 a.m. from the PTemp variable in the OneMin table of the CR1000 in the LoggerNet server data source:

`http://192.168.4.14/weahter/?command=dataquery&uri=Server:CR1000.o  
nemin.ptemp &format=html&mode=since-time&p1=2011-10-01T10:00:00`

Datalogger

In these examples, you are directly accessing the datalogger at 192.168.12.55.

- To return all records since record 14400 of TempF in the OneMin table of the datalogger at 192.168.12.55:

`http://192.168.12.55/?command=dataquery&uri=OneMin.TempF&format  
=html&mode=since-record&p1=14400`

- To return all records since one hour ago:

`http://192.168.12.55/?command=dataquery&uri=OneMin.TempF&format  
=html&mode=backfill&p1=3600`



## BrowseSymbols

The BrowseSymbols command is used to return all the sources in an RTMC project, all the stations in a server data source, all the tables in a datalogger or database, all the fields in a table, or all the elements of an array. It has the following parts:

**URI**            The URI specifies the name of the parent element for which to return the BrowseSymbol information. The format is *source\_name:station\_name.table\_name.field\_name*.

**Format**        The Format is the file format for the result of the command. Options are: HTML, JSON, or XML. The following information is returned:

Return	Description
Name	The name of the child element in the datalogger.
URI	The URI of the child element.
Type	The type of the element. 1 = LoggerNet Data Source, 2 = Data File Data Source, 3 = Database Data Source, 9 = HTTP Data Source, 4 = LoggerNet Station, 5 = LoggerNet Statistics Broker, 6 = Table, 7 = Array, 8 = Scalar
Is_enabled	Boolean value which indicates whether the element is enabled for scheduled data collection (relevant only to LoggerNet data sources).
Is_read_only	Boolean value which indicates whether the element is read-only. If not read-only, the element can be changed using SetValueEx.
Can_expand	Boolean value that indicates whether the element has child elements.

## Examples

### CSI Web Server

In these examples, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To return all data sources in a project:

`http://192.168.4.14/weather/?command=browsesymbols&format=html`

- To return all stations in the LoggerNet server data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Server&format=html`
- To return all tables of the CR1000 station in the LoggerNet server data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Server:CR1000&format=html`
- To return all fields of the Public table of the CR1000 station in the LoggerNet server data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Server:CR1000.Public&format=html`
- To return all elements in the Flag array in the Public table of the CR1000 station in the LoggerNet server data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Server:CR1000.Public.Flag&format=html`
- To return all tables of the Database data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Database&format=html`
- To return all fields of the CR1000\_OneMin table of the Database data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=Database:CR1000_OneMin&format=html`
- To return all fields of the OneMin table of the DataFile data source:  
  
`http://192.168.4.14/weather/?command=browsesymbols&uri=DataFile:OneMin&format=html`

#### Datalogger

In these examples, you are directly accessing the datalogger at 192.168.12.55.

- To return all tables in a datalogger:  
  
`http://192.168.12.55/?command=browsesymbols&format=html`
- To return all fields in the Public table:  
  
`http://192.168.4.14/?command=browsesymbols&uri=Public&format=html`
- To return all the elements in the Flag array, which is part of the Public table:  
  
`http://192.168.4.14/?command=browsesymbols&uri=Public.flag&format=html`

### 4.4.3 Control Commands

#### SetValueEx

The SetValueEx command is used to set a value in the datalogger. For the CSI Web Server, a user name and password that has at least read/write rights must be entered (or previously entered in the same session) or the command will fail. Likewise, for direct datalogger access, if a .csipasswd file has been sent to the datalogger, a user name and password must be entered (or previously entered in the same session) or the command will fail. SetValueEx has the following parts:

URI	The URI specifies the value that should be set in the format of <i>source_name:station_name.table_name.field_name</i> .
Value	The new value to which the URI should be set.
Format	The Format is the file format for the result of the command. Options are HTML, JSON, or XML. A result code and description are returned.

Code	Description
0	An unrecognized failure occurred
1	Success
2	The data-source connection failed (LoggerNet data sources only)
3	LoggerNet logon failed (LoggerNet data sources only)
4	Blocked by LoggerNet security (LoggerNet data sources only)
5	Read only
6	Invalid table name
7	Invalid fieldname
8	Invalid fieldname subscript
9	Invalid field data type
10	Datalogger communication failed
11	Datalogger communication disabled (LoggerNet data sources only)
12	Blocked by datalogger security
13	Invalid table definitions (LoggerNet data sources only)

14 Invalid device name (LoggerNet data sources only)

15 Invalid web client authorization

Results codes marked as (LoggerNet data sources only) are applicable only when the API is being used with the CSI web server.

### ***Example***

In this example, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To set the Boolean variable called Flag(1) in the Public table of the CR1000 of a LoggerNet server data source to True (-1):

`http://192.168.4.14/weather/?command=setvalueex&uri=Server:CR1000.Public.flag(1)&value=-1&format=html`

### **ClockCheck**

Returns the current time of the CSI Web Server or a station specified by the URI.

URI The URI can be specified as `URI=source_name:station_name` or URI can be omitted.

### ***Examples***

#### CSI Web Server

In these examples, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To check the clock of the CSI Web Server:

`http://192.168.4.14/weather/?command=clockcheck&format=html`

- To check the clock of the CR1000 in the LoggerNet server data source:

`http://192.168.4.14/weather/?command=clockcheck&URI=Server:CR1000_ip&format=html`

#### Datalogger

In this example, you are directly accessing the datalogger at 192.168.12.55.

- To check the clock of the datalogger:

`http://192.168.12.55/?command=clockcheck&format=html`

## ClockSet

Sets the time for the station specified by the URI. For the CSI Web Server, a user name and password that has at least read/write rights must be entered (or previously entered in the same session) or the command will fail. Likewise, for direct datalogger access, if a .csipasswd file has been sent to the datalogger, a user name and password must be entered (or previously entered in the same session) or the command will fail. ClockSet has the following parameters:

URI	The URI can be specified as <code>URI=source_name:station_name</code> . For direct datalogger access, the URI can be omitted.
Time	The time to set the clock to, in the format of YYYY-MM-DD T:HH:MM:SS.MS. MS is optional.
Format	The Format is the file format for the result of the command. Options are HTML, JSON, or XML.

A result code, time, and description are returned for ClockCheck and ClockSet. With ClockSet, the time returned is the time before the clock was set.

Code	Description
1	The clock was checked (successful)
2	The clock was set
3	The LoggerNet session failed (LoggerNet data sources only)
4	Invalid LoggerNet logon (LoggerNet data sources only)
5	Blocked by LoggerNet security (LoggerNet data sources only)
6	Communication with the station failed (LoggerNet data sources only)
7	Communication with the station disabled (LoggerNet data sources only)
8	Blocked by datalogger security
9	Invalid station name (LoggerNet data sources only)
10	LoggerNet device is busy (LoggerNet data sources only)
11	Specified URI does not reference a LoggerNet station (LoggerNet data sources only)

Results codes marked as (LoggerNet data sources only) are applicable only when the API is being used with a CSI web server.

### *Examples*

#### CSI Web Server

In this example, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To set the clock of the CR1000 in the LoggerNet server data source to November 1, 2011, 12:26:00:

`http://192.168.4.14/weather/?command=clockset&uri=Server:CR1000&format=html&time=2011-11-01T12:26:00`

#### Datalogger

In this example, you are directly accessing the datalogger at 192.168.12.55.

- To set the clock of the datalogger to November 1, 2011, 12:26:00:

`http://192.168.12.55/?command=clockcheck&format=html&time=2011-11-01T12:26:00`

## **4.4.4 File Management Commands**

### **NewestFile**

The NewestFile command will return the most recent file that matches a given expression, as defined by the `expr` argument. This command can be used to display the most recent image stored to the datalogger by a camera. The command will return other files, as well, and the file will be processed based on the settings in the web client (for instance, if the specified file is a CR1 file and the command is entered into a browser, the browser may prompt for the file to be saved or for selection of the program to open the file).

**URI**            The URI can be specified as `URI=source_name:station_name`. For direct datalogger access, the URI can be omitted.

**Expr**           Specifies the path and file pattern for the desired file to be returned. Path determines the drive on the datalogger, i.e., CPU:, USB:, or CRD:. The file pattern can incorporate the use of wildcards. If the path is omitted or invalid, or a file matching the pattern does not exist, an Unrecognized Request response will be returned.

NewestFile requires a minimum access level of Read Only.

## Examples

### CSI Web Server

In these examples, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To return the newest file with a \*.jpg extension from the USR drive of the CR1000 in the LoggerNet server data source:

```
http://192.168.4.14/weather/?command=newestfile&uri=Server:CR1000&
expr=USR:*.jpg
```

- To return the newest \*.cr1 file from the CPU drive of the CR1000 in the LoggerNet server data source:

```
http://192.168.4.14/weather/?command=newestfile&uri=Server:CR1000&
expr=CPU:*.cr1
```

### Datalogger

In these examples, you are directly accessing the datalogger at 192.168.12.55.

- To retrieve the newest \*.jpg file on the datalogger's USR drive:

```
http://192.168.12.55/?command= NewestFile&expr=USR:*.jpg
```

- To retrieve the newest \*.cr1 file on the datalogger's CPU drive:

```
http://192.168.12.55/?command= NewestFile&expr= CPU:*.cr1
```

### ListFiles

When accessing data through the CSI Web Server, the ListFiles command returns a list of all files stored on the specified station. When accessing a datalogger directly, the ListFiles command returns a list of files stored in the specified directory (/CPU, /USR, /CRD, /USB) of the datalogger. The ListFiles command requires a minimum security level of Read Only.

**URI**                      The URI can be specified as `URI=source_name:station_name`. For direct datalogger access, the URI is omitted.

**Format**                      The Format is the format in which to return the list of files. Options are HTML, JSON, and XML.

ListFiles returns the following, formatted in a table:

**Path**                      The path of the file or directory, relative to the URL.

**Is Directory**              A Boolean value that indicates whether or not the returned object is a directory.

**Size**                      An integer that provides the size of a file in bytes, or the number of bytes free in a directory.

Last Write	A string that specifies the date and time a file was last written (returned for files only).
Run Now	A Boolean value that indicates whether or not the file (a datalogger program) is marked by the datalogger file system as currently running.
Run On Power Up	A Boolean value that indicates whether or not the file (a datalogger program) is marked by the datalogger file system as run on power up.
Read Only	A Boolean value that indicates whether or not the file is marked by the datalogger file system as read-only.
Paused	A Boolean value that indicates whether or not the file (a datalogger program) is marked by the datalogger file system as paused.

### ***Examples***

#### **CSI Web Server**

In this example, you are accessing data through the CSI Web Server at address 192.168.4.14. The RTMC project is published to the remote folder Weather.

- To see all files on the CR1000 in the LoggerNet server data source:  
  
`http://192.168.4.14/weather/?command=ListFiles&uri=Server:CR1000&format=html`

#### **Datalogger**

In this example, you are directly accessing the datalogger at 192.168.12.55.

- To return all files on the datalogger's USB drive:  
  
`http://192.168.12.55/USB/?command=ListFiles&format=html`

### **FileControl**

The FileControl command allows you to perform actions on files that are located on one of the datalogger's drives. Note that FileControl can only be used when accessing a datalogger directly and not through the CSI Web Server. The command has the following parts:

File	The name of the file on which to perform the file control operation. This command is optional for Actions 7, 8, 9, 11, and 12.
File2	The name of the second file required for the command. This command is used for options 15, 16, 17, 18, 19, and 20.



## Action

The following actions are supported:

<b>Code</b>	<b>Description</b>
1	Compile and run the file specified by File and mark it as the program to be run on power up.
2	Mark the file specified by File as the program to be run on power up.
3	Mark the file specified by File as hidden.
4	Delete the file specified by File.
5	Format the device specified by File.
6	Compile and run the file specified by File without deleting existing data tables.
7	Stop the currently running program.
8	Stop the currently running program and delete associated data tables.
9	Install the operating system (*.obj) specified by File. The file must reside on the datalogger's CPU drive (sent to the datalogger using HTTPPut)
10	Compile and run the program specified by File but do not change the program currently marked to run on power up.
11	Pause execution of the currently running program.
12	Resume execution of the currently paused program.
13	Stop the currently running program, delete its associated data tables, run the program specified by File, and mark the same file as the program to be run on power up.
14	Stop the currently running program, delete its associated data tables, and run the program specified by File without affecting the program to be run on power up.
15	Move the file specified by File2 to the name specified by File.
16	Move the file specified by File2 to the name specified by File, stop the currently running program, delete its associated data tables, and

run the program now specified by File while marking it to run on power up.

- |    |   |
|----|---|
| 17 | Move the file specified by File2 to the name specified by File, stop the currently running program, delete its associated data tables, and run the program now specified by File without affecting the program that will run on power up. |
| 18 | Copy the file specified by File2 to the name specified by File.   |
| 19 | Copy the file specified by File2 to the name specified by File, stop the currently running program, delete its associated data tables, and run the program now specified by File while marking it to run on power up.                     |
| 20 | Copy the file specified by File2 to the name specified by File, stop the currently running program, delete its associated data tables, and run the program now specified by File without affecting the program that will run on power up. |

**Format**      The Format is the file format for the result of the command. Options are HTML, JSON, or XML.

FileControl returns the following:

**Outcome**      If 0 is returned, the command succeeded. Any non-zero value indicates a failure.

**Time**          The number of seconds that the web client should wait before attempting more communication with the station. A value of 0 means communication can resume immediately.

**Description**   Provides details about the FileControl attempt.

### ***Example***

#### Datalogger

In this example, you are directly accessing the datalogger at 192.168.12.55.

- To set a program named tc-fast.cr1 on the datalogger's CPU drive to run on power up:

`http://192.168.12.55/?command=filecontrol&file=CPU:tc-fast.cr1&action=2`



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