

ACCELERATOR Diagram Builder SEL-5035 Software

Instruction Manual

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SEL SCHWEITZER ENGINEERING LABORATORIES

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S E C T I O N 1

Install Your Software

Installing Diagram Builder

You can obtain a copy of the ACCELERATOR® Diagram Builder™ SEL-5035 Software from your local SEL representative or download the software from selinc.com.

Upgrading an Existing RTAC

To perform an HMI upgrade of an existing RTAC, first obtain from your local SEL representative the HMI MOT upgrade file and the latest firmware file. The upgrade file will be a zipped file. Do not unzip it. Open the ACCELERATOR RTAC® SEL-5033 Software and select the SEL logo () at the upper left. Then perform the following steps:

NOTE

The following steps to perform a firmware upgrade cause erasure of the loaded RTAC project. You will need to resend the project after you have loaded firmware.

- Step 1. Select the **Options** button at the lower right.
- Step 2. Select **Firmware Update** from the menu.
- Step 3. Follow the prompts, and point the firmware update tool to the latest firmware available from SEL.
- Step 4. Send the file to the RTAC.
- Step 5. After you have sent the file to the RTAC, repeat the previous steps but in Step 3, point to the zipped MOT upgrade file.

SEL HMI Updates

As we continue to improve our HMI software and capabilities, we will make available update files that you can easily send to your RTAC without disrupting the existing firmware or projects of the RTAC.

NOTE

Beginning with RTAC Firmware R143, a firmware update also automatically updates the necessary .binz file. If you need a specific .binz file, follow the instructions on this page. The HMI runtime version should always match the Diagram Builder project version.

- Step 1. With Diagram Builder open, select **Tools > HMI Runtime Binary Upload Tool**.
- Step 2. Follow the prompts and point the tool to the .binz file update you received from your local SEL representative. Alternatively, you can download the file named **RTAC HMI Runtime Files** from <https://selinc.com/products/5035/#tab-downloads> and then install

2 Install Your Software SEL HMI Updates

the RTACHMIRuntimeSetup.exe file on your computer. After installation of that file, navigate on your computer to C:\Program Files\SEL\AcSELERator\DiagramBuilder\hmi_runtimes to see an archive of .binz files.

NOTE

To determine the necessary .binz file compatible with your RTAC firmware, use the tool at <https://selinc.com/products/5035/#tab-compatibility>.

Automatically Upload Matching HMI Runtime Version

- Step 1. With Diagram Builder open, select **Settings > RTAC Connection Settings**.
- Step 2. Select the **Auto Upload Matching HMI Runtime Version** check box and follow any subsequent prompts needed to find the .binz file that matches the installed Diagram Builder version.

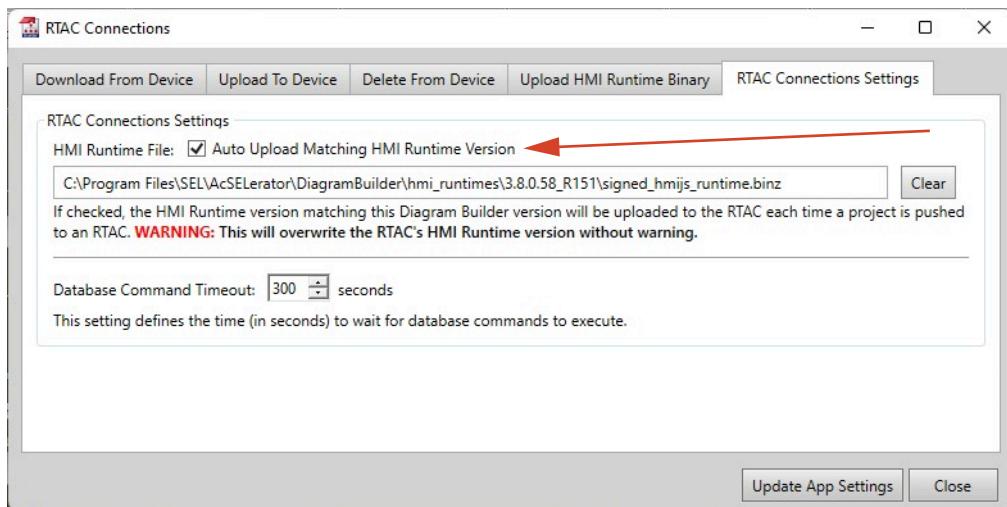


Figure 1.1 RTAC Connections Settings

SECTION 2

Getting Started With ACCELERATOR Diagram Builder

After you have loaded and licensed Diagram Builder, you can begin development.

NOTE

Only Diagram Builder version 2.4.2.7527 and earlier must be licensed.

Languages

Diagram Builder is currently available in English, French, Spanish, and Mexican Spanish. The default option is **System**, as shown in *Figure 2.1*, which mirrors the language of the operating system so long as it is one of the four selectable languages. If the operating system is in another language, selecting **System** defaults to English. For more information, see *Application Settings* on page 13.

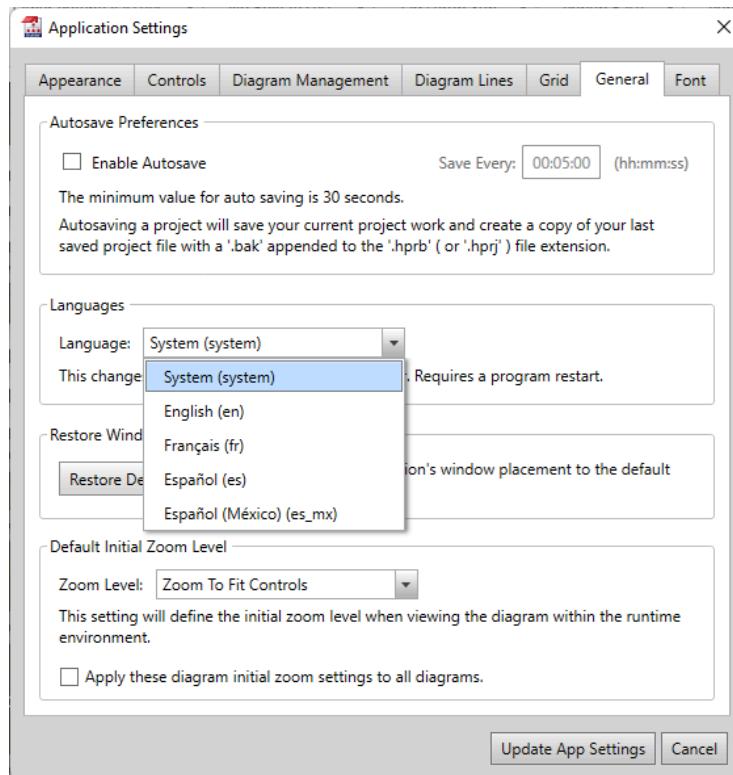


Figure 2.1 Application Language Settings

New Project

With Diagram Builder open, select **File > New > Project** or press **<Ctrl+N>** to open a new project. A Project Settings window will appear, as shown in *Figure 2.2*. Once you have selected your desired settings, select **Done** to create the project. For more information on the available project settings, see *Project Settings on page 13*.

By default, user role-based security is disabled and the **Roles** tab is grayed out. To enable role-based security, select the **Use role-based security** check box.

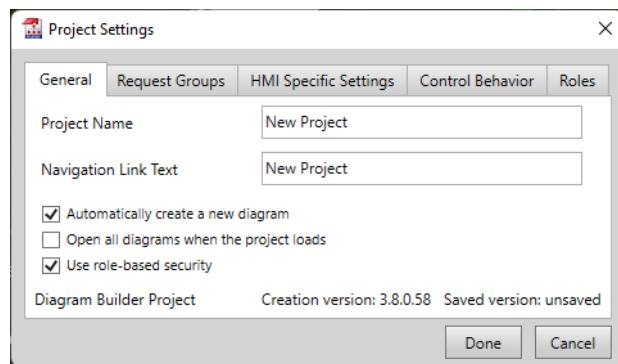


Figure 2.2 Initial Project Settings

HMI Tags

You can either start with an existing comma-separated values (CSV) file of tags or create a new ACCELERATOR RTAC project file before working with Diagram Builder.

Device Tags

Device tags are tags that ACCELERATOR RTAC defines and enables within each of the device connections it configures within the RTAC.

Virtual Tags

Virtual tags are tags within the RTAC that are not directly tied to any device or process. You can use all virtual tags in Diagram Builder and display these tags on the HMI. While no scripting engine exists within the Diagram Builder software, the RTAC has a very powerful one. Within the RTAC arithmetic features, you can perform comparisons, averages, and many more functions to device tags and load a result into a virtual tag. You can then use the virtual tag inside the Diagram Builder and display it on the HMI.

Importing Tags

After you have completed an ACCELERATOR RTAC project, you can use Diagram Builder to import all of the tags you defined in the project, or a specified subset. There are two methods by which you can import the tags into Diagram Builder: obtain the tags either from the project file or the RTAC itself. To start, select the **Import Tags** icon (Import icon) or select **File > Import Tags**.

Importing System Tags Directly From an RTAC

To import system tags directly from an RTAC, select the **Direct To RTAC** Connection Type radio button. Enter the IP address of the RTAC in the **IP Address** field and then enter the RTAC **User Name** and **Password**. Select **Load Tags** to import the tags directly from the RTAC.

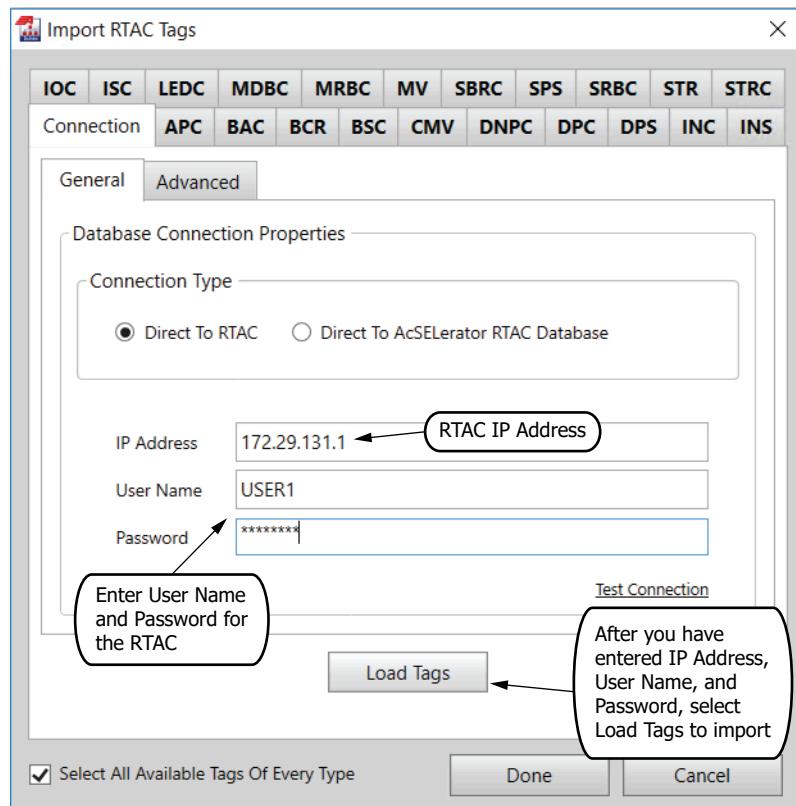


Figure 2.3 Import System Tags Directly From an RTAC

After you select **Load Tags**, the device loads tags by their type. To select the tags you want to import, either select the **Select All Available Tags Of Every Type** check box or select one of the tag type tabs to select the individual tags to be imported.

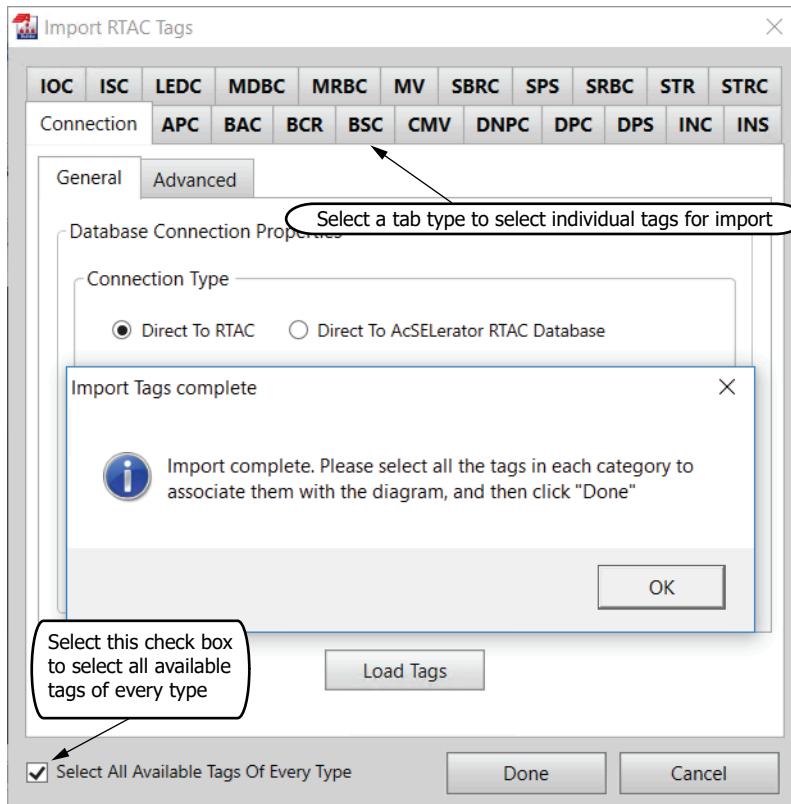


Figure 2.4 Select Imported Tags

Importing System Tags Via an RTAC Database

To import system tags via an ACCELERATOR RTAC Database, select the **Direct to AcCELERATOR RTAC Database** Connection Type radio button. Leave the **IP Address** as the loopback IP address for your machine (127.0.0.1). Enter the **User Name** and **Password** for the RTAC Database. Select the RTAC project from which you would like to use tags. Once all the fields are entered, select **Load Tags**.

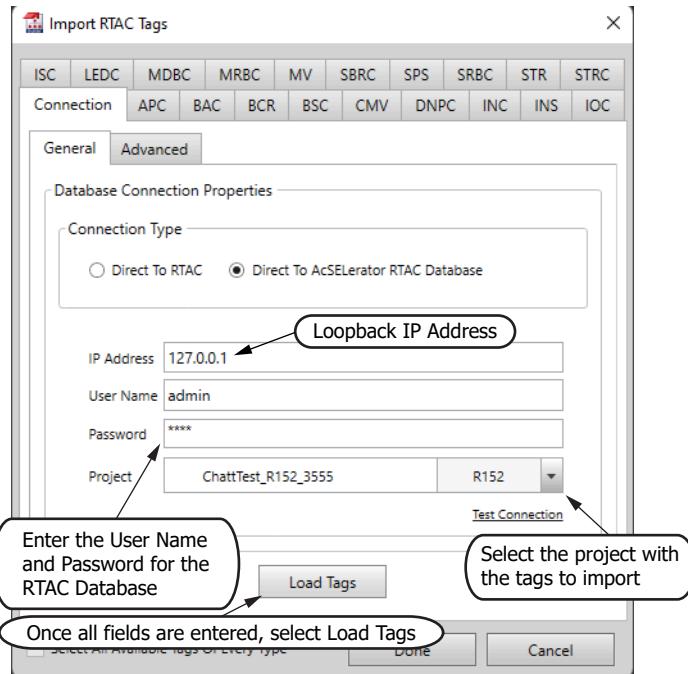


Figure 2.5 Import RTAC Tags From the ACCELERATOR RTAC Database

Importing System Tags Via the System Tags Import/Export Tool

To import system tags using the import/export tool, select **Tools > System Tags Import/Export** and then **Import**. Follow the prompts to select the CSV file that contains the tag definitions.

To export system tags using the import/export tool, select **Tools > System Tags Import/Export** and then **Export**. Follow the prompts to save the generated CSV file.

The CSV file must consist of only two columns: Tag Type and Tag Name. Importing system tags overwrites all pre-existing tags in the project. To add tags to an existing project, SEL recommends first exporting the existing tags to a CSV file, adding the new tags to that file, and then importing the updated file into the project.

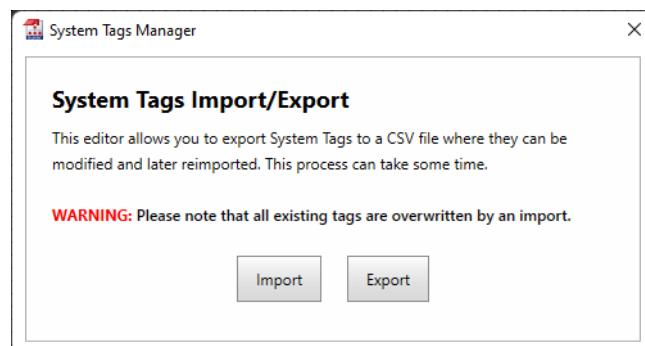


Figure 2.6 Importing RTAC Tags Via the System Tags Import/Export Tool

Removing Unused Tags From a Diagram Builder Project

Once tags have been imported into a Diagram Builder project, you can choose to remove all tags that have not been used in the project. This could be applied as the final stage of the project building process to help keep the size of the project from being unnecessarily large. This in turn can help manage the loading time of the RTAC HMI in the browser. To remove all of the unused tags from the project, select the **Remove Unused Tags** icon (as shown in *Figure 2.7*) or select **File > Remove Unused Tags**.

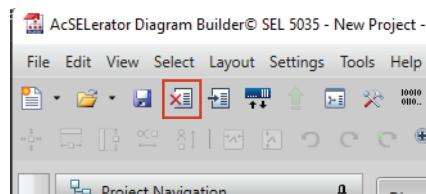


Figure 2.7 Removing Unused Tags From Diagram Builder

NOTE

Only the tags contained in the project are available for Dynamic Trending when viewing the RTAC HMI in the browser.

Working With the Diagram

After you have imported tags and started a new diagram, you can begin developing the one-line diagram or process that you want to display on the HMI. There are two methods available for displaying the tags that you imported on the diagram: placing the tags directly on the diagram or placing controls on the diagram and then associating them to the tag.

Diagram Types

There are three types of diagrams available within Diagram Builder: Diagrams, Popup Diagrams, and Synthetic Diagrams.

Diagrams are the default diagram type, and the only type that can be set as the default diagram for a project (see *Setting the Default Diagram on page 11*).

Popup Diagrams are temporary diagrams that are created and deleted as needed in the HMI runtime. These diagrams have additional properties to define how and where in the HMI runtime they appear.

Synthetic Diagrams are autogenerated by the Substitution Control. The HMI runtime converts Synthetic Diagrams into either Diagrams or Popup Diagrams depending on the type of the parent diagram.

Popup Diagrams

Popup Diagrams differ from Diagrams in that they are created on-demand by the HMI runtime and automatically deleted upon closing. Additional settings added to the Appearance tab of the Diagram Properties tool (see *Diagram Properties*) allow you to configure the duration, location, and size of Popup Diagrams.

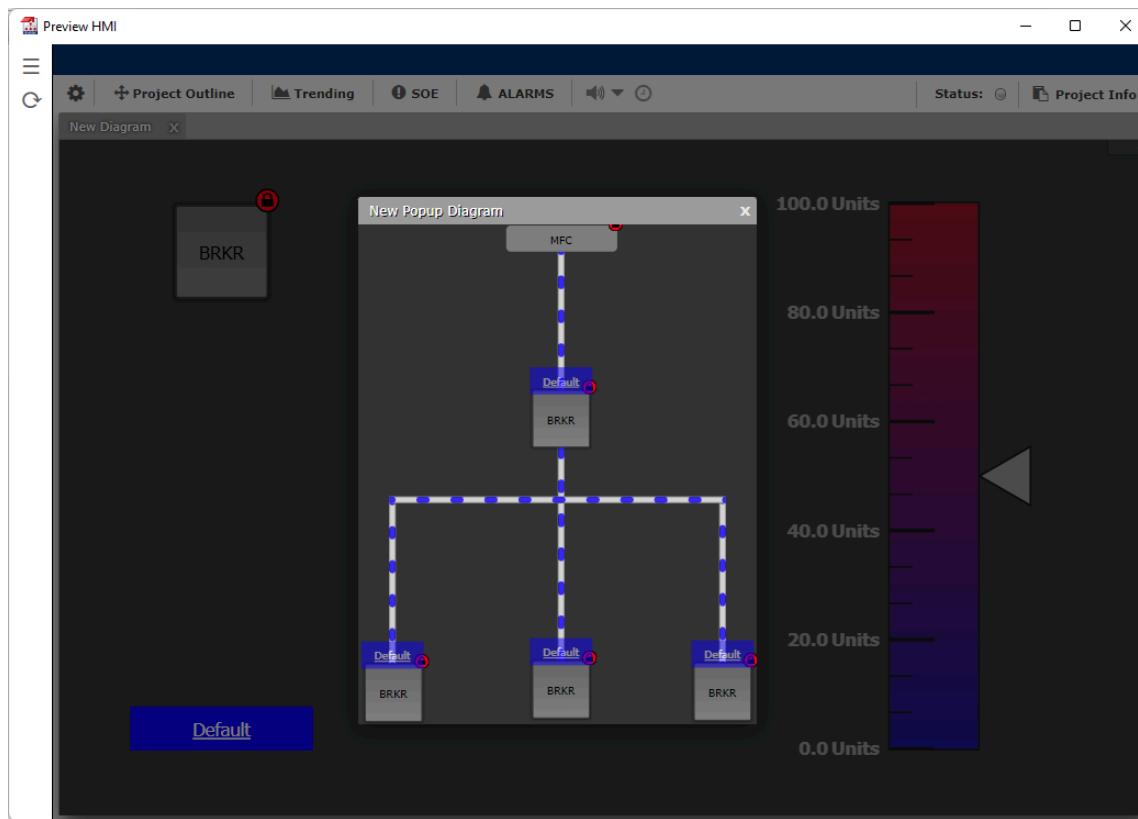


Figure 2.8 Popup Diagram in HMI Runtime

Synthetic Diagrams

Synthetic Diagrams serve as templates for Diagrams and Popup Diagrams in the HMI runtime. Use the Substitution control in Diagram Builder to configure user-defined tags (UDTs) and substituted property values in a Synthetic Diagram. This configuration will determine the appearance of any Diagrams or Popup Diagrams created from that Synthetic Diagram.

The Substitution control includes the following options for use in creating Synthetic Diagrams:

- ▶ **Tag Substitution** is the mapping of defined tag values across a number of Synthetic Diagrams.
- ▶ **Property Substitution** is the mapping of control property values across a number of Synthetic Diagrams.

Placing Tags Onto the Diagram

When you import tags into the project, they become available for use on the diagram.

Select the **Tags** button to the upper left of the Diagram Builder. Then find a tag and drag and drop it onto the diagram, as shown in *Figure 2.9*. This tag will adopt the default tool for that tag type.

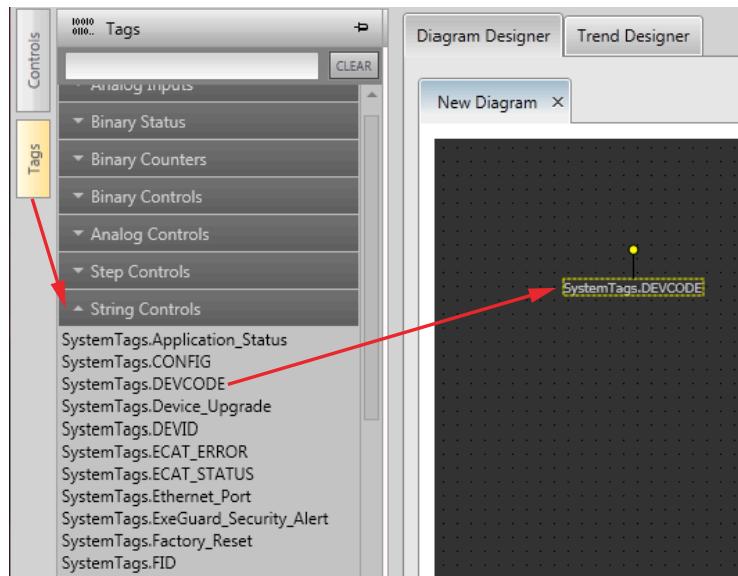


Figure 2.9 Place Tag on Diagram Palette

Placing Controls on the Diagram

Another method is to use the **Toolbox** to drag precanned controls onto the diagram and then use the **Tag Name** property for each control to tie them to tags (see *Figure 2.10*).

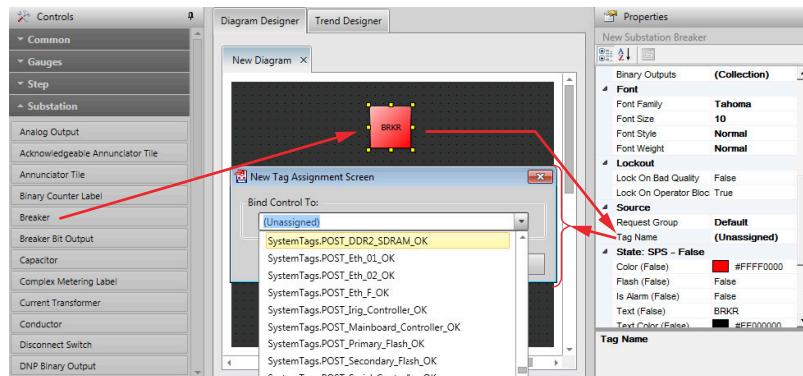


Figure 2.10 Assign Tag to Control

Alignment, Spacing, and Arrangement Tools

Various tools in the toolbar can be used to organize the controls and adjust their appearance to obtain a more orderly and consistent look and feel for the HMI diagram. Find all layout options under the **Layout** menu.

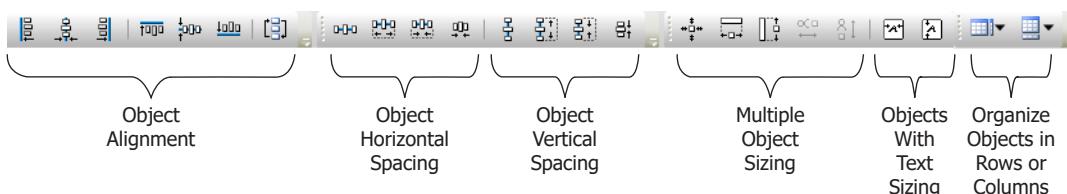


Figure 2.11 Diagram Layout Tools

Settings

Diagram Properties

The Diagram Properties tool, accessible by right-clicking a diagram and selecting **Properties**, allows you to configure the behavior and attributes of the selected diagram. For example, you can define how the title of the diagram appears in the HMI, configure the background color and size of the diagram, or define line colors and change the font of items on the diagram.

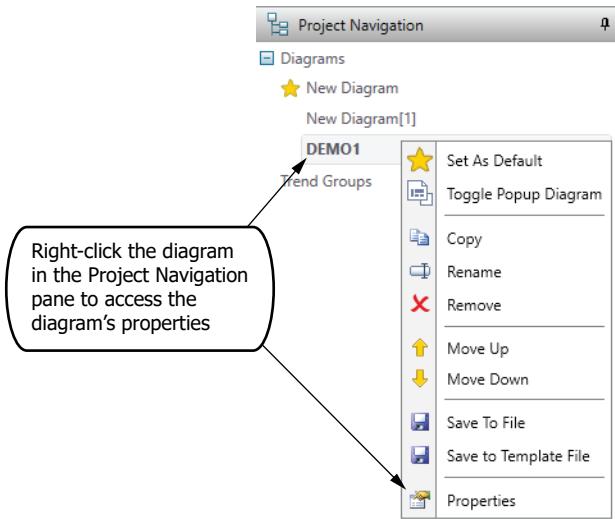


Figure 2.12 Diagram Right-Click Options

Setting the Default Diagram

To configure what diagram appears when you first view the HMI online, select the desired diagram in the Project Navigation pane, right-click it, and select **Set As Default**.

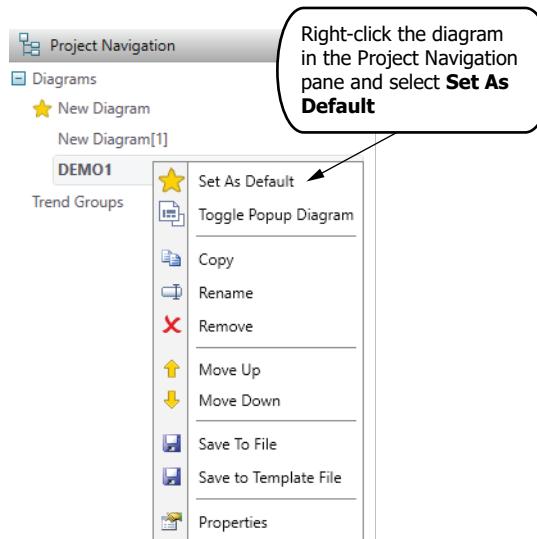


Figure 2.13 Set Diagram as Default

Rearranging Diagram Links

To rearrange the order of diagrams in the Project Navigation pane, you can right-click a diagram's name and select **Move Up** or **Move Down**, as shown in *Figure 2.14*, to move the diagram one line up or down, respectively.

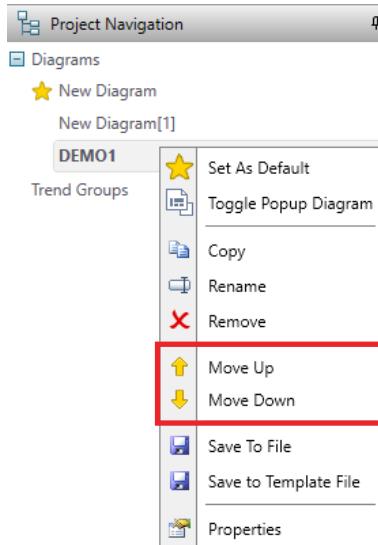


Figure 2.14 Move a Diagram Up or Down in the Project Navigation Pane

Alternatively, you can drag and drop a diagram to move it to any desired location in the Project Navigation pane, as shown in *Figure 2.15*.

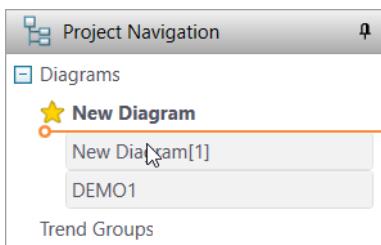


Figure 2.15 Rearrange Diagrams in the Project Navigation Pane Via Drag and Drop

Saving a Single Diagram as a File

Diagram Builder provides two options for saving diagrams: **Save To File** and **Save To Template File**. Both files have an .hmid extension. The **Save To File** option retains the tags associated with the controls in the diagram. Conversely, the **Save To Template File** option removes all of the tags from the controls and only retains the layout of the objects and controls on the diagram, allowing you to use it as a template.

To save a diagram, right-click the diagram name in the **Project Navigation** panel and choose the appropriate option.

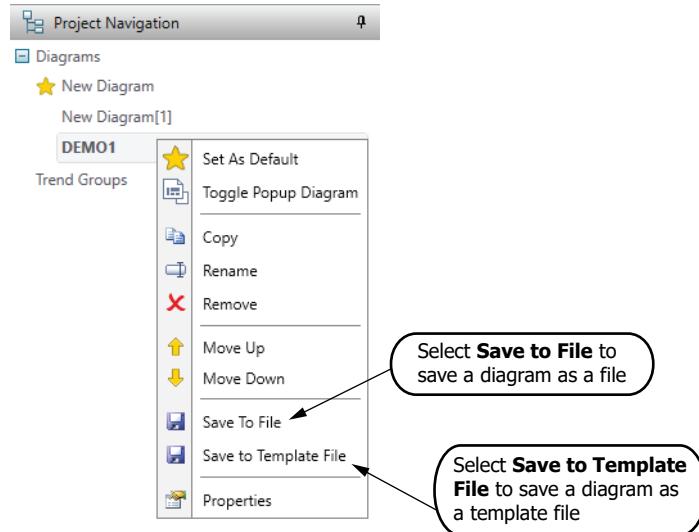


Figure 2.16 Save Diagram as a File or a Template File

Application Settings

The Application Settings window allows you to set global defaults or make global changes to the project such as modifying the background color, lines, font, appearance, language, grid spacing, and Diagram Builder behavior settings. Open the Application Settings window by selecting **Settings > Application Settings**.

Project Settings

The project settings apply to the organization and settings for the project. To access the project settings, select **Settings > Project Settings**.

General

Use the **General** tab to control project naming and to globally enable or disable user role-based security for accessing the diagrams in the project on the RTAC HMI in the browser.

- The Project Name will appear at the top of the Diagram Builder window during configuration.
- The Navigation Link Text will appear in the HMI section of the RTAC web server.

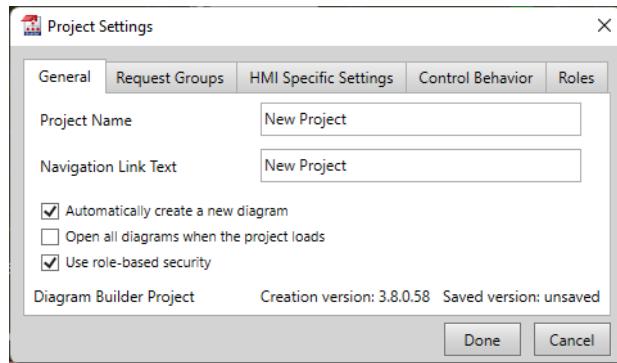


Figure 2.17 General Project Settings

Request Groups

Diagram Builder ties every control and status to a request group. You can choose to have tag updates occur at different intervals by tying controls and statuses to different request groups. Note that when the number of tags within a request group exceeds 250, Diagram Builder creates a new overflow request group in the HMI that updates at the default interval.

- The **Event Poll Interval** determines the periodic poll rate at which Diagram Builder updates only those group tag values that have changed since the previous poll.
- The **Integrity Poll Interval** determines the periodic poll rate at which Diagram Builder updates the status of all tags you have assigned to a group.

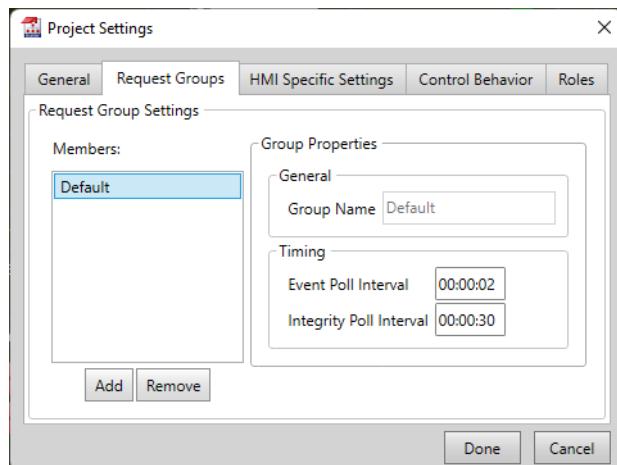


Figure 2.18 Request Groups Project Settings

HMI-Specific Settings

- **Alarms Viewer:** Selecting the **Enable auto polling of records in the Alarm Viewer** option enables the RTAC HMI to automatically refresh the Alarms Viewer to show you alarms as they occur. If you leave this check box unselected (which is the default), you must launch the Alarms Viewer to refresh the list of alarms.
- **Control Styling:** Selecting the **Use legacy styles on controls** option results in 3D-shaped controls that follow the legacy format. Disabling this provides controls with a flat modern look instead.
- **Control Window Settings:** Selecting the **Disable navigation while the control window is open** option disables navigation features when a control window is opened on a screen. Closing the control window will re-enable navigation features.
- **Lazy Loading:** Selecting the **Enable lazy loading of diagrams** option sets a project to open as few diagrams as possible in the RTAC HMI in order to improve the overall performance of the client connection. Lazy loading will be applied to all diagrams that are not associated with annunciator or alarm annunciator controls with the additional alarm on child diagram property enabled.
- **HMI Runtime Settings File:** Attaching an HMI runtime settings file to a project will change the default settings of the HMI runtime when opening that project to reflect those settings. Selecting the **Enforce HMI Runtime Settings** option will prevent an RTAC HMI operator from being able to modify those settings from within the HMI runtime.

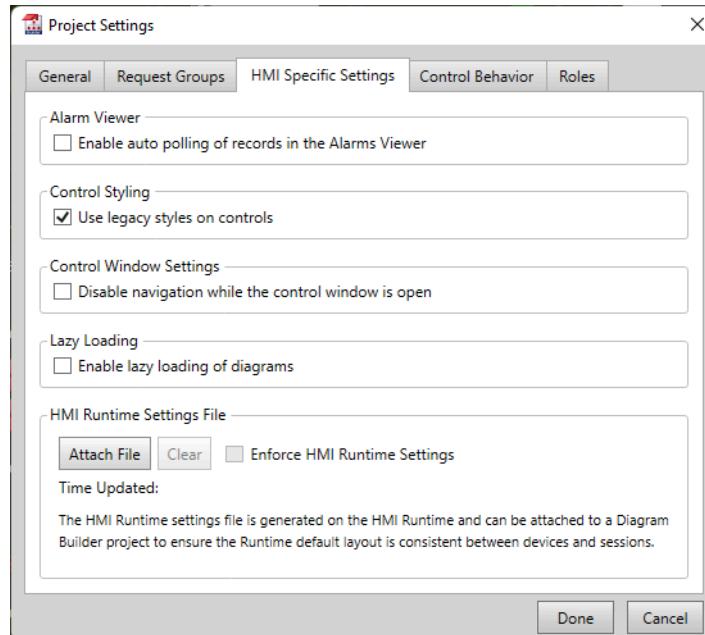


Figure 2.19 HMI Specific Settings Project Settings

Control Behavior

By default, a confirmation message will appear before and after a control command is sent in the web HMI. You can change these settings to allow for fewer interruptions.

- ▶ **Enable message settings on individual controls:** Selecting this option disables the project message settings and allows the user to define message settings per individual controls.
- ▶ **Show warning before sending control commands:** This warning message prompts you to verify that you want to operate the control.
- ▶ **Show confirmation after sending control commands:** This warning message notifies you that the RTAC has acknowledged the control message.

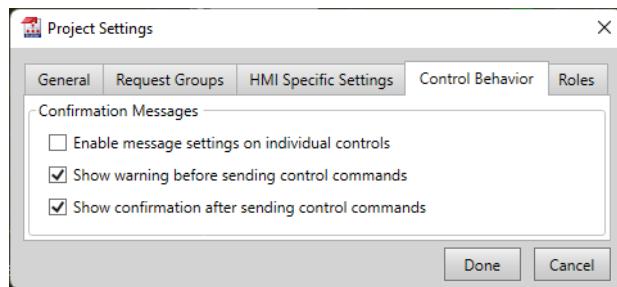


Figure 2.20 Control Behavior Project Settings

Roles

Use the **Roles** tab to configure user role-based security for accessing the diagrams in a project on the RTAC HMI in the browser.

- ▶ The **Role Names** area lists the existing user role names in the project. Use the **Add** and **Remove** buttons to add new user role names and remove existing ones.
- ▶ The **Diagrams** area lists all the existing diagrams in the project. It allows you to rename user role names and configure access rights to diagrams in the project.
- ▶ To update a user role name, select a role in the **Role Names** area, type a new name in the **Role Name** text box in the **Diagrams** area, and select **Done**.
- ▶ Configure access rights to diagrams in the project by user role by selecting a user role in the **Role Names** area and either individually selecting or clearing individual diagram check boxes in the **Diagrams** area or selecting or clearing the **Select/DeSelect All** check box.

NOTE

Diagram Builder has no awareness of user role names or user role hierarchy as defined in the RTAC. When configuring access rights to diagrams in the project, the user must manually enter role names in Diagram Builder, ensure that they match exactly the user role names defined in the RTAC, and manually manage the user role hierarchy in Diagram Builder.

NOTE

Diagram Builder projects with user role-based security enabled will only render through the use of HTML5 in an RTAC with firmware R141 or later. Refer to Table B.1 for a list of browsers that support rendering in HTML5.

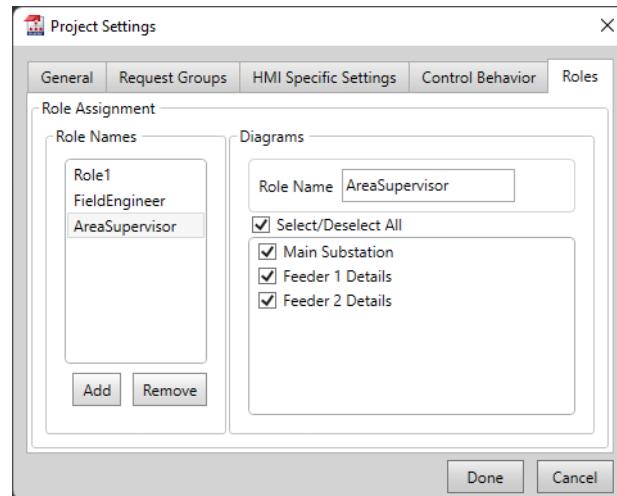


Figure 2.21 RTAC HMI User Roles and Diagram Access Configuration Window

Find Text

Use the **Find Text** feature to search for a particular usage of text within the current diagram, diagrams that are presently open, all diagrams, or just what you have selected on the diagram. You can expand your search to include case sensitivity, exact word entry, or only certain properties of controls within the diagram.

- **Search In:** By selecting **Search In**, you can select to only search in certain areas such as open diagrams, in the entire project, or just the presently active diagram.

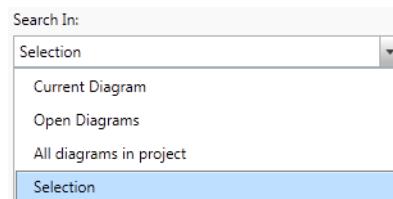


Figure 2.22 Search Parameters

Replace Text

The **Replace Text** feature is one of the most powerful tools within Diagram Builder. If, for example, you have developed several similar annunciator tiles that differ only in their child tag names and descriptions, the **Replace Text** tool can make quick work of assigning new tags and descriptions. In the form represented by the following screenshot, for example, you can replace the unique portion of the tag names with a single click.

- **Search In:** By selecting **Search In**, you can select to only replace controls in certain areas such as open diagrams, in the entire project, or in just the presently active diagram.
- **Only Replace In:** By selecting **Only Replace In**, you can choose to have replacement occur only in tag names, descriptions, or other properties.

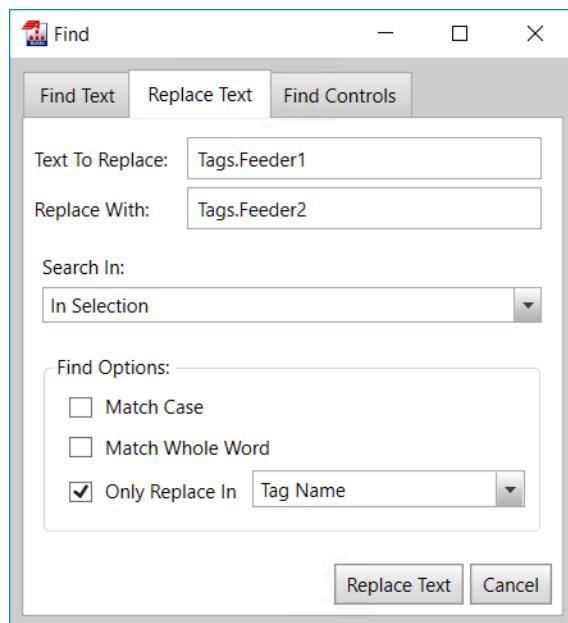


Figure 2.23 Replace Text

Find Controls

The **Find Controls** function lets you search for a particular control type you have used within the project. As with the Find Text function, within this function that you can choose to search only specific areas.

- **Find Control Type:** This dropdown search box populates with control types in use within the area selected in the **Search In** field.
- **Search In:** By selecting **Search In**, you can choose to only search in certain areas such as open diagrams, the entire project, or just the presently active diagram.

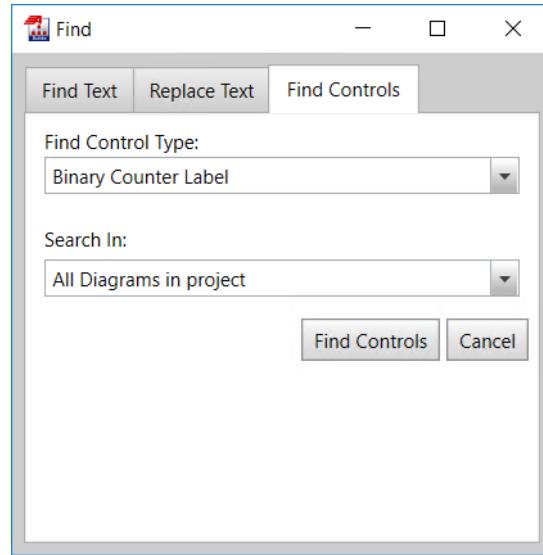


Figure 2.24 Find Controls

Select

Use the **Select** menu to make simultaneous changes to multiple controls or to select multiple controls to copy or delete.

Select All

Using **Select > Select All** selects everything on the active diagram. You can also accomplish this by pressing **<Ctrl+A>**.



Figure 2.25 Select All

Select Lines

Using **Select > Select Lines** selects all lines on the active diagram.

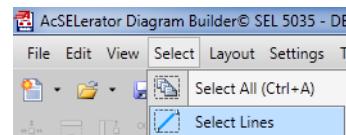


Figure 2.26 Select Lines

Select Controls by Type

Through the use of **Select > Select Control Type**, you can select all controls of a given type. This is particularly useful when you need to change a single property for all of the controls for the selected control type. For example, you can use this tool to change the alarm color for all breakers at the same time.

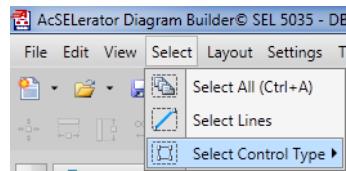


Figure 2.27 Select Control Type

Preview of Control Conditions

After or during diagram development, you can choose to view how the diagram would display under certain conditions. On the toolbar, there are several selections available for previewing the conditions of the diagram control within Diagram Builder.

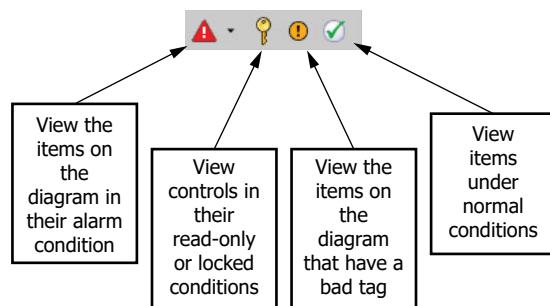


Figure 2.28 Control Preview Tools

Quality Symbol

Every control has a quality label with which it is associated. If the assigned tag to the control or label has a bad quality condition, that quality indicator will appear on the HMI. For analog displays, this will appear as an exclamation point preceding the metering label. For all other displays, this indicator will appear as a yellow circle with an exclamation point. An annunciator tile will display a quality indication if any of its child controls or assigned tags have a quality of bad.



Figure 2.29 Runtime Bad Quality Indication

Locked Condition for Controls

When the HMI is in read-only mode or the **Always Authenticate** property of a control is set to **True**, the control displays a lock. When you select the control, Diagram Builder displays a small username login screen from which you must authenticate your user level before the program issues the control.

A control will also be locked if the **Locked on Operator Blocked** property is true. This property monitors the quality status of the assigned control tag. If this tag is of bad quality, the property locks and inhibits controls. You can ignore this quality error by selecting the control, authenticating the user level, and sending the control.

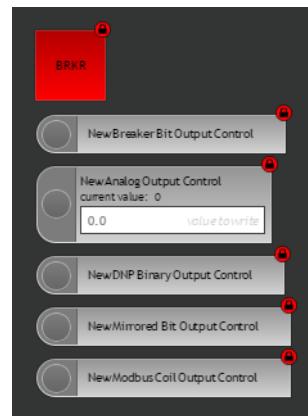


Figure 2.30 Runtime Lockout Condition

Additional Runtime Indications

A pink circle with a plus sign on the HMI indicates the presence of a supported and configured Control Window.

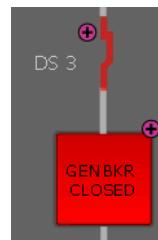


Figure 2.31 Runtime Indication for the Presence of a Configured Control Window for a Control

If the annunciator or the acknowledgeable annunciator tiles are configured with **Show Alarm For Children** selected, and the **Show Child in Alarm Symbol** property is set to **True**, a bell symbol in the HMI runtime indicates the presence of an alarm condition on the child diagram. If the **Show Child in Alarm Symbol** property is set to **False**, the parent tiles display the alarm behavior, but no bell symbol is displayed. Enable the bell symbol to help you determine if the alarm is coming from a child diagram during the HMI runtime.

NOTE

For the acknowledgeable annunciator tile to show the bell symbol, its child diagram must contain another acknowledgeable annunciator tile in an alarm condition.

NOTE

A black question mark surrounded by a blue circle displayed on an annunciator tile is a symbol indicating that a child diagram has a control with invalid quality.



Figure 2.32 Runtime Indication for the Presence of an Alarm Condition on the Child Diagram

Locking Movement of Controls in a Diagram Builder Project

You can choose to lock a control in Diagram Builder to prevent its movement on a diagram in the Diagram Builder project. Additionally, if a control is locked in Diagram Builder, the properties of the control are hidden from the user, thus further preventing modification to its configured properties. This ability is available for all controls except the Trend Control and Lines. The application of this lock does not impact the behavior of the control on the RTAC HMI in the browser.

Right-click a control on a diagram in Diagram Builder and select **Lock Control** to prevent its unintentional movement on the diagram and to prevent any unintentional changes to the configured properties of the control.

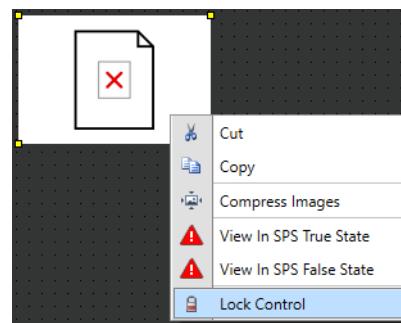


Figure 2.33 Lock Control Option in Diagram Builder

Once locked via this method, the control is marked with an outline in the color as configured under **Application Settings > Controls > Locked Control Border Color** in the Diagram Builder project.

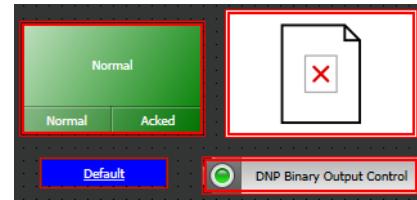


Figure 2.34 Lock Control With the Lock Option Applied

Right-click a locked control on a diagram in Diagram Builder and select **Unlock Control** to remove the lock applied via the **Lock Control** option.

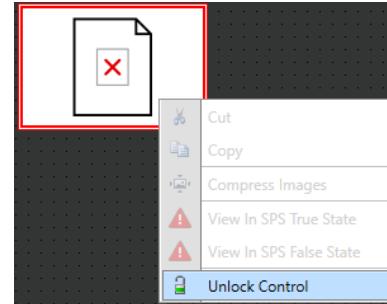


Figure 2.35 Unlock Control Option in Diagram Builder

HMI Export/Import

The **HMI Export/Import** tool allows mass changes to be made to a project by exporting to a CSV file, making the modifications, and then importing the modified CSV. You can access this tool by selecting **Tools > HMI Export/Import**. Note that this tool only allows modification of existing controls.

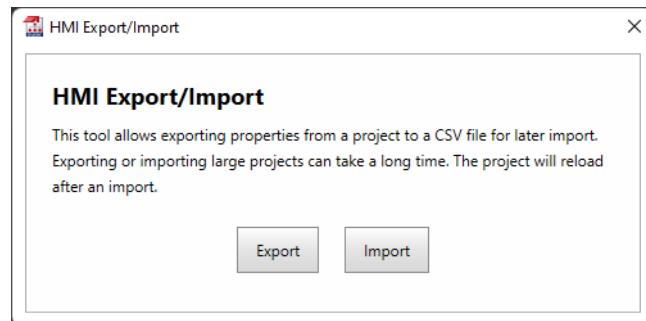


Figure 2.36 HMI Export/Import

HPRJ, HPRB, HMID, and HMIJson—Types of Files Used by Diagram Builder

Diagram Builder employs four types of files according to the task being performed.

HPRJ (HMI Project XML)

An SEL RTAC stores HMI projects in the HPRJ format. When sending projects to an RTAC, Diagram Builder automatically converts the project into the HPRJ format. When reading projects from an RTAC, Diagram Builder saves the project locally on your computer in the HPRJ format.

HPRB (HMI Project Binary)

HMI projects created or opened and then saved by Diagram Builder are stored using the compressed HPRB format.

HMID (HMI Diagram)

Individual diagrams from an HMI project that are saved by Diagram Builder are stored using the HMID format. These diagrams can then be added to new or existing projects.

HPRJson (HMI JSON)

HMI projects exported from Diagram Builder using the HPRJson format (via **File > Export Project**) or converted using **Project Convert** can be uploaded through a browser to an RTAC running firmware version R152 or later.

RTAC Connections

Use the RTAC Connections utility to delete projects or to upload and download projects to and from the RTAC. You can start the utility by selecting the RTAC Connections icon () on the toolbar or by selecting **File > RTAC Connections**.

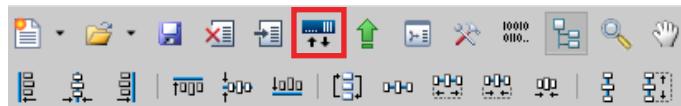


Figure 2.37 Manage Project

Download From Device

Perform the following in the RTAC Connections utility to download the HMI files from the RTAC:

- Step 1. Select the **Download From Device** tab.
- Step 2. Choose the location to which you want to save the HMI files.

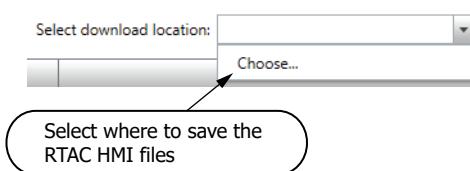


Figure 2.38 Select Download Location

Step 3. Select **Get Available Files To Download**.

Step 4. Connect to the RTAC by entering the corresponding **IP Address**, **User Name**, and **Password** and selecting **Connect**. If you need to modify your TCP Port to connect with your RTAC, you can do so under the Advanced tab.

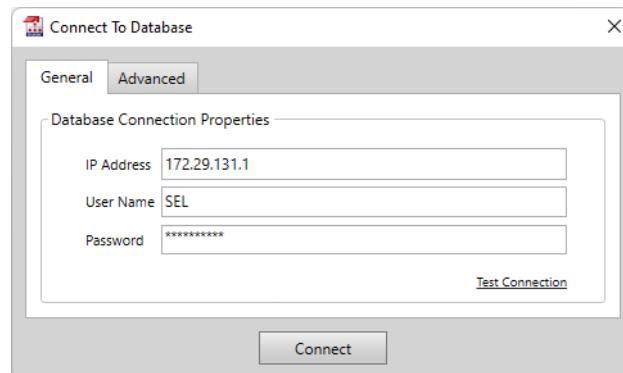


Figure 2.39 Connect to Database

Step 5. Select the HMI files to be downloaded and then select **Download Selected Files** in the lower right corner.

Upload to Device

Perform the following in the RTAC Connections utility to upload a project to the RTAC:

Step 1. Select the **Upload To Device** tab.

Step 2. Select **Choose Files To Upload** and select the project file(s) you want to upload.

Step 3. Select the HMI files to be uploaded to the RTAC then select **Upload Selected Files** in the lower right corner.

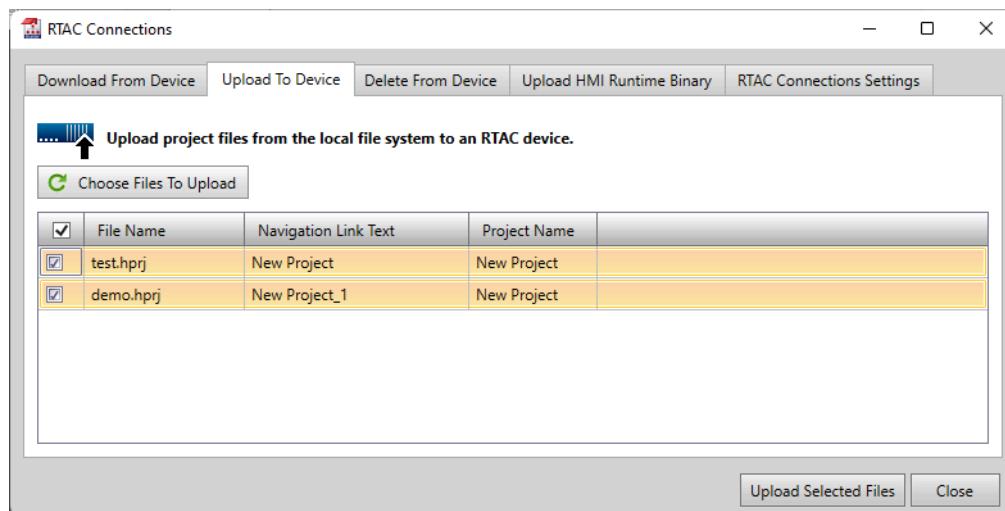


Figure 2.40 Upload Project to Device

Delete From Device

Perform the following in the RTAC Connections tool to delete projects that you have previously loaded on the RTAC:

- Step 1. Select the **Delete From Device** tab.
- Step 2. Select **Get Available Files to Delete** and enter the corresponding IP address, user name, and password to log in to the RTAC.
- Step 3. Select the HMI files to be deleted from the RTAC and then select **Delete Selected Files** in the lower right corner.

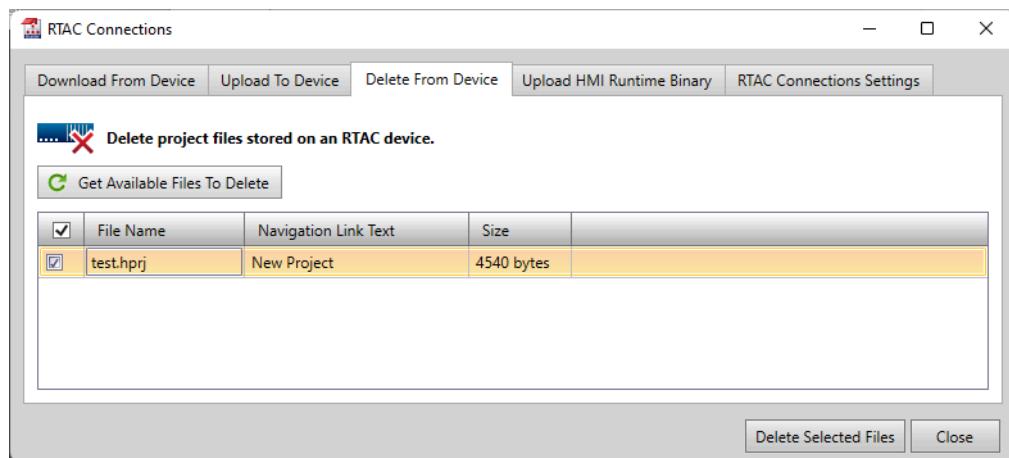


Figure 2.41 Delete Project From Device

Clearing the Browser Cache for Runtime Files

After uploading a .binz file to an RTAC, the browser cache must be cleared in order for it to load the correct runtime file version and render correctly. Failure to clear the browser cache may result in inconsistent rendering of the HMI runtime. Use the following instructions to clear the browser cache for remote connections into Chromium running on the local display of an SEL-3555 RTAC.

SEL-3555 RTAC Running a Local Display With Chromium

For firmware versions R143 and earlier, press <Ctrl+D> to clear the cache and restart the browser on the local display of the SEL-3555 RTAC.

For firmware versions R144 and later, use the following steps to clear the cache on a local display of the SEL-3555 RTAC:

- Step 1. Using a keyboard connected to an SEL-3555 RTAC, press <F11> to access the Kiosk mode.
- Step 2. In the Chromium browser of the RTAC, access the settings menu.
- Step 3. Expand the Advanced settings and look for the **Clear Browsing Data** option under **Privacy and Security**.
- Step 4. Select a **Time range of All Time** and make sure the **Cached images and files** check box is selected.
- Step 5. Select **Clear data**.

Remote Connection to an RTAC Using a Chromium Browser

Instructions for clearing your browser cache can be found at the following:

- Microsoft Edge
- Google Chrome

Log File Viewer

The **Log File Viewer** is a diagnostic tool that you can use to view the diagnostics log and quickly find and resolve issues that you discovered during development. You can access this tool through selection of **Tools > Log File Viewer**.

Log Viewer

The **Log Viewer** is a graphical user interface (GUI) from which you can view log file contents. Diagram Builder actively generates a log file during development. If issues occur, you can use this tool to diagnose problems.

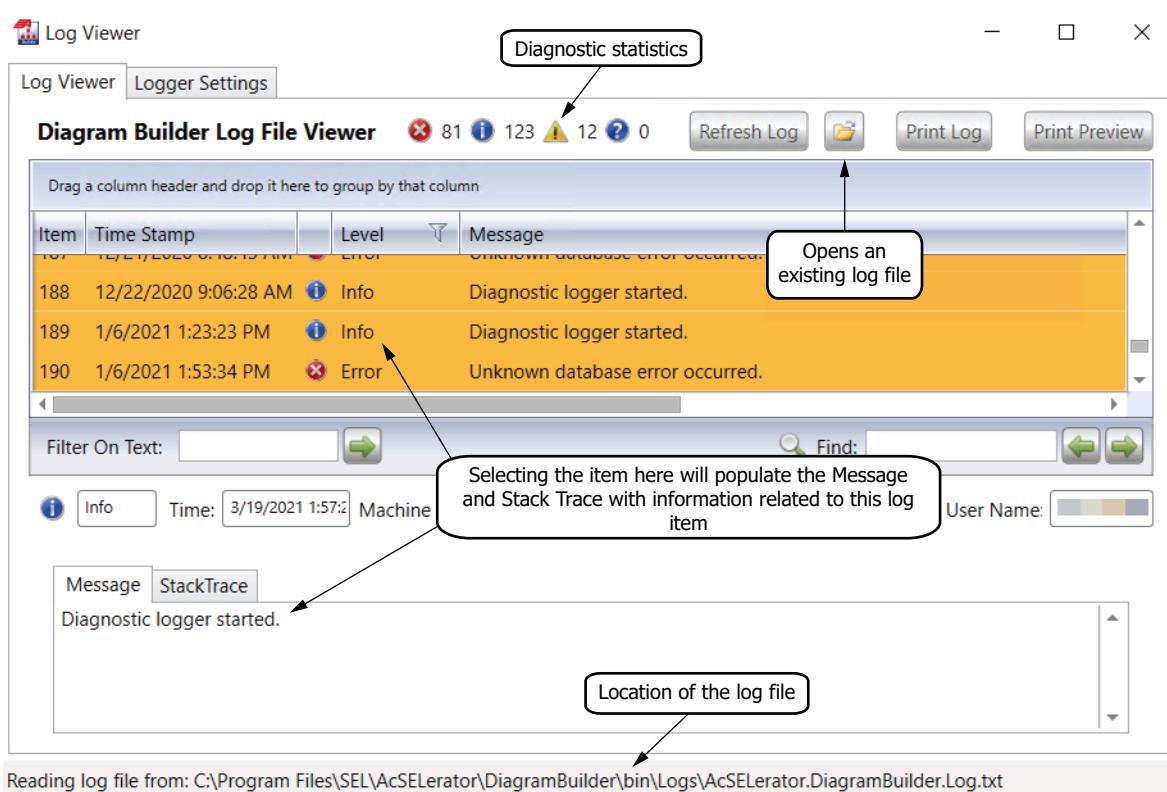


Figure 2.42 Diagram Builder Log Viewer

Logger Settings

Through the use of the **Logger Settings** tab, you can limit the file size of the log file. The log file rolls over when you exceed this threshold.

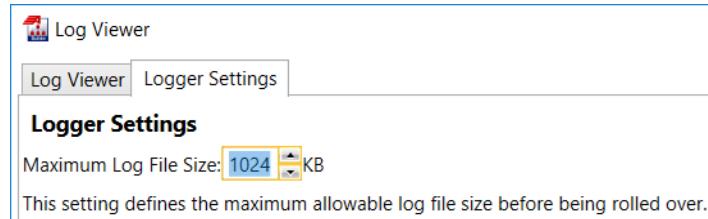


Figure 2.43 Adjust Maximum Log File Size

SECTION 3

Navigating the HMI Runtime

Control Window

The Control Window is a popup that displays and provides digital and analog inputs and outputs related to a parent control, such as the **Breaker** control. The controls that support the Control Window are the **Breaker** control, **Disconnect Switch** control, and **Multifunction Control**. Diagram Builder applies tags to the **Control Window** section inside the device properties of the controls supporting the **Control Window**. For example, during RTAC HMI operations you can either hold down the <Ctrl> key while clicking the mouse on the **Breaker** control or double-click the **Breaker** control (based on your project configuration) to cause the Control Window pane to open as configured, with all tags applied to the **Control Window** properties. (For additional information on **Breaker** properties, see *Table 4.1.*)

NOTE

The controls supporting the Control Window must have at least one tag assigned to their **Control Window** property for the Control Window to function in runtime.

Selecting Tags

Selecting the breaker in Diagram Builder will expose its properties in the properties pane. Assignment of the tags that display in the Control Window during runtime occurs in the **Control Window** properties pane. At least one binary output must be assigned for the Control Window to become available during operation through the RTAC HMI.

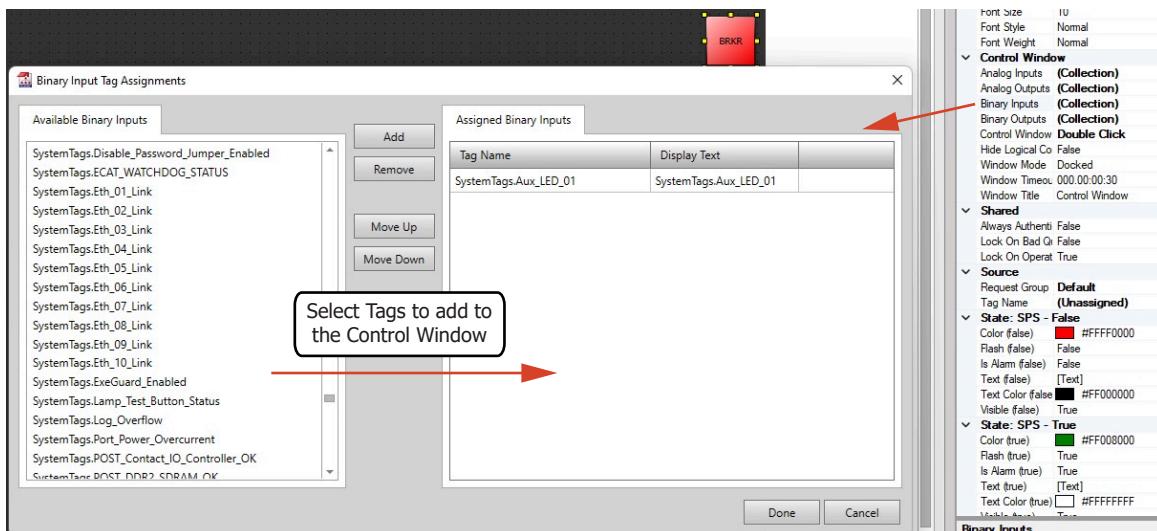


Figure 3.1 Control Window Tag Selection

The Control Window submenu provides you the ability to add analog and binary inputs and outputs by clicking on each option to open a window and assign each respective type of tag. In each window, as shown in *Figure 3.2*, is a Display Text column in which you can enter a description of what the control does or represents.

Assigned Analog Inputs	
Tag Name	Display Text
SystemTags.Eth_10_Bytes_Received	Custom Text 1
SystemTags.Eth_10_Collisions	Custom Text 2
SystemTags.Eth_10_Ports_Active	Custom Text 3

Figure 3.2 Control Window Element Description

For the **Binary** and **Analog** outputs, you get an additional column named **Button Display Text**, as shown in *Figure 3.3*, which specifies the custom text that appears on a button during RTAC HMI Control Window operations.

Assigned Analog Outputs		
Tag Name	Display Text	Button Display Text
ControlCentric.ControlDock	Activate Alarm 1	ALARM ON
ControlCentric.ControlDock	Deactivate Alarm 1	ALARM OFF
Tags.APC00	Custom Text	CustomText

Figure 3.3 Control Window Button Display Text

You can open the Control Window with either a single click or a double-click.

When set to **True**, the **Hide Logical Command Column** setting displays the tag structure operation name associated with the control. Set this to **False** if you prefer not to show the operation type such as trip, close, pulse, and others in the Control Window while operating the RTAC HMI.

Window Mode enables you to select whether you want the Control Window popup to be docked or floating.

Window Timeout determines the amount of time that the Control Window remains open for operation.

Control Window in Runtime

To open the Control Window while using the HMI, either hold down the **<Ctrl>** key and click with your mouse on the relevant control or double-click the relevant control. This option is configured in Diagram Builder in the properties pane of a control supporting the Control Window under the Control Window property category. The Control Window will appear as configured to expose all live values for tags assigned in the **Control Window** properties.

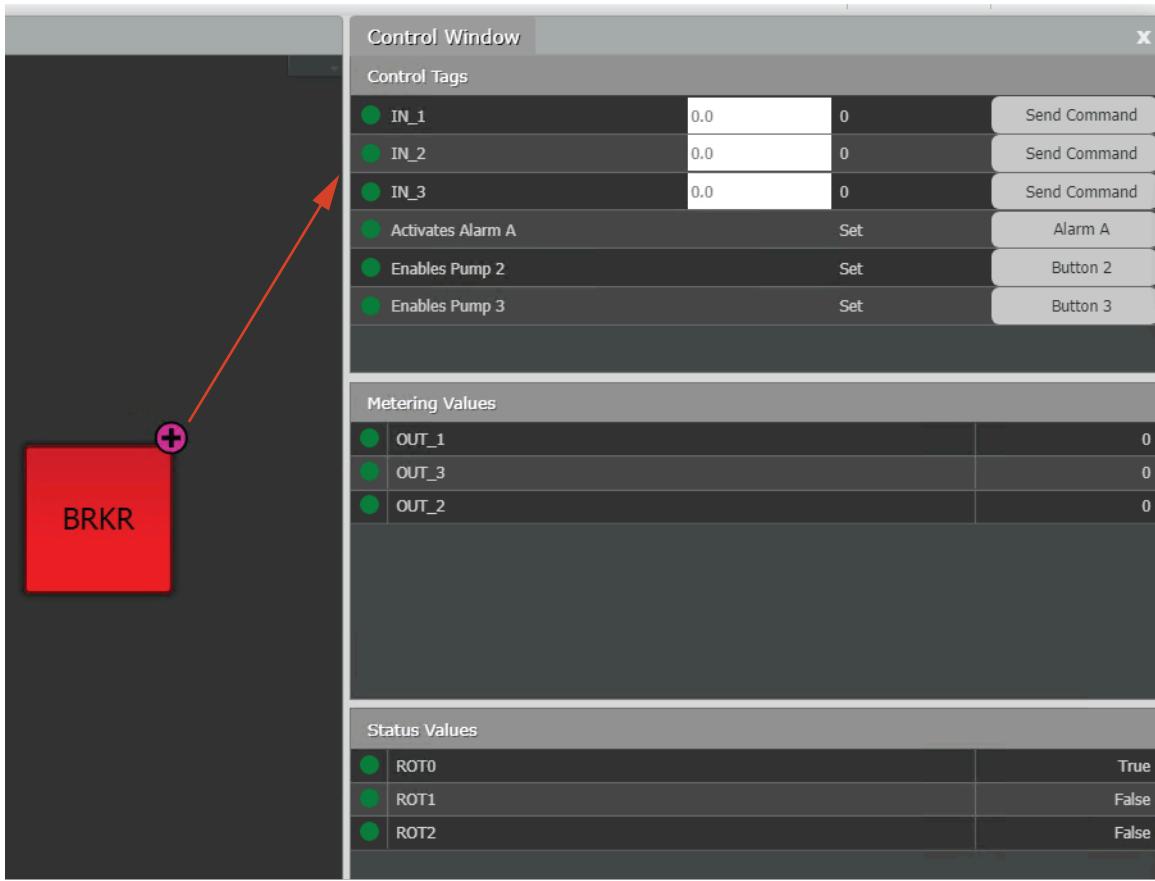


Figure 3.4 Viewing the Runtime Control Window

Announcer Tiles

The primary purpose of announciator tiles is to provide you with a graphical representation of an alarm condition, and to act as a link to a child diagram, so you can see additional detail for a specific area. For instance, you can place an **Announcer Tile** above any control in Diagram Builder and make it invisible. Double-clicking the tile while operating the RTAC HMI will open another diagram that you can fill with more comprehensive diagnostics and graphics related to that control or critical area. The **Announcer Tile** from the main diagram can also be configured to flash in alarm if any item in the child diagram goes into alarm or if its assigned tag goes into alarm. (For a detailed view of **Announcer Tile** properties, see *Table 4.1*).

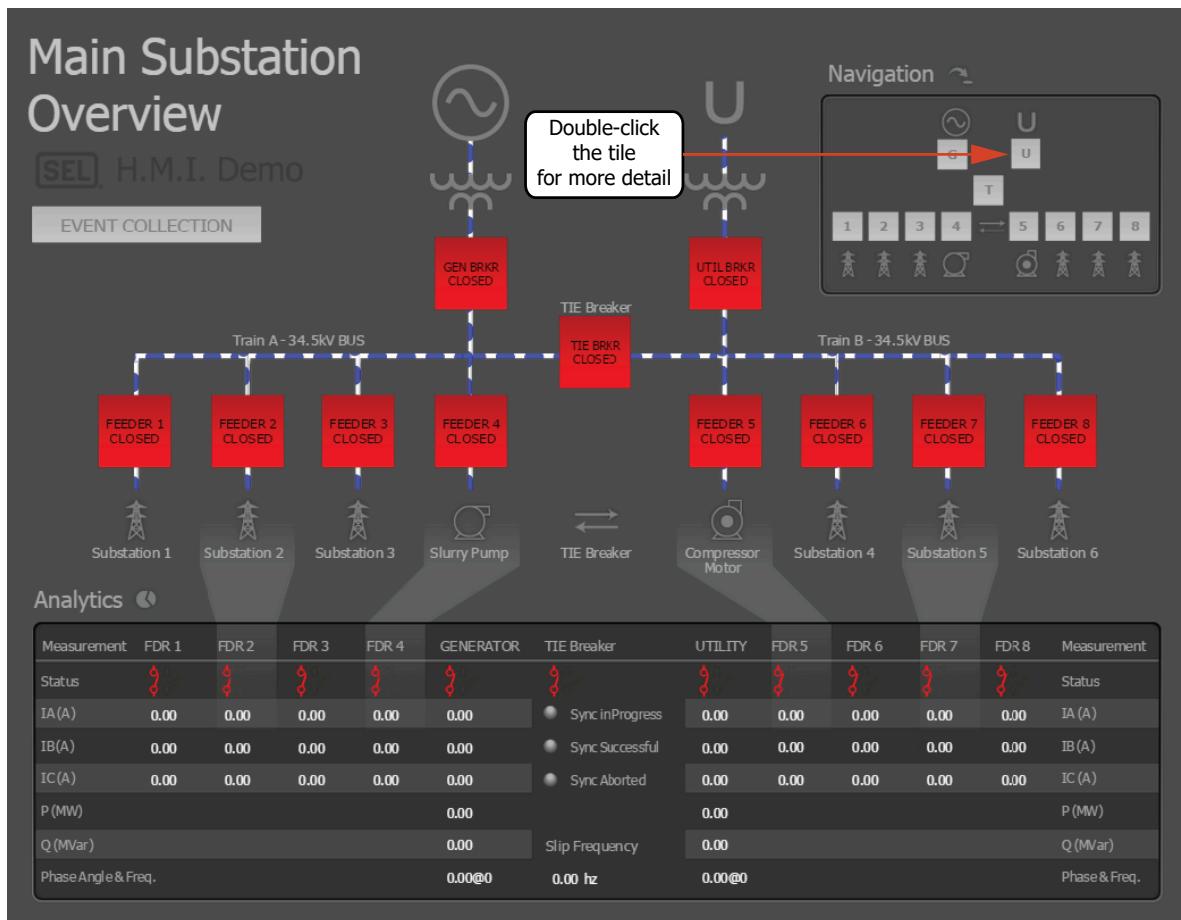


Figure 3.5 Viewing the Runtime Annunciator Child Diagram

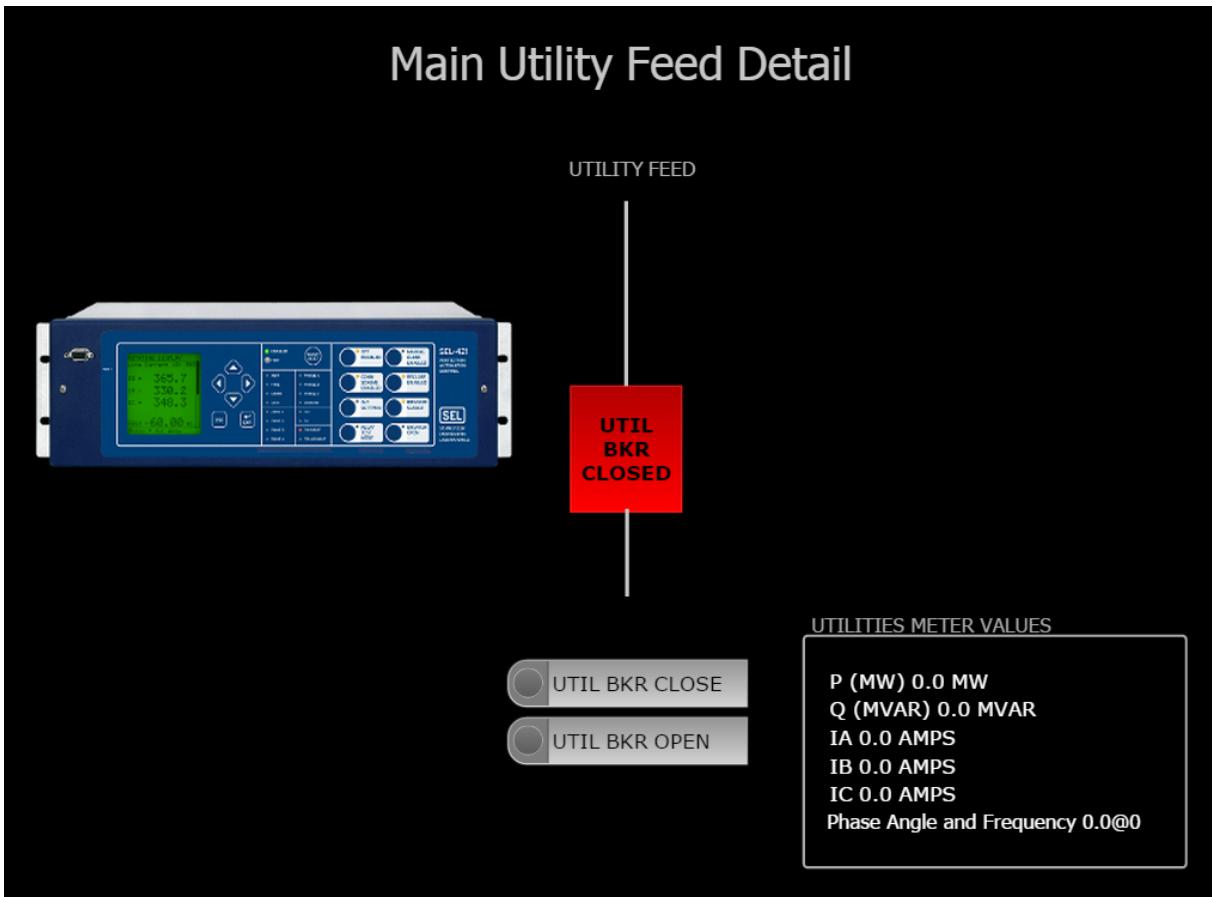


Figure 3.6 Annunciator Child Diagram

Acknowledgeable Annunciator Tiles

Acknowledgeable annunciator controls can provide alarms to alert viewers of immediate problems. Through the use of acknowledgeable annunciator controls, viewers can also acknowledge alarms.

During runtime, if the tag tied to the acknowledgeable annunciator tile changes states, the tile goes into an alarm state. From this point, the control can be acknowledged, or the control reverts to a normal state if the alarm clears. The control has four different states in which the alarm could be at any given time; *Figure 3.7* displays these states.

NOTE

The acknowledgeable annunciator tiles have to be configured both in Diagram Builder and the associated ACSELERATOR RTAC project. For further information, see the SEL application guide "Alarm Acknowledgment in the RTAC HMI" (AG2014-35) available at selinc.com/products/5035/#tab-literature.

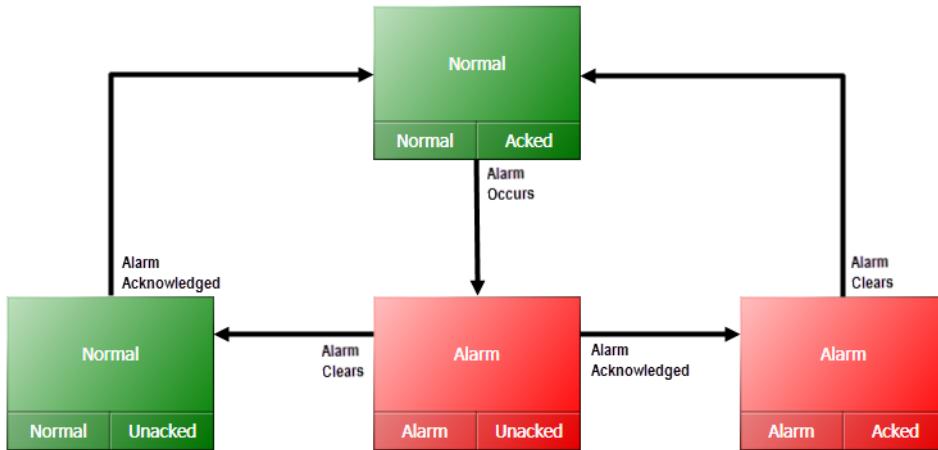


Figure 3.7 Functionality of the Four Acknowledgeable Annunciator Tile States

Project Outline

While operating or reviewing the RTAC HMI, the **Project Outline** lists all diagrams in your project and allows you to navigate through those that are available to you while in runtime. The diagrams are listed based on user role-based security settings; those that you can access are listed under **Available Diagrams**, and any that you cannot access will be listed under **Disabled Diagrams**. Select a diagram listed under **Available Diagrams** to open it in the HMI.

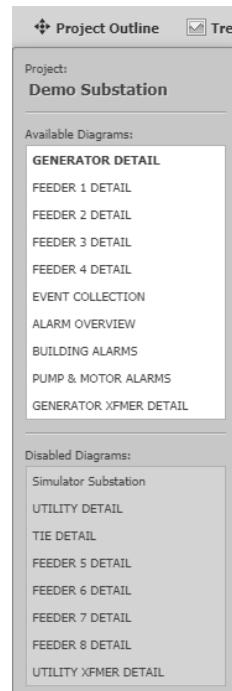


Figure 3.8 Runtime Diagram Navigation

Trend Designer for Static Trends

Inside the project development of Diagram Builder is a feature to design static trends in the project. These are trends viewable by all clients but unconfigurable by users once you have loaded them into a project.

From the **Project Navigation** pane inside Diagram Builder, right-click the **Trend Groups** header and select **Create New**.

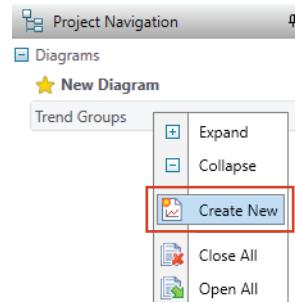


Figure 3.9 Create New Static Trend

Step 1. From the **Controls** pane, pull a **Trend** control onto the trend group space.

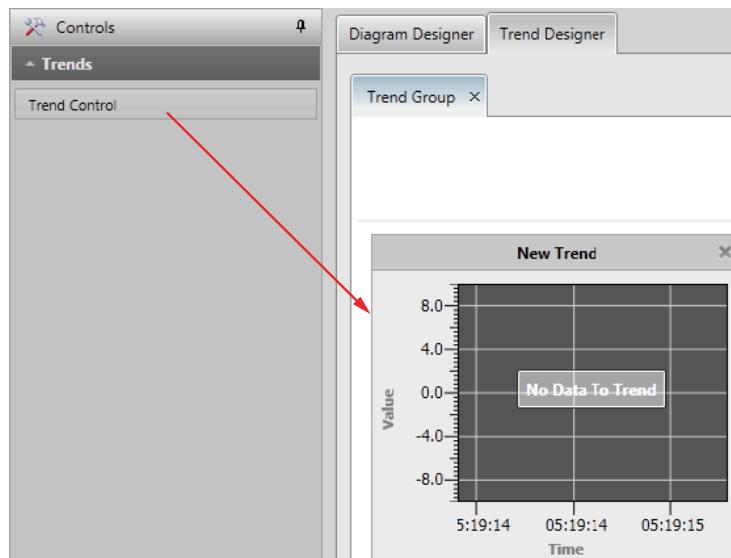


Figure 3.10 Place Trend Onto Trend Space

Step 2. From the **Tags** pane, pull as many as four tags into the **Trend** control.

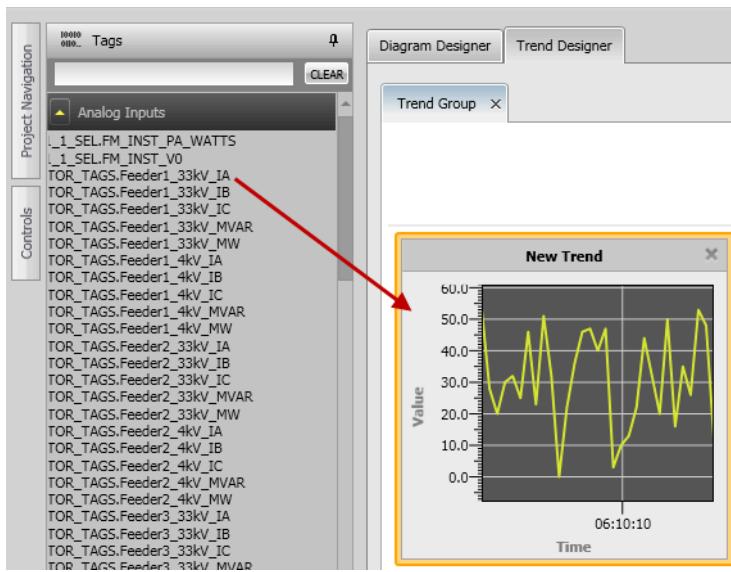


Figure 3.11 Drag Tag Onto New Trend

Dynamic Trend Design at Runtime

While viewing the project in runtime, users can create active trends to display data in which they are interested. A trend actively traces to a client computer as long as the HMI is running.

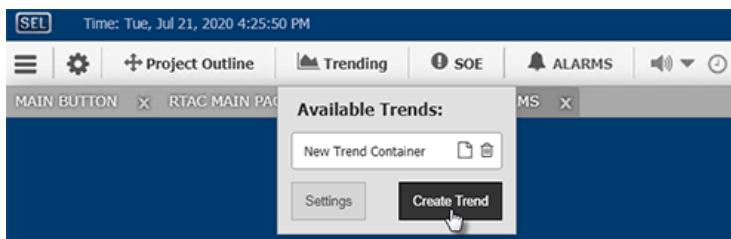
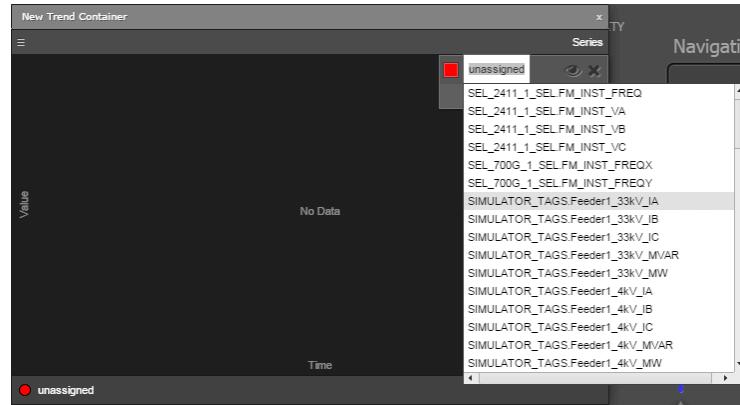
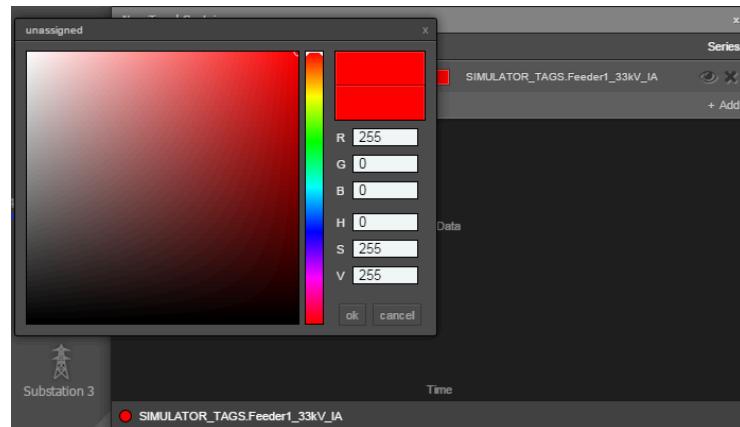


Figure 3.12 Creating a Trend

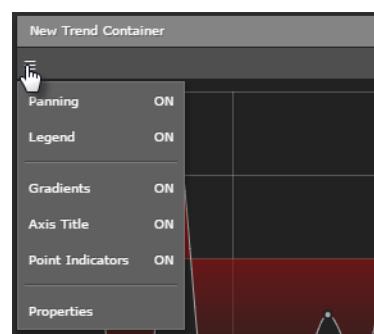
- Step 1. Select **Trending > Create Trend** to create a new dynamic trend.
- Step 2. In the **New Trend Container** that displays, select **Series** in the upper right-hand corner and then hover your mouse over **unassigned**. When the text editor cursor appears, click once and then select the tag(s) you would like to trend.

**Figure 3.13 Add Tags to Trend View**

Step 3. Change the color of the trend line by double-clicking the default color next to the tag name under **Series**.

**Figure 3.14 Adjust Trend Line Color**

Step 4. Change the trend name and axis titles by selecting the more details icon (☰) and then selecting **Properties**.

**Figure 3.15 Trending Options**

Step 5. Switch the **Panning** and **Point Indicators** options to **ON**. This will enable you to pan and view any values of the trending graph by simply hovering over its curves. To resume the rendering of the trending graph, select the play icon (▶).



Figure 3.16 Hovering Over the Trending Graph

Setting Defaults for Static and Dynamic Trends at Runtime

You can set default settings for rendering Static and Dynamic trends while viewing the RTAC HMI in the browser. All default settings, except the Time Format setting, apply to all Static and Dynamic trends on the RTAC HMI. The Time Format property for Static Trends in a project must be set and updated in the Diagram Builder for it to take effect. Select **Trending > Settings** to access the settable default Trend settings from the RTAC HMI in the browser.

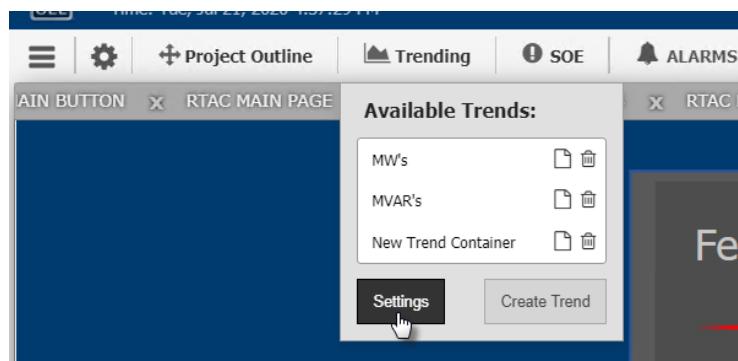


Figure 3.17 Accessing Default Settings for Static and Dynamic Trends at Runtime

You can set the default settings for **Legend**, **Gradients**, **Axis Titles**, **Point Indicators**, **Panning**, and **Time Format** of the trends. Once you have set the Default Trend Settings, select **Update Settings**.

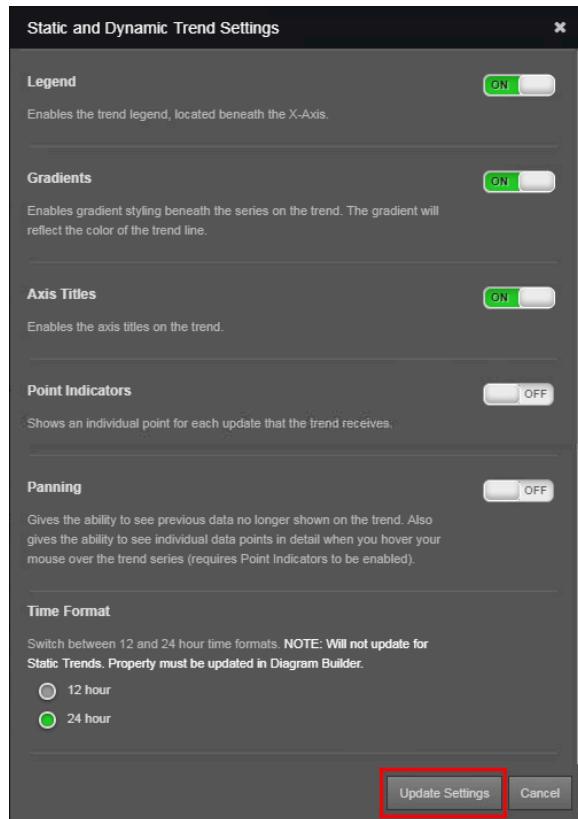


Figure 3.18 Available Default Trends Settings for Static and Dynamic Trends at Runtime

Selecting **Update Settings** provides an option to reload the RTAC HMI immediately or later. Select **Yes** if you want to reload the RTAC HMI immediately. Select **Restart Later** if you want to reload the RTAC HMI later.

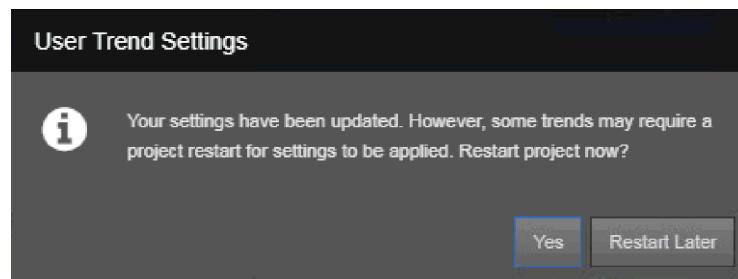


Figure 3.19 Reload RTAC HMI After Updating Static and Dynamic Trends Default Settings

All default settings changes require the RTAC HMI in the browser to be reloaded to guarantee that the settings changes take effect. For some settings changes, it is possible for the applied change to take effect before the RTAC HMI is reloaded; however, switching between 12-hour and 24-hour time formats requires the RTAC HMI to be reloaded before the time format change becomes effective. As previously mentioned, this time format change applies to Dynamic Trends only. If you choose to restart the RTAC HMI later, the time format change for Dynamic Trends will remain in a pending state until you reload the RTAC HMI. Select **Trending > Settings > Restart HMI** when you are ready to reload the RTAC HMI to apply the time format change to the Dynamic trends.

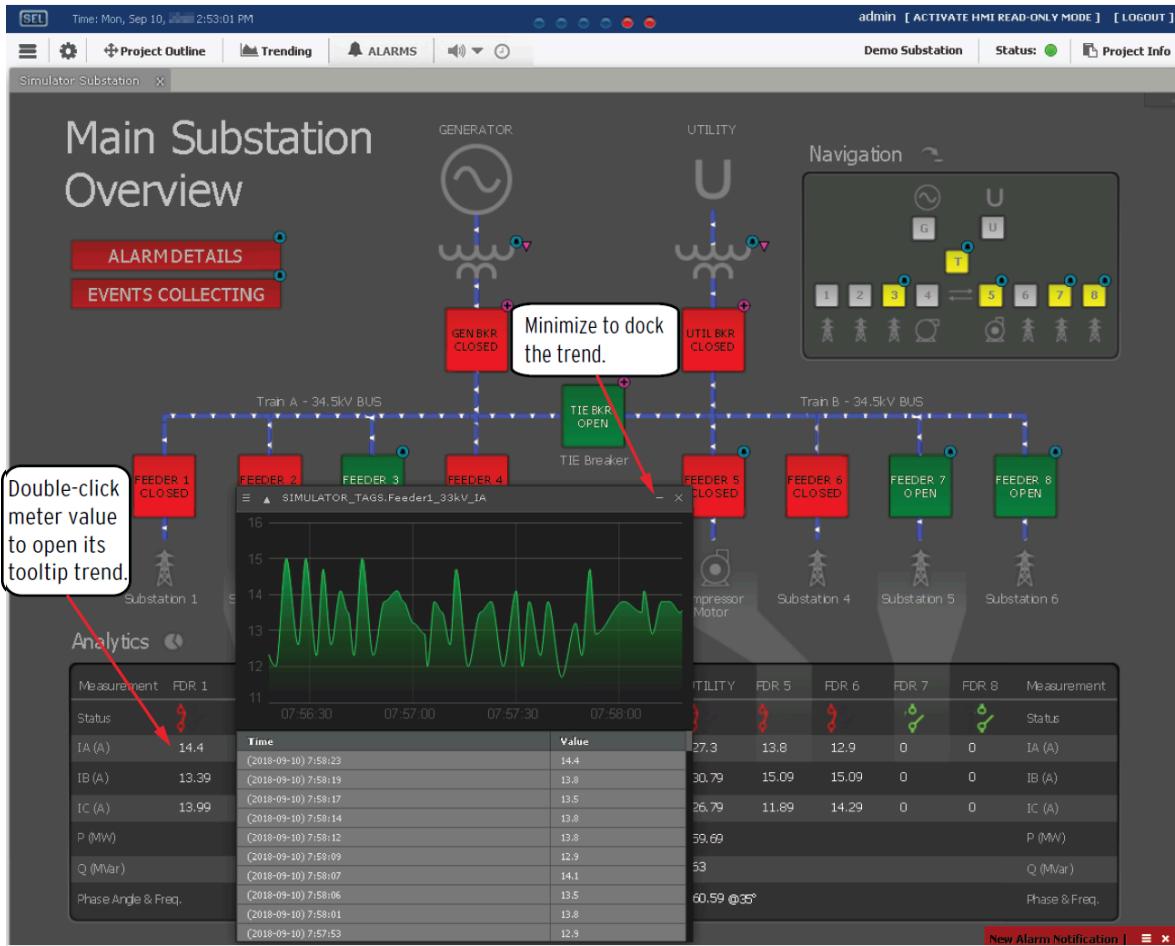


Figure 3.20 Reloading RTAC HMI Later for Time Format Update for Dynamic Trends at Runtime

If you choose to reload the RTAC HMI immediately, the time format change for the Dynamic Trends on the RTAC HMI in the browser will be applied right after the RTAC HMI reloads.

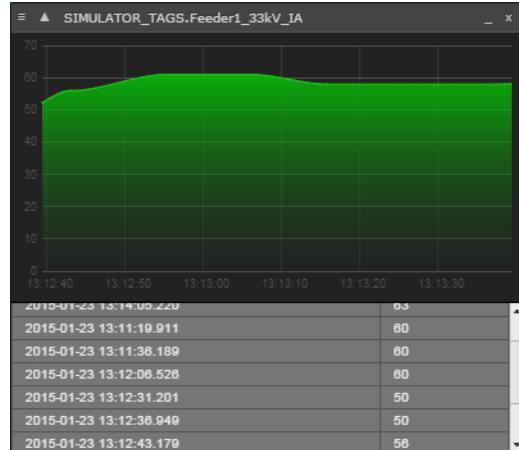
Tooltip Trending

Use tooltip trending to implement trending with metering tags placed on diagrams. You can run as many as ten tooltip trends simultaneously. For a metering value to be eligible for tooltip trending, the **Enable Tooltip Trending** option must be set to **True**. See *Table 4.1* for more details. Initiate tooltip trending by double-clicking the metering label while running the RTAC HMI.

**Figure 3.21 Runtime Popup Trend**

Several options are available after you have created the tooltip trend.

- By default, the tooltip trend will persist until manually closed.
- **Show Data** by selecting the navigation icon in the upper left of the tooltip trend and then selecting **Show Data**.

**Figure 3.22 Popup Trend Details**

- Selecting the collapse arrow hides everything but the title.
- Use the minimize button to place the trend along the base of the diagram. You can place as many as ten diagrams along the base of the diagram for easy viewing.

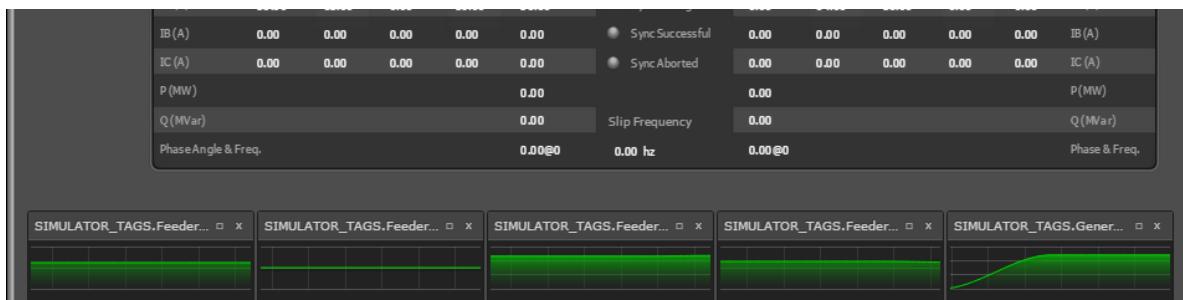


Figure 3.23 Runtime Trend Viewing

- Select the close icon to exit the tooltip trend.

Sequence of Events (SOE) Viewer

The **SOE Viewer** is available on the HMI at runtime and enables you to view, acknowledge or delete, and export SOE records as well as fully customize the reports by using the filtering and customization options.

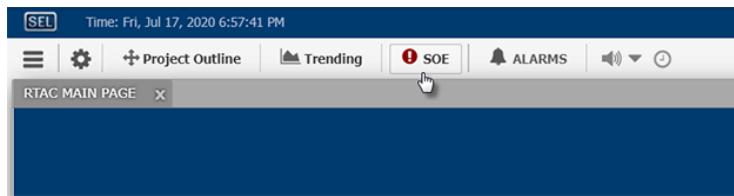


Figure 3.24 Sequence of Events Viewer

Select **SOE** to bring up the **SOE Viewer** window, which shows all the events in a grid (see *Figure 3.25*). The list columns contain the following data:

- **Timestamp:** The time stamp of each particular event down to the millisecond.
- **Tag Name:** The name of the tag that generated the event in question.
- **Alarmable:** A true or false that indicates whether a tag has the capability of becoming an alarm.
- **Ack Time:** The time at which an alarm was acknowledged.
- **Priority:** The type of priority of the event.
- **Category:** The category that the event falls under.
- **Message:** A relevant set of information which serves as a description of the event that occurred.

Timestamp	Tag Name	Alarma...	Ack Time	Prio...	Categ...	Message
2018-01-05 22:10:...	SystemTags.User_Log...	false	(unacknowle...		Security	admin logged on device via Web
2018-01-05 19:55:...	SystemTags.Disable_P...	true	(unacknowle...		Security	User account passwords disabled, default user account enable...
2018-01-05 19:50:...	SystemTags.User_Ch...	false	(unacknowle...		Security	Time System modified settings
2018-01-05 19:49:...	DPS_LOGIC.TX_OFFLI...	true	(unacknowle...			69 KV TRANSMISSION LINE OFFLINE
2018-01-05 19:48:...	SystemTags.Power_U...	false	(unacknowle...		Internal	RTAC started with firmware: SEL-3530-R141-V9-2001001-D20...
2018-01-05 19:48:...	SystemTags.User_Log...	false	(unacknowle...		Security	admin logged off device via Web
2018-01-05 19:48:...	SystemTags.User_Log...	false	(unacknowle...		Security	admin logged off device via Web
2018-01-05 18:57:...	SystemTags.User_Log...	false	(unacknowle...		Security	admin logged off device via Web
2018-01-05 18:53:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_2440...
2018-01-05 18:52:...	SystemTags.User_Log...	false	(unacknowle...		Security	admin entered read-only mode via HMI
2018-01-05 18:51:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_2440...
2018-01-05 18:51:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_2440...
2018-01-05 18:47:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_787_6...
2018-01-05 18:43:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_787_6...
2018-01-05 18:43:...	SystemTags.HMI_Con...	false	(unacknowle...		Security	admin performed control operation on Application.SEL_787_6...

Figure 3.25 Event Viewer Grid

Acknowledge and Delete Event Records

You can select one or multiple events by selecting the circle to the left of each event on the list. Once you select the circle, the **Acknowledge Records** and **Delete Records** options automatically appear, enabling you to either acknowledge or delete alarmed event records by selecting the appropriate button. Additionally, you can hover over the icon to the far left to expand the **Acknowledge All** option. Select this option to select and acknowledge all of the records available on the list with a single click.

SOE Viewer						
<input checked="" type="checkbox"/> Acknowledge All	<input type="checkbox"/> Acknowledge Records	<input type="checkbox"/> Delete Records	Page 1 / 5	Showing 25 of 101		
<input checked="" type="checkbox"/> 2016-07-11 17:14:11.720	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg
<input checked="" type="checkbox"/> 2016-07-11 20:51:13.951	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg
<input checked="" type="checkbox"/> 2016-07-11 20:51:03.215	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg
<input checked="" type="checkbox"/> 2016-07-11 20:48:02.436	SystemTags.User_Changed...	false	(unacknowledg...		Security	Time
<input checked="" type="checkbox"/> 2016-07-11 20:48:01.854	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg
<input checked="" type="checkbox"/> 2016-07-11 20:48:01.578	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg
<input checked="" type="checkbox"/> 2016-07-11 20:47:58.975	SystemTags.Power_Up_De...	false	(unacknowledg...		Internal	RTAC
<input checked="" type="checkbox"/> 2016-07-11 20:47:42.594	SystemTags.User_Logged_...	false	(unacknowledg...		Security	c logg

Figure 3.26 Grid Interaction Options

Reload

Select the **Reload** button to refresh the contents of the **SOE Viewer**. The list will also refresh when you acknowledge or delete a record. Note that enabling the **Auto collect SOE records** option in the settings automatically refreshes the **SOE Viewer** and disables the **Reload** button.

Settings

Hover over the settings gear (⚙️) and select the **Settings** option (⚙️ Settings) that appears. The **SOE Settings** window will appear and assist you in adjusting the following options:

- **Record Retrieval Options:** You can retrieve records through one of three methods:
 - **By Date:** This option allows you to specify a **Start Date** and **End Date**.
 - **By Number:** This option allows you to enter a specific number of records to be retrieved. Note that a maximum of 200 records can display on the RTAC HMI SOE viewer. You can find the full archive of SOE records in the RTAC web interface reports.
 - **Auto collect SOE records:** This option allows you to automate the collection of all the latest records.

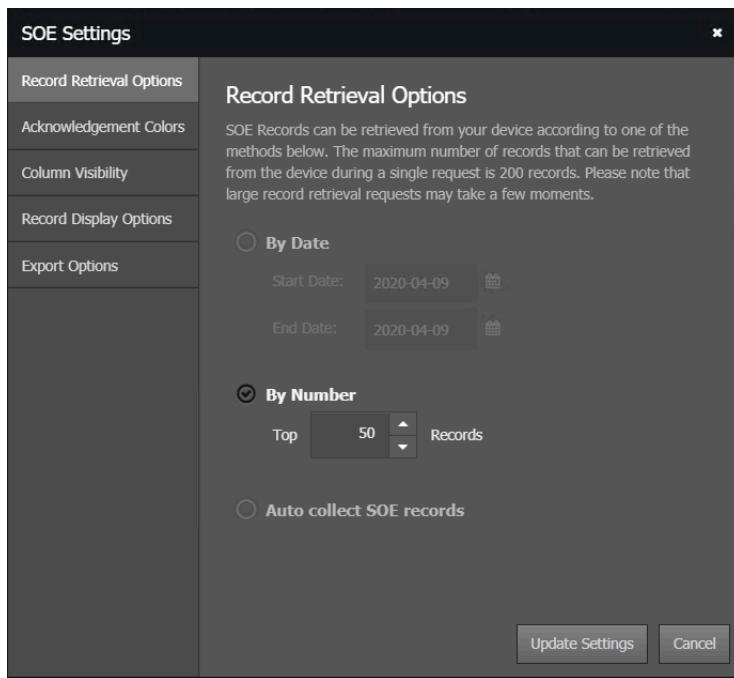


Figure 3.27 Record Retrieval Options

- **Acknowledgement Colors:** You can specify the exact color by selecting each of the alarm acknowledgment states and selecting the color you desire for each state. When a specific alarm appears on the **SOE Viewer**, it will match the color that you selected. For more information about pre-filtered alarm conditions, refer to *Filters on page 47*.

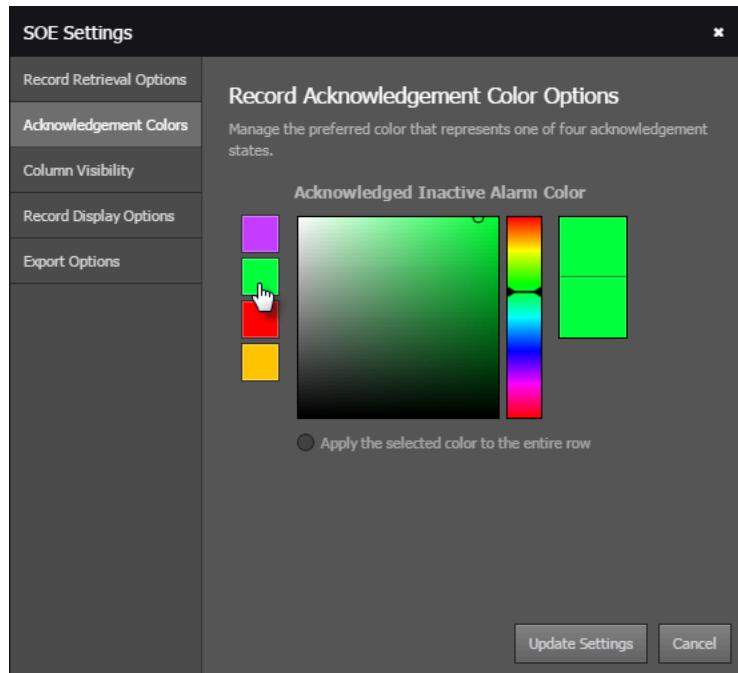


Figure 3.28 Acknowledgement Color Options

- **Column Visibility Options:** You can select the columns that will be visible in the SOE Viewer; any column that is not selected will not appear in the SOE Viewer.

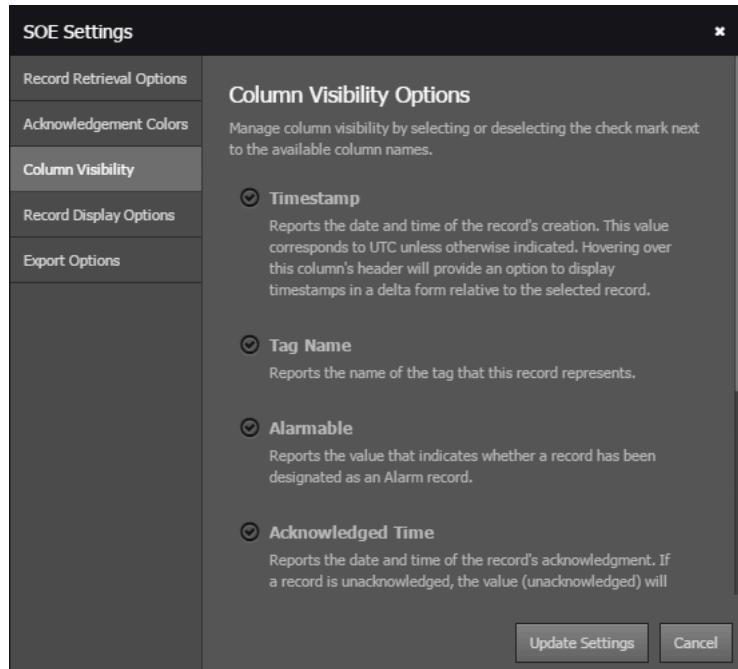


Figure 3.29 Column Visibility Options

- **Record Display Options.** Adjust the text size contained in the SOE Viewer by expanding the Text Size dropdown menu and selecting the option you want. You can also set the **Timestamp Settings** in terms of the timezone or the timestamp offset direction (positive or negative),

hours (0–23), and minutes (0–59). The time stamp displays according to the offset you configured here. To save the offset permanently, select the logout option of the RTAC Web interface to apply the changes. If you close the browser or present tab, the changes will not be saved.

NOTE

By default, the SOE Viewer displays the records in UTC time and does not support DST offsets.

NOTE

Adjusting the Timestamp Offset setting propagates the changes to both the SOE Viewer and the Alarms Viewer for consistency.

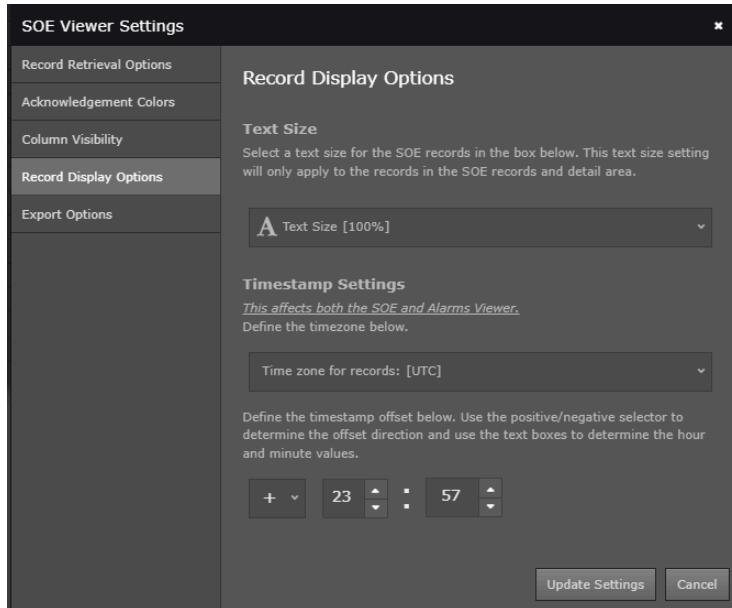


Figure 3.30 Record Display Options

- **Export Options:** You can export the SOE records from the **SOE Viewer** to a CSV file. You can select the content that will be present on the exported report by selecting the circle to the left of each desired option. Once you are done with your selection, select **Export Records**.

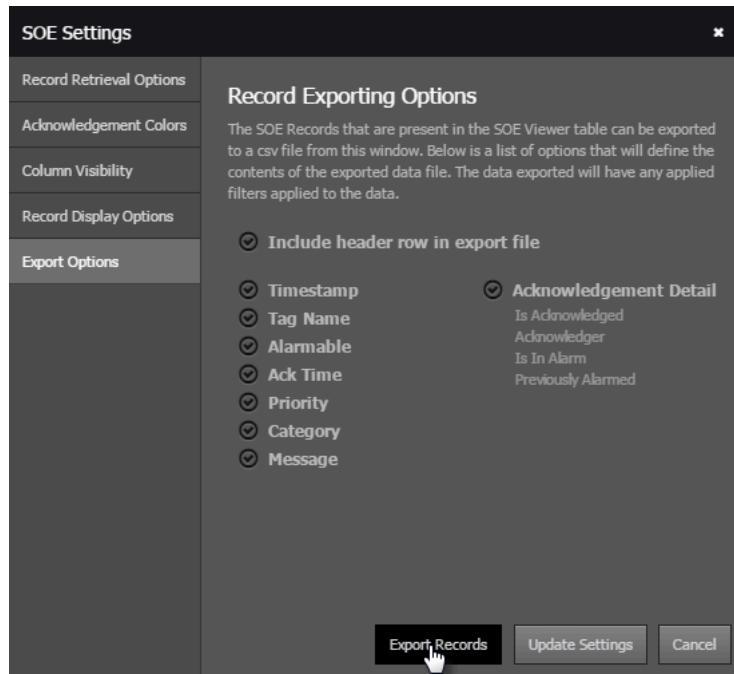


Figure 3.31 Export Options

The columns that appear from top to bottom on this menu will appear in the same order from left to right once the record is exported to a CSV file.

Export

Select **Export** (**Export**) on the menu to export RTAC HMI SOE Viewer records with a single click. This shortcut allows you to export records that are present in the SOE viewer table to a .csv file in accordance with the Saved Record Exporting Options for RTAC HMI SOE records.

Filters

Select **Filters** (**Filters**) on the menu to bring up the **Filter Management** window. In this window, you can apply a filter from a default list of available filters. Select the circle next to the filter that you wish to apply, and it will refresh the **SOE Viewer** screen.

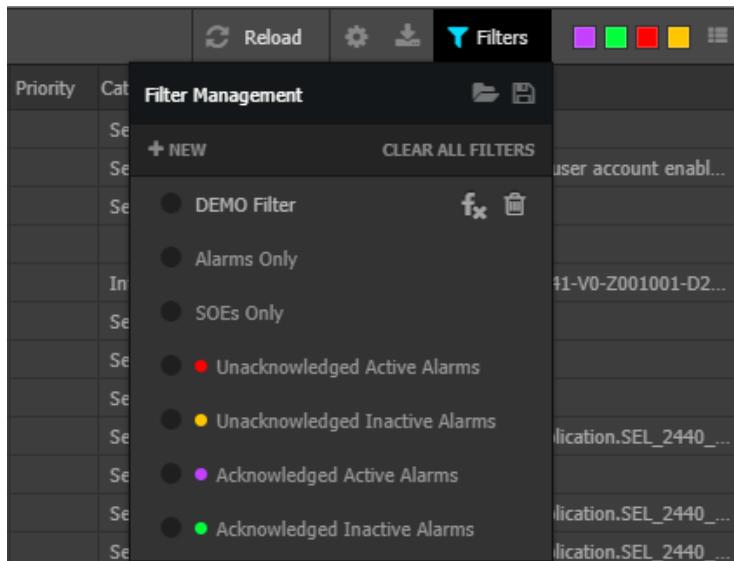


Figure 3.32 Filter Management

You can create your own filters by selecting the **+ New** button, which will enable additional options on the **SOE Viewer**. The options enable you to give a name to the filter and use logical filtering operators for content such as **equals**, **is greater than**, **is less than**, **contains**, and others.

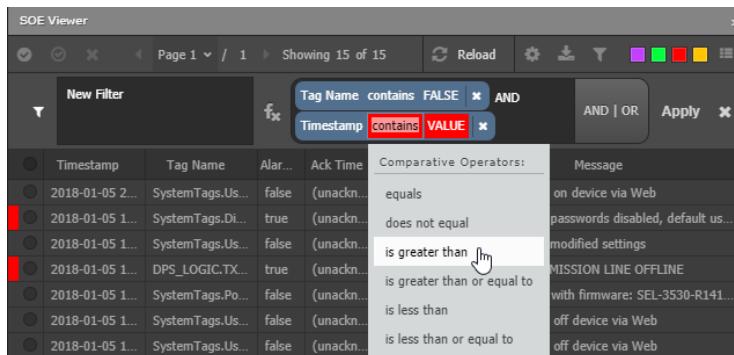


Figure 3.33 SOE Filtered Records

Once you have made your selection, select the **Apply** button. You will now have a new filter in the **Filter Management** list that you can apply to the SOE report by selecting the circle next to it. Once you have created a filter, you can save your configuration as an .fltrs file, and you can open it to apply your saved filter to any future sessions by using the appropriate save and open buttons ( ) at the right top corner of the **Filter Management** window.

NOTE

NOTE The colors assigned in the Acknowledgement Colors section will appear as shortcuts for applying the filter to alarm states associated with each color.

Alarm Filters

The RTAC HMI provides you with a set of preconfigured filters to show the alarm states Active Acknowledged, Active Unacknowledged, Inactive Acknowledged, and Inactive Unacknowledged, as shown in *Figure 3.34*.

Each filter shows you only the relevant alarms for each state, displaying each event sequentially. Select the Alarms Only option if you want to see a list of your alarms.

Timestamp	Tag Name	A...	Ack Time	Priority	Categ...	Message
2020-04-15 21:55:48.862	Tags.ACNOWLEDG...	t...	(unacknowledged)	Minor	ACK_0...	Asserted
2020-04-15 21:55:48.862	Tags.ACNOWLEDG...	t...	(unacknowledged)	Catastrophic	ACK_0...	Asserted
2020-04-15 21:55:48.862	Tags.ACNOWLEDG...	t...	(unacknowledged)	Major	ACK_0...	Asserted

Figure 3.34 SOE Viewer Unacknowledged Active Alarm Filter

Details

The **Details** section will show you all of the pertinent details for each of the events in the **SOE Viewer**. To activate **Details**, select any event that you want to analyze and the details will appear to the right of the **SOE Viewer** window. If at some point the details section is not necessary, select the **Details** button () to alternate between hidden and visible.

Timestamp	Tag Name	Alar...	Ack Time	Prior...	Category	Message	Details
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged on device via Web		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged off device via Web		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged on device via Web		
2018-01-0...	SystemTags.Disab...	true	(unackno...	Security	User account passwords disabled, defa...		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	Time System modified settings		
2018-01-0...	DPS_LOGIC.TX_O...	true	(unackno...		69 KV TRANSMISSION LINE OFFLINE		
2018-01-0...	SystemTags.Powe...	false	(unackno...	Internal	RTAC started with firmware: SEL-3530-...		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged off device via Web		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged off device via Web		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin logged off device via Web		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.User_...	false	(unackno...	Security	admin entered read-only mode via HMI		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		
2018-01-0...	SystemTags.HMI_...	false	(unackno...	Security	admin performed control operation on ...		

DPS_LOGIC.TX_OFFLINE_ALARM.stVal

Unacknowledged Active Alarm
2018-01-05 19:49:53.006

Message	69 KV TRANSMISSION LINE OFFLINE
Priority	
Category	
Device Name	SEL_RTAC
Cleared	false
Comment	
Event ID	59c190ee-c0ab-4600-ad02-86ca2e33146e
Host Name	SEL-3530-0030A70EA2DD
Index	5
Anti-chatter Enabled	true
Quality Data	Bad
Acknowledgment Data	
Is Acknowledged	false
Acknowledger	
Ack Timestamp	(unacknowledged)
Alarmable	true
Is In Alarm	true
Previously Alarmed	false

Figure 3.35 Event Details

Current SOE Alarm Severity Sounds

The RTAC HMI runtime has different sounds that you can associate with **Catastrophic**, **Major**, **Minor**, and **Information** SOE alarms. By expanding the menu next to the mute/sound button (), you can mute and/or filter any of these sound alarms.

NOTE

To take advantage of the alarm severity sounds in RTAC HMI, configure the **Logging Priority** column in the tag processor of the associated ACCELERATOR RTAC project to match the applicable category from the four severity levels mentioned here. For more information on how to add severity to alarms, see SEL application guide "Alarm Acknowledgment in the RTAC HMI" (AG2014-35), available at selinc.com/literature/application-guides.

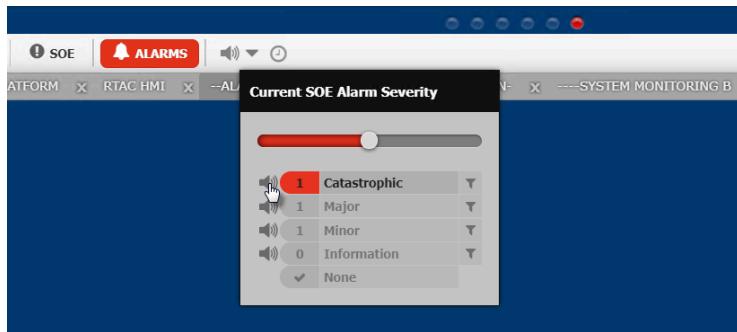


Figure 3.36 Current SOE Alarm Severity

Alarms Viewer

The Alarms Viewer is available on the HMI at runtime and enables you to view, acknowledge or delete, and export active alarm records as well as fully customize the reports by using the filtering and customization options. The viewer shows you active alarms in two categories: Active Unacknowledged and Active Acknowledged. Once an active alarm has been acknowledged, it remains on the list marked as Active Acknowledged.

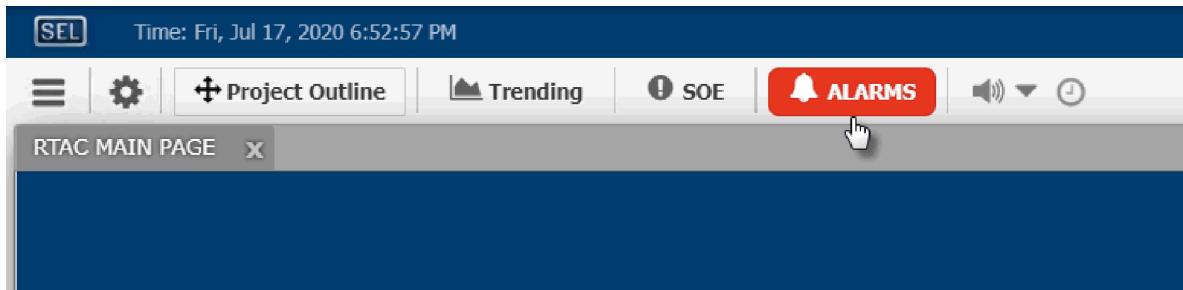


Figure 3.37 Alarms Viewer

Select **ALARMS** to display the Alarm Viewer window. This shows all active alarms in a grid (see *Figure 3.38*). The list columns contain the following data:

- **Timestamp.** The time stamp of each particular event, down to the millisecond.
- **Tag Name.** The name of the tag that generated the event in question.
- **Ack Time.** The time at which an alarm was acknowledged.
- **Priority.** The priority of the event.

- **Category.** The category of the event.
- **Message.** A relevant set of information that serves as a description for the event that occurred.

The screenshot shows a software window titled "Alarms Viewer". At the top, there are buttons for "Page 1" and "Showing 3 of 3", along with standard window controls like "Reload", "Settings", "Download", "Search", and "Print". The main area is a table with the following columns: "Timestamp", "Tag Name", "Ack Time", "Priority", "Category", and "Message". There are three rows of data:

Timestamp	Tag Name	Ack Time	Priority	Category	Message
2020-07-16 23:19:36.348	Tags.ACNOWLEDGEABLE_TILE_1	2020-07-17 16:10:45....	Minor	ACK_01_Activated	Asserted
2020-07-16 23:19:36.348	Tags.ACNOWLEDGEABLE_TILE_2	2020-07-17 17:57:06....	Major	ACK_02_Activated	Asserted
2020-07-16 23:19:36.348	Tags.ACNOWLEDGEABLE_TILE_3	2020-07-17 17:57:06....	Catastrophic	ACK_03_Activated	Asserted

Figure 3.38 Alarms Viewer Grid

Acknowledge and Delete Alarm Records

You can select a single or multiple alarms by selecting the circle to the left of each alarm on the list. Once you select the circle, Acknowledge Records, and Delete Records options appear. Select the appropriate button to either acknowledge or delete alarms. Additionally, you can hover over the icon to the far left to expand the Acknowledge All option. Select this option to choose and Acknowledge all of the records available on the list with a single click.

The screenshot shows the same "Alarms Viewer" window as Figure 3.38, but with several checkboxes selected next to the first six rows of data. At the top, there are three buttons: "Acknowledge All" (radio button), "Acknowledge Records" (radio button), and "Delete Records" (checkbox). The table structure is identical to Figure 3.38, with columns for Timestamp, Tag Name, Ack Time, Priority, Category, and Message. The data rows are identical to those in Figure 3.38.

Figure 3.39 Alarm Grid Interaction Options

Alarms Reload

Select the **Reload** button to refresh the contents of the **Alarms Viewer**. The list refreshes when you acknowledge or delete a record. It is important to note that if you enable the **Auto collect Alarmable Records** option in the settings, it automatically refreshes the **Alarms Viewer** and disables the **Reload** button.

Alarms Settings

Hover over the settings gear () and select the settings option () that appears. From the **Alarm Viewer Settings** window that displays, you can adjust the following options:

- **Record Retrieval Options.** Retrieve records through one of the following three methods:
 - **By Date.** Specify a Start Date and End Date.
 - **By Number.** Enter a specific number of records to be retrieved. Note that a maximum of 200 records can display on the RTAC Alarm Viewer. You can find the full archive of Alarm records in the RTAC Web interface Alarm Summary.
 - **Auto collect Alarmable Records.** Automate the collection of all the latest records.

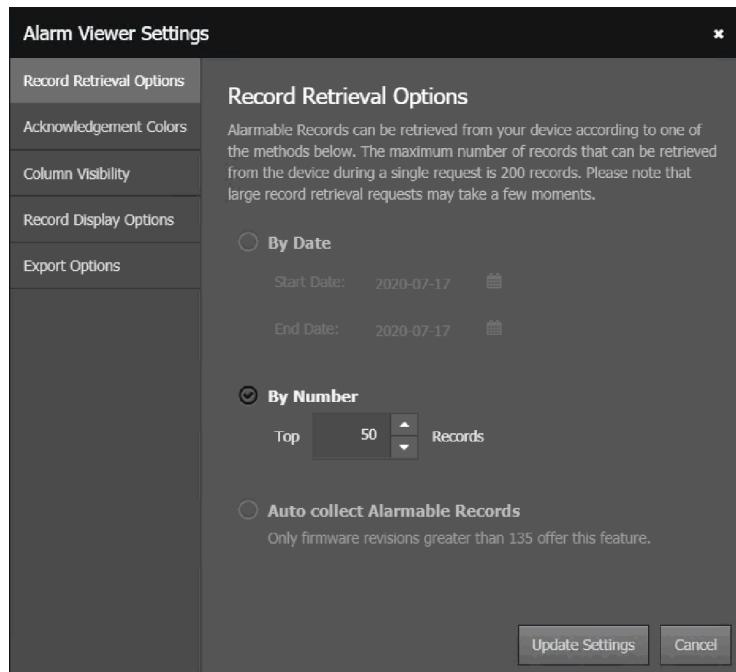


Figure 3.40 Alarm Record Retrieval Options

- **Acknowledgement Colors.** Specify the exact color you want by selecting each of the alarm acknowledgment states and selecting the color you want for each state. When a specific alarm displays on the **Alarms Viewer**, it matches the color that you selected.

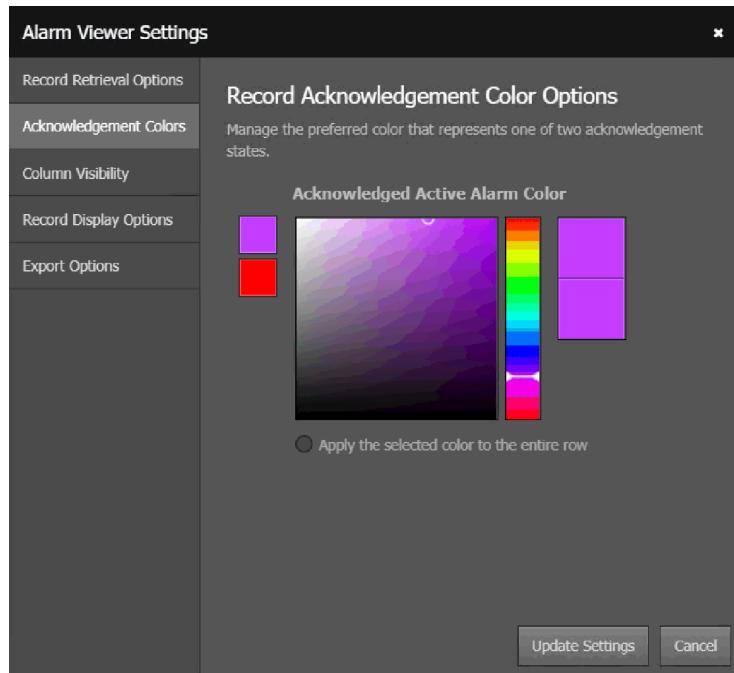


Figure 3.41 Active Alarms Color Options

- **Column Visibility Options.** Select the columns that you want to be visible in the **Alarms Viewer**; any column not selected will not appear in the **Alarms Viewer**.

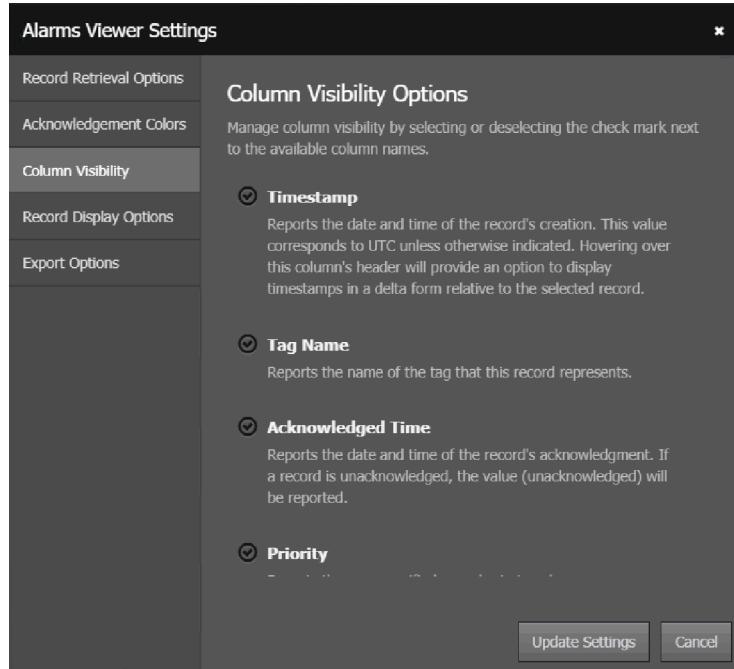


Figure 3.42 Alarms Viewer Column Visibility Options

- **Record Display Options.** Adjust the text size contained in the **Alarms Viewer** by expanding the Text Size dropdown menu and selecting the option you want. You can also set the **Timestamp Settings** in terms of the timezone or the timestamp offset direction (positive or negative),

hours (0–23), and minutes (0–59). The time stamp displays according to the offset you configured here. To save the offset permanently, select the logout option of the RTAC Web interface to apply the changes. If you close the browser or present tab, the changes will not be saved.

NOTE

By default, the Alarms Viewer displays the records in UTC time and does not support DST offsets.

NOTE

Adjusting the Timestamp Offset setting propagates the changes to both the SOE Viewer and the Alarms Viewer for consistency.

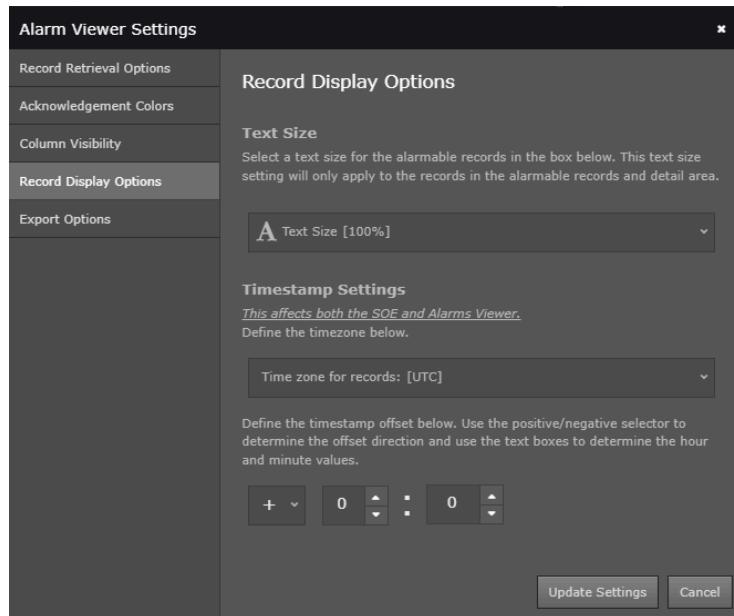


Figure 3.43 Alarms Viewer Record Display Options

- **Export Options.** Export the SOE records from the Alarms Viewer to a .csv file. You can select the content that you want present in the exported report by selecting the circle to the left of each desired option. Once you are done with your selection, select the **Export Records** button.



Figure 3.44 Alarms Viewer Export Options

The columns that display from top to bottom on this menu appear in the same order from left to right once the record is exported to a .csv file.

Alarms Export

Select **Export** (**Export**) on the menu to export RTAC HMI Alarm Viewer records with a single click. This shortcut allows you to export records that are present in the Alarm Viewer table to a .csv file in accordance with the Saved Record Exporting Options for the RTAC HMI Alarms records.

Alarms Filters

Select **Filters** (**Filters**) on the menu to bring up the **Filter Management** window. In this window, you can apply a filter from a default list of available filters. Select the circle next to the filter you want to apply, and it refreshes the **Alarm Viewer** screen.

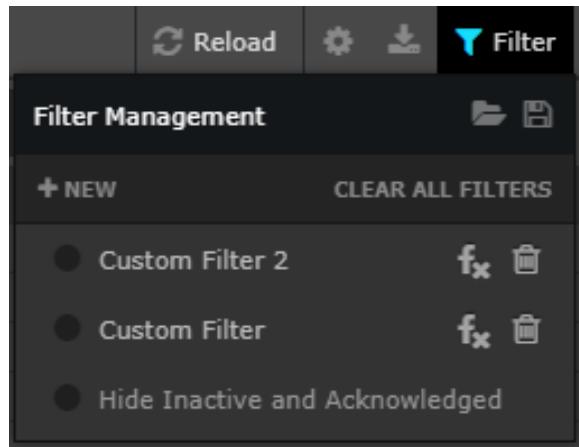


Figure 3.45 Alarms Filter Management

Create your own filters by selecting the **+ NEW** button, which enables additional options on the **Alarms Viewer**. The options enable you to give a name to the filter and use logical filtering operators for such content as contains, does not contain, equals, does not equal, and others.

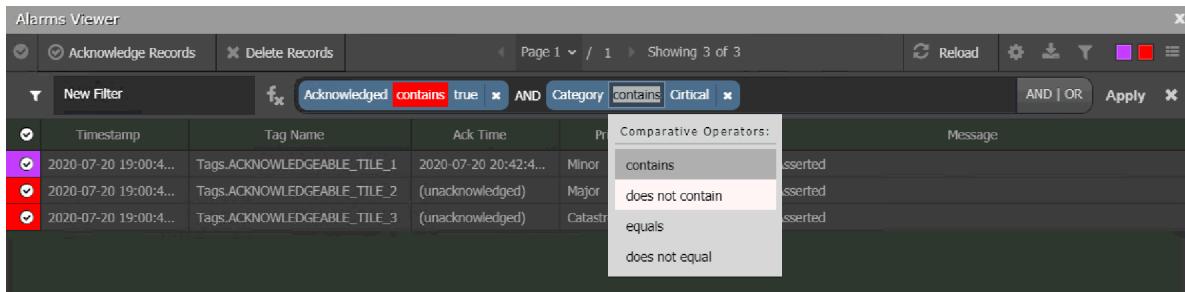
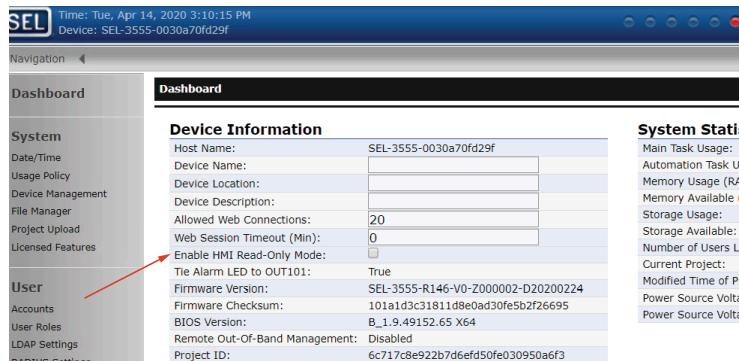


Figure 3.46 Alarms Filtered Records

After you make your selection, select the **Apply** button. You now have a new filter in the **Filter Management** list that you can apply to the Alarms report by selecting the circle next to it. Once you have created a filter, you can save your configuration as a .fltrs file, and you can open it to apply your saved filter to any future sessions by use of the appropriate save and open buttons (**Save**, **Open**) at the right top corner of the **Filter Management** window.

HMI Read-Only Mode

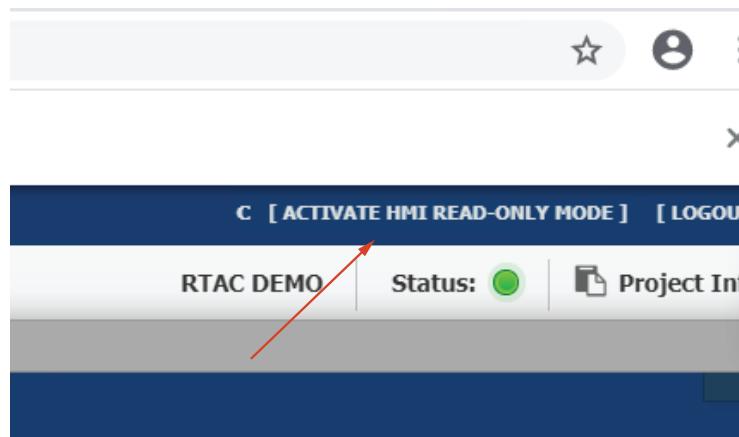
The RTAC HMI offers the option of enabling Read-Only Mode, which causes all the controls to go into a locked state until an operator inputs credentials to unlock the controls. To enable the Read-Only Mode on the RTAC HMI, you must first enable the read-only option through the RTAC web interface, as shown in *Figure 3.47*.

**Figure 3.47 RTAC Web Interface HMI Read-Only Mode Setting**

Once the Enable HMI Read-Only Mode is active in the RTAC web interface, you can launch your HMI project and enable its Read-Only Mode by selecting ACTIVATE HMI READ-ONLY MODE as shown in *Figure 3.48*.

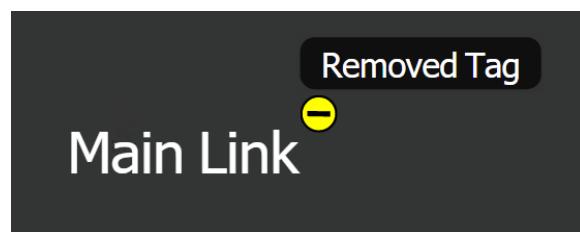
NOTE

If you select the READ-ONLY MODE in the RTAC HMI without the read-only mode enabled in the RTAC web interface, you will be logged out of the session.

**Figure 3.48 HMI Activate HMI Read-Only Mode**

HMI Debug Mode

The RTAC HMI has a Debug Mode that provides you a visual representation of controls that have issues. Emphasized issues normally result from a missing or invalid tag association. Once this mode is activated, the HMI displays symbols such as those shown in *Figure 3.49* to highlight where issues exist.

**Figure 3.49 Debug Mode Removed Tag Symbol**

The Removed Tag symbol *Figure 3.49* displays usually means that the tag associated with that control has been removed or does not exist on the corresponding ACCELERATOR RTAC project.

Figure 3.50 shows another symbol that you may encounter. This normally symbolizes that the tag associated with the control being flagged is no longer valid. This can result from a valid earlier association to a tag supported by the control being changed later in the ACCELERATOR RTAC project. A change in tag type or definition can cause these types of issues.

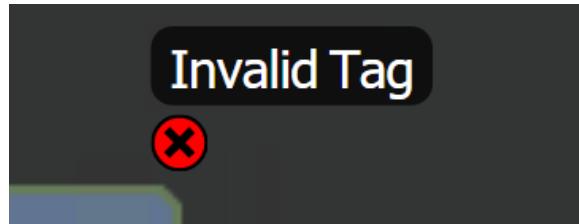


Figure 3.50 Debug Mode Invalid Tag Symbol

To resolve a tag being reported as removed or invalid, first ensure that you have the correct tags by reimporting the tags from the valid ACCELERATOR RTAC project. Then send the HMI project to the RTAC and use the Debug Mode to verify that no issues exist. You can resolve any issues by checking the relevant control in the Diagram Builder project.

Perform the following steps to enable Debug Mode:

- Step 1. Launch the RTAC HMI.
- Step 2. Click the gear icon to open the HMI settings window, as shown in *Figure 3.51*.

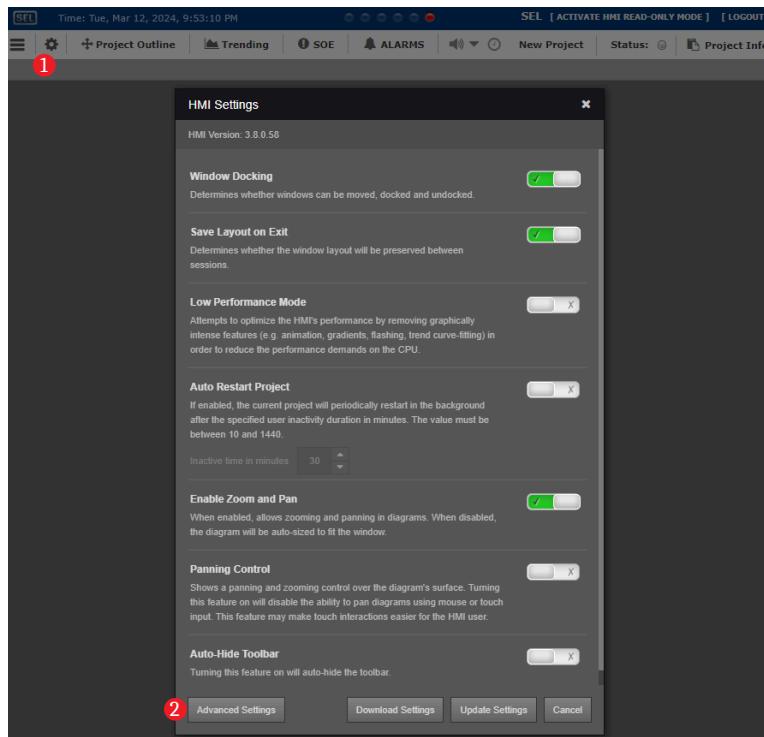


Figure 3.51 HMI Settings Menu

Step 3. Enable **Debug Mode** and select **Update Settings**, as shown in *Figure 3.52*.

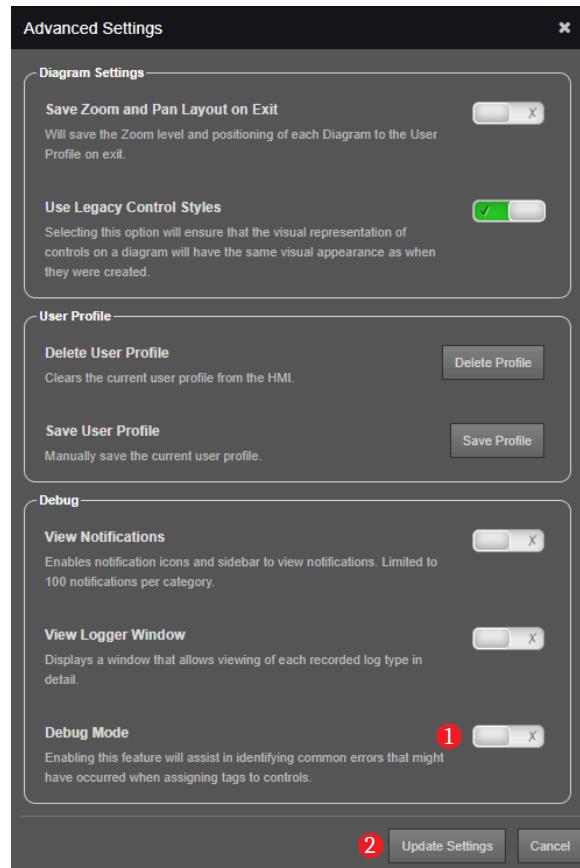


Figure 3.52 HMI Advanced Settings Menu

Step 4. Relaunch the HMI to view the HMI in Debug Mode.

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S E C T I O N 4

HMI Design Controls

Table 4.1 HMI Design Controls Overview

Control	Overview
Common	
Button	<p>The Button control enhances the functionality of the String Output control and is designed to only work in tandem with that control. The Button control will not function by itself and can be tied to as many as ten individual String Output controls. Once you have configured and deployed the Button control on the RTAC HMI, you can select the control to send the string contents of the String Output control to the RTAC.</p>
Group Box	<p>The Group Box contains controls. Moving the Group Box moves all of the controls it contains.</p>
Hyperlink	<p>The Hyperlink control provides the ability to link a diagram to either a webpage or a second diagram.</p>
Image	<p>The Image control allows you to display images on the HMI. These images can be .png, .bmp, .jpg, .jpeg, .tif, or .tiff files.</p>
Indirect Tag	<p>The Indirect Tag control allows you to add an image control to a project that achieves two main purposes:</p> <ul style="list-style-type: none">► sending a control to the RTAC► navigating to a predetermined child diagram <p>Use this control with the indirect tagging implementation on the RTAC for projects that have diagrams containing redundant components. This control saves you from having to create a large number of diagrams, which in turn can dramatically improve the performance of the RTAC HMI.</p> <p>The control also offers the capability of showing a status condition based on a binary tag assignment. Once a tag is associated with the control, you can specify which image to display based on its present logical state.</p>
Indirect Tag Link	<p>The Indirect Tag Link control allows you to add a label control to a project that achieves two main purposes:</p> <ul style="list-style-type: none">► sending a command to the RTAC► navigating to a predetermined child diagram <p>Use this control with the indirect tagging implementation on the RTAC for projects that have diagrams containing redundant components. This control saves you from having to create a large number of diagrams, which in turn can dramatically improve the performance of the RTAC HMI.</p> <p>The control also offers the capability of showing a status condition based on a binary tag assignment. Once a tag is associated with the control, you can specify which text and box colors to display based on its present logical state.</p>
Label	<p>The Label control allows you to display text information on the HMI.</p>

Control	Overview
Multi Image	<p>The Multi Image control allows you to display different images depending upon the incoming tag value. You can tie the Multi Image control with an analog tag or a Boolean tag. When associated with a Boolean Tag, you can assign as many as two images to the Multi Image control. When associated with an analog tag, you can assign as many as five images to the Multi Image control. In either case, the images that can be assigned to the Multi Image control are of the following type: .png, .bmp, .jpg, .jpeg, .tif, or .tiff. If a specific image is selected for a state image, that image appears in the HMI, otherwise, the default image appears. If no image is chosen for any of the states or for the default image, the Multi Image control displays No Image Loaded on the RTAC HMI in the browser.</p> <p>NOTE</p> <p>The Multi Image control will only render through the use of HTML5 in an RTAC with firmware R141 or later. Loading a project that contains this control on Internet Explorer using Silverlight may cause HMI loading errors because the control was designed for HTML5. Refer to Table B.1 for a list of browsers that support rendering in HTML5.</p>
Rotating Fan	<p>The Rotating Fan control is a configurable control that allows you to represent various fans in your system. You can tie the Rotating Fan control to an analog tag for varying rotation rates or to a Boolean tag for a constant rotation rate. In addition, you can configure the Rotating Fan control to display with varying colors as the rotation rate reaches different thresholds.</p> <p>NOTE</p> <p>The Rotating Fan control will only render through the use of HTML5 in an RTAC with firmware R141 or later. Loading a project that contains this control on Internet Explorer using Silverlight may cause HMI loading errors because the control was designed for HTML5. Refer to Table B.1 for a list of browsers that support rendering in HTML5.</p> <p>Additionally, the Rotating Fan control will render the rotation animation in the RTAC HMI when viewed using the local display port only on the SEL-3555 RTAC and on no other RTAC platforms that support a local display port.</p>
Shape	<p>The Shape control is a configurable control you can use to display one of the following: Rectangle, Arc, Arrow, Circle, Hexagon, Pentagon, Ring, Star, or Triangle.</p> <p>You can configure the Shape control fill style for display according to its Boolean or analog tag assignment.</p>
Substitution Control	<p>The Substitution Control facilitates tag and property substitution; placing it on a diagram transforms that diagram into a template from which one or more Synthetic Diagrams are created. Open the Tag Assignments window via the property grid or by double-clicking a control to map user-defined tags to system tags. Open the Property Assignments window via the property grid or by holding the shift button and double-clicking a control to map substitute properties to each of the Synthetic Diagrams. This control is invisible in the HMI runtime.</p> <p>See <i>Synthetic Diagrams on page 9</i> for more information about tag and property substitution.</p>
Gauges	
Linear Gauge	<p>The Linear Gauge displays the magnitude of BCR, INS, LBCR, and MV tag types in three different visual styles: gradient, solid, and dynamic fill. In the HMI, the gauge will show the value as it fluctuates between the defined parameters.</p>
Phase Angle Gauge	<p>The Phase Angle Gauge displays the angle of a complex measured value (CMV) type tag. You can apply as many as eight different CMV tags, each with its own color-configurable indicator needle, to the gauge. In the HMI, the gauge will simultaneously show the values of all the tags via the needles.</p>

Control	Overview
Step Controls	
Analog Step	Use Analog Step to raise and lower the predetermined position of an electrical device from the HMI. You can tie this control to BAC tag types defined in the RTAC.
Binary Step	Use Binary Step to raise and lower the predetermined position of an electrical device from the HMI. You can tie this control to BSC tag types defined in the RTAC.
Integer Step	Use Integer Step to input an integer value from the HMI and set a step position to an exact value. You can tie this control to Integer ISC control tag types defined in the RTAC.
Substation	
Analog Output	Use the Analog Output to write analog values from the HMI to the RTAC. You can tie this output control only to the analog output tags you defined in the RTAC project.
Breaker Bit Output	Use the Breaker Bit Output control to send breaker Trip or breaker Close commands from the HMI. You can tie this control only to breaker bit tags in the RTAC. Tie these tags either directly to devices or virtual tags. See <i>Virtual Tags on page 4</i> for more information.
DNP Binary Output	Use the DNP Binary Output control to send DNP control commands from the HMI. You can tie this control only to DNP output tags in the RTAC. Tie these tags either directly to devices or virtual tags. See <i>Virtual Tags on page 4</i> for more information.
Double Point Output	Use the Double Point Output control to send Set or Clear commands from the HMI. You can tie this control only to double point controls in the RTAC. Tie these tags either directly to devices or virtual tags. See <i>Virtual Tags on page 4</i> for more information.
Input/Output	Use the Input/Output control to send I/O control commands from the HMI. You can tie this control only to I/O control virtual tags you defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
Integer Output	Use the Integer Output control to set an integer value from the HMI. You can tie this control only to Integer control virtual tags you defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
LED Control	Use the LED Control to set an LED value from the HMI. You can tie this control only to LEDC-type virtual tags you defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
Mirrored Bit Output Control	Use the Mirrored Bit Output Control to set a MIRRORED BITS value from the HMI. You can tie this control only to Mirrored Bit Control tags defined in SEL-type devices in the RTAC or virtual tags defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
Modbus Coil Output Control	Use the Modbus Coil Output Control to set a Modbus coil value from the HMI. You can tie this control only to device Modbus coil tags defined in the RTAC or virtual tags defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
Remote Bit Output	Use the Remote Bit Output control to set a remote bit value from the HMI. You can tie this control only to SEL device remote bit (RB) tags defined in the RTAC or virtual tags defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
String Output	Use the String Output control to write alphanumeric text from the HMI. You can tie this control only to String Control virtual tags that are defined within the Virtual Tag List in the RTAC (see <i>Virtual Tags on page 4</i> for more information).
Labels	
Binary Counter Label	The Binary Counter Label displays the value of a binary counter type tag or BCR. This can be tied to a binary counter tag defined in a device connected to the RTAC or binary counter tag in a Virtual Tag List . See <i>Virtual Tags on page 4</i> for more information.
Complex Metering Label	The Complex Metering Label displays the measured value and angle of the CMV-type tag. You can tie this to any CMV tag defined in a device connected to the RTAC or CMV tag in a Virtual Tag List (see <i>Virtual Tags on page 4</i> for more information). You can also choose to hide or display the angle of the CMV tag on the RTAC HMI in the browser.

Control	Overview
Directional Metering Label	The Directional Metering Label displays the measured value of an analog tag using either directional arrows or mathematical symbols. You can tie this to any MV or a CMV-type tag defined in a device connected to the RTAC or an MV or a CMV tag in a Virtual Tag List (see <i>Virtual Tags on page 4</i> for more information). When tied to a CMV tag, you can also choose to hide or display the angle of the CMV tag on the RTAC HMI in the browser.
Integer Status Label	Use the Integer Status Label to visualize an integer value from the HMI. You can tie this control only to Integer control virtual tags you defined within the Virtual Tag List in the RTAC. See <i>Virtual Tags on page 4</i> for more information.
Metering Label	The Metering Label displays the value of an MV-type tag. You can tie this to any MV tag defined in a device connected to the RTAC or an MV tag in a Virtual Tag List . See <i>Virtual Tags on page 4</i> for more information.
Status Label	The Status Label displays the value of a single point status (SPS)-type tag. You can tie this to any SPS tag defined in a device connected to the RTAC or an SPS tag in a Virtual Tag List . See <i>Virtual Tags on page 4</i> for more information.
String Data Label	The String Data Label displays the value of a String (STR)-type tag. You can tie this to any STR tag defined in a device connected to the RTAC or an STR tag in a Virtual Tag List . See <i>Virtual Tags on page 4</i> for more information.
Substation Symbols	
Substation Symbols	The Substation Symbols are multiple controls used to display the following: Current Transformer, Generator, Ground, Potential Transformer, Reactor, Voltage Regulator, and Transformer.
Miscellaneous Substation Controls	
Annunciator Tile	Double-click the Annunciator Tile to open a child diagram that you can use to navigate to additional detail from the main diagram. You can tie the Annunciator Tile to open any of the diagrams in the Project Navigation pane. You can also tie the Annunciator Tile to a tag that will cause it to display its fill color. You can also indicate if any of the items on the child diagram go into alarm.
Breaker	The Breaker control symbolizes an electrical system circuit breaker. You can tie the Breaker control to the breaker status tag to simulate the system breaker status. You can configure this control to have a separate Control Window popup, as described in <i>Control Window on page 29</i> . See <i>Virtual Tags on page 4</i> for more information.
Capacitor	The Capacitor control symbol ties to a tag. You can then display the symbol as one color when the tag is set to True and another color when the tag is false. In addition, you can cause the symbol to flash for an alarm condition.
Conductor	The Conductor control has various uses but is intended primarily to show flow through a pipe or conductor line. You can tie the Conductor control to an analog tag for varying speeds or to a Boolean tag for a steady flow. You can configure the Conductor control to provide varying colors as the flow reaches different thresholds.
Disconnect Switch	<p>The Disconnect Switch can be assigned a single point status (SPS)-type tag to display the open and closed states.</p> <p>You can configure this control to have a separate Control Window popup, as described in <i>Control Window on page 29</i>.</p>
Input LED	The Input LED Control replicates the LED status of a device based on states and color.
Multifunction Control	The Multifunction Control combines functionality from other controls into one with the added flexibility of setting additional properties.
Protection Indication Control	Use the Protection Indication Control to visually display trip or event activation on the A-, B-, or C-phase. This control will only be available if either ACT or ACD tags have been imported into a project. The appearance of the control will depend on which tag type is assigned to it. A Protection Indication Control that has an ACD type tag assigned to it will show both the direction of a fault and whether a trip or event has been activated.

Control	Overview
Trend	
Trend Control	The Trend Control is a static trend that you can place anywhere in the diagram to show a trend of the assigned tags.

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S E C T I O N 5

Application Examples

Building an HMI

The basic HMI electrical one-line drawing consists of the following:

- ▶ Lines
- ▶ Breakers
- ▶ Analog values
- ▶ Status values
- ▶ Annunciator tiles (for detail screens)

To begin the one-line drawing, open Diagram Builder and do the following:

- Step 1. Create a new project. Leave **Automatically create a new diagram** checked.
- Step 2. Import tags from the ACSELERATOR RTAC project. (For more information, see *Importing Tags on page 5*.)
- Step 3. Drag an **Annunciator Tile** onto the diagram from the toolbox. (For more information, see *Table 4.1*.)
- Step 4. Drag a **Breaker** onto the diagram from the **Toolbox**. Assign its tag property to the proper 52A or 52B breaker contact. (For more information, see *Table 4.1*.) Remember to adjust the alarm and normal state properties according to the contact you are using.
- Step 5. Drag a couple of **Conductors** to the diagram from the **Toolbox**. (For more information, see *Table 4.1*.) Assign tag properties to the proper analog or Boolean tags.

Step 6. Situate and resize the controls to match the following screenshot.

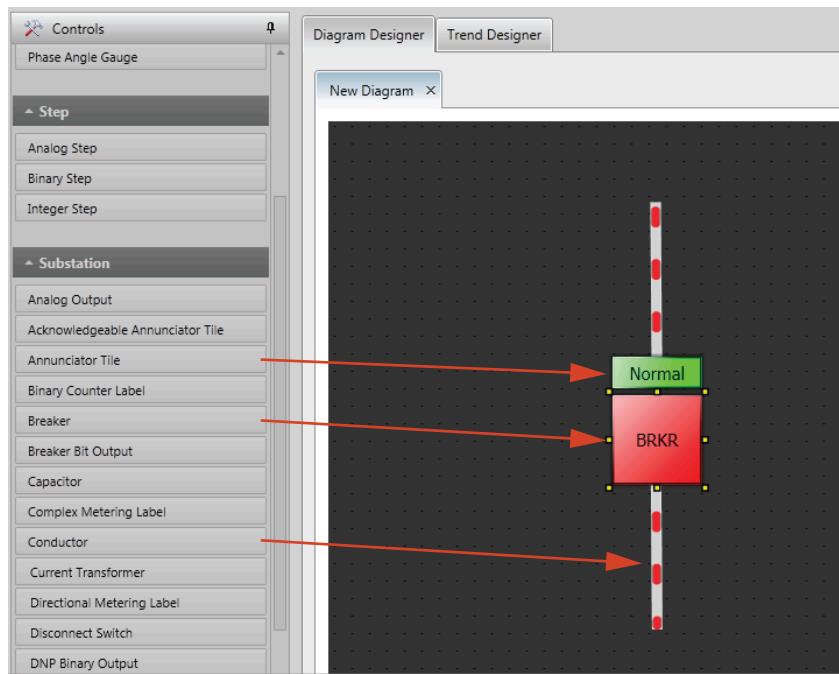


Figure 5.1 Breaker, Conductor, and Announcer Tile Layout

Step 7. Hold down your left mouse button on the diagram and drag the transparent selection box around all **Conductor**, **Announcer Tile**, and **Breaker** controls to select them.

Step 8. While you have the controls selected, press <Ctrl+C> on your keyboard to copy them.

Step 9. Now press <Ctrl+V> on the keyboard to paste the controls you copied. Do this three times.

Step 10. Position the groupings similar to *Figure 5.2*.

Step 11. Copy one of the **Conductors** and paste it twice on the diagram.

Step 12. Right-click and rotate each **Conductor** two 45-degree steps, for a total of 90 degrees. Place each **Conductor** in the same bus location as *Figure 5.2* indicates.

Step 13. Drag a **Metering Label** onto the diagram three times. For more information, see *Table 4.1*.

Step 14. Align the three **Metering Labels**.

Step 15. Select and copy all three **Metering Labels**.

Step 16. Paste the copied **Metering Labels** to the locations shown in the following screenshot.

Step 17. To complete the main level one-line diagram, use the chapters in this manual for reference and set all control parameters in the diagram.

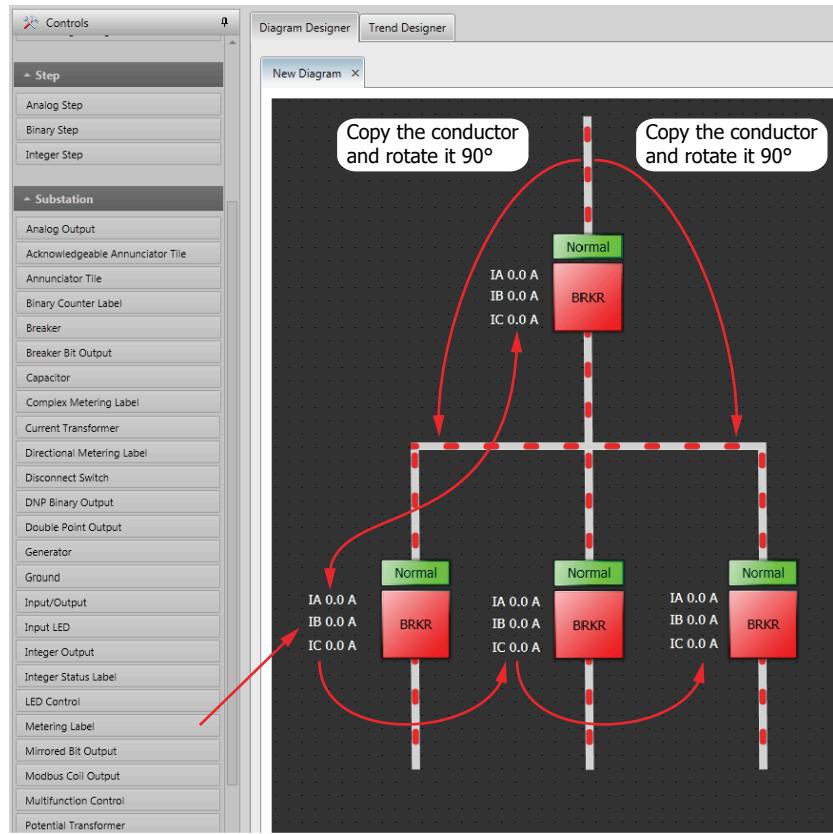


Figure 5.2 Example Control Layout

Step 18. Select and copy the three **Metering Labels**, the **Breaker**, the **Annunciator Tile**, and two **Conductor** controls for Feeder Detail Relay 1 (FDR1).

Step 19. Double-click the **Annunciator Tile** above FDR1.

Step 20. Paste the controls you copied into the child diagram that displays after you double-click the **Annunciator Tile**.

Step 21. Add additional detail items to this screen.

Step 22. Add control items to the child screen.

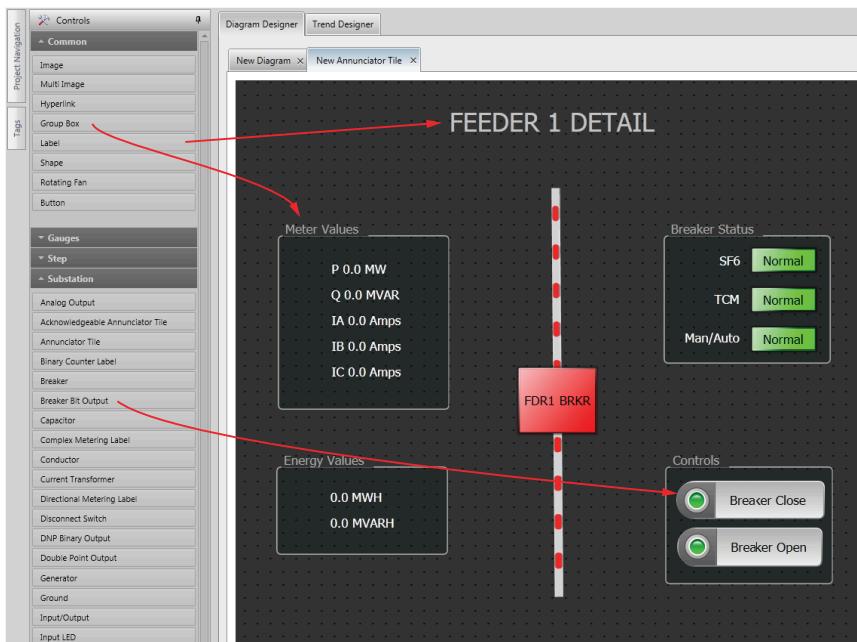


Figure 5.3 Annunciator Tile Child Diagram Layout

Step 23. While you are within the child diagram, use <Ctrl+A> from your keyboard to select and copy all controls.

Step 24. Open **Annunciator Tiles** in FDR2, FDR3, and Main and paste within these the items you copied.

Step 25. Use Find (<Ctrl+F> from your keyboard) to reassociate the tags in FDR2, FDR3, and Main.

Building Front-Panel Faceplates

Adding images is one method by which you can improve the look and feel of the HMI. Diagram Builder provides the ability to add the front-panel image of an SEL device and drag input LEDs on top of the image to reproduce exactly what operators would see if they were in the substation.

Step 1. Within an **Annunciator Tile** (see *Table 4.1* for details about Annunciator Tiles) or a new Diagram, drag the **Image** control onto the diagram. For more information about Image controls, see *Table 4.1*.

Step 2. In the **Image** control properties, select an image file that shows a device front panel.



Figure 5.4 SEL-2411 Front-Panel Image

- Step 3. Drag **Input LEDs** onto the control and size these LEDs accordingly.
- Step 4. Tie the LEDs to the appropriate front-panel LED tags. Also verify that the alarm state and normal state are set to their proper colors. For more information on LED properties, see *Table 4.1*.

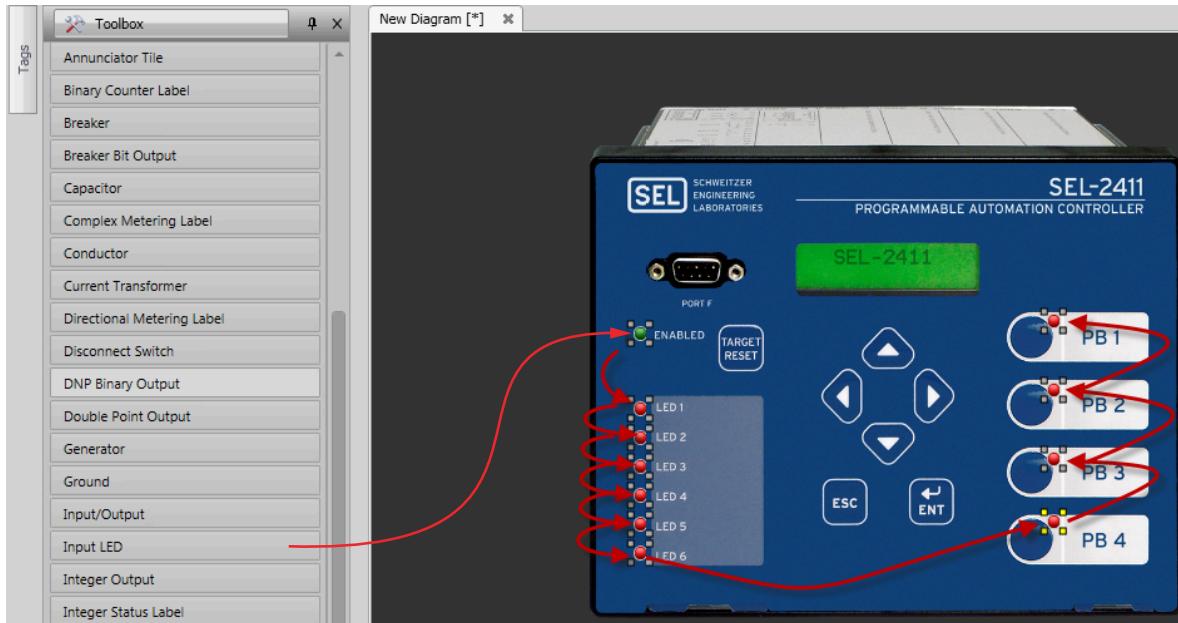


Figure 5.5 Example Front-Panel Layout

View the RTAC HMI in Runtime

HMI Preview

The HMI Preview allows you to view and make quick changes to your project without needing to push it to an RTAC. If tag values are needed, an optional linkage to an RTAC is available. To use the HMI Preview, perform the following steps:

- Step 1. Open your project in Diagram Builder.
- Step 2. Select the Show HMI Preview menu icon (Preview) or select **Tools > Preview HMI**.
- Step 3. If no RTAC data are needed, select **Load**. Otherwise, select **Connect to RTAC for Data**, enter the login details for the desired RTAC, and select **Load**.

You are now viewing your HMI project.

NOTE

HMI Debug Mode is always enabled in the HMI Preview. For more information, see HMI Debug Mode on page 57.

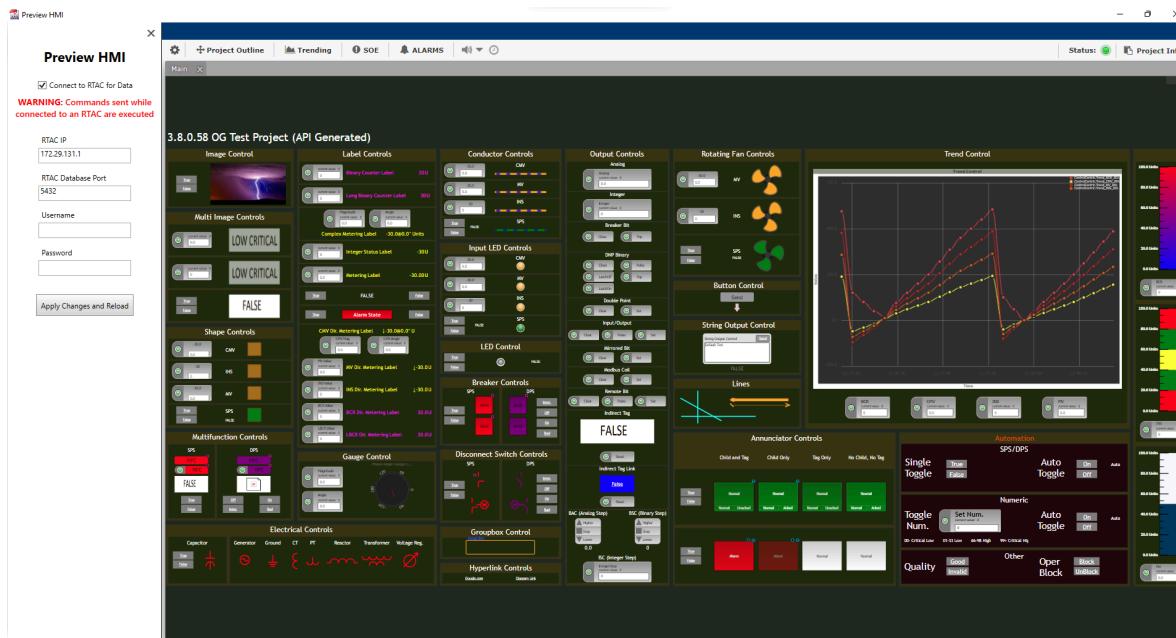


Figure 5.6 HMI Preview

RTAC HMI

Perform the following steps to view the RTAC HMI:

- Step 1. Launch a Chromium-based browser (i.e., Google Chrome or Microsoft Edge) and direct it to the IP address of the RTAC.
- Step 2. Log in to the RTAC web interface.

Step 3. Select the uploaded project under **HMI** in the RTAC navigation.

NOTE

The RTAC will display the Navigation Link Text defined in the Project Settings. See Figure 2.17.

You are now viewing your HMI project.



Figure 5.7 RTAC HMI

Online Resources

The SEL website provides videos of additional HMI examples at selinc.com/products/5035.

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A P P E N D I X A

Software and Manual Versions

Software

To find the software version of ACSELERATOR Diagram Builder, open the program, select the **Help** menu tab, and then select **About**. This results in the display of a window showing the name of the program and the version number at the top.



Table A.1 lists the software versions, a description of modifications, and the date code corresponding to the software version. The table lists the most recent software version first. *Table A.1* is frequently updated, but please go to selinc.com/products/5035/ and select **Latest Software Version** for the most recent software version.

Starting with revisions published after March 1, 2022, changes that address security vulnerabilities are marked with "[Cybersecurity]". Other improvements to cybersecurity functionality that should be evaluated for potential cybersecurity importance are marked with "[Cybersecurity Enhancement]".

Table A.1 Software Version History

Software Version Number	Summary of Revisions	Manual Date Code
3.9.1.229	<ul style="list-style-type: none"> ► Improved performance in Diagram Builder for extremely large projects. ► Improved RTAC Connections to allow for special characters in passwords. ► Miscellaneous bug fixes. 	20240816
3.9.0.143	<ul style="list-style-type: none"> ► Improved memory usage, CPU usage, and project load time in the HMI runtime. ► Improved annunciator tiles and acknowledgeable annunciator tiles in the HMI runtime. ► Improved the rendering of Shape controls in the HMI runtime. ► Improved the rendering of String Output controls in both Diagram Builder and the HMI runtime. ► Miscellaneous bug fixes. 	20240522
3.8.0.58	<ul style="list-style-type: none"> ► Added internationalization/localization support for Spanish and Mexican Spanish. ► Added a Linear Gauge to the HMI design controls. ► Added the ability to preview the HMI from within Diagram Builder. ► Sending projects through Diagram Builder now automatically uploads the HMI runtime .binz file. ► Added a KeepSizeRatio property to all symbol controls. ► Miscellaneous bug fixes. 	20240227
3.7.0.307	<ul style="list-style-type: none"> ► Added internationalization/localization support for French. ► Changed Substitution control to allow editing in the Diagram Builder mappings window. ► Added the ability to specify a TCP port for Diagram Builder communicating with an RTAC. ► Updated the RTAC Connections window (<i>formally Manage RTAC Projects</i>) to incorporate an HMI Runtime Binary upload. ► Updated SOE and Alarm viewer in RTAC HMI to support local time zone. ► Changed HMI to reset to default layout and zoom level after user inactivity timeout is reached. ► Added new Diagram Builder project save format for direct RTAC web upload. This requires RTAC firmware version R152 or later. ► Improved numeric value alignment for label controls. ► Optimized and improved HMI trends. ► Improved HMI Request Groups for Popup Diagrams or Lazy Loaded Diagrams. ► Miscellaneous bug fixes. 	20231103
3.6.0.160	<ul style="list-style-type: none"> ► Added option to set diagrams as Popup Windows. ► Added feature for importing HMI Runtime settings into projects. ► Added Protection Indication Control. ► Enabled multi-touch support for HMI runtime. ► Addressed issue with diagram line crossing in HMI runtime. ► Added option for setting time zone for SOE and Alarm viewer in HMI runtime. ► Redesigned trended tooltips for better memory consumption. ► Added option for allowing 1-second event poll. ► Added option for disabling pan/zoom in HMI runtime. ► Improved Diagram Builder project navigation options for renaming diagrams. 	20230609
3.5.0.61	<ul style="list-style-type: none"> ► Added project settings for enabling lazy loading of diagrams in order to improve overall performance based on project type. ► Added advanced option to runtime, allowing informational messages to be shown to client. ► Improved progress bar messages to better represent loading of project. ► Removed Silverlight support from runtime. 	20230303
3.4.3.304	<ul style="list-style-type: none"> ► Added option to import or export System Tags into a project as CSV files. ► Added support for RTAC R151 SSL connection type. ► Expanded navigation controls to support closing diagrams on click. ► Added option in runtime to automatically restart sessions. ► Improved Alarm Viewer to match RTAC webpage acknowledgments. 	20221103
3.4.2.250	<ul style="list-style-type: none"> ► Integrated command line HMI Import / Export feature into Tools menu. ► Expanded Substitution control to include control properties. ► Improved Substitution control mappings view with better search and filtering options. ► Improved tag selection properties to support alphabetization. ► Added option to define control messaging behavior for better customization. ► General maintenance fixes. 	20220831

Software Version Number	Summary of Revisions	Manual Date Code
3.4.1.125	<ul style="list-style-type: none">▶ Added project creation and saved dates to Project Settings dialog.▶ Enhanced copy and paste for conductor control.▶ Added Hide Negative Symbol option to metering labels.▶ Added option to disable snap to shape controls.▶ Updated API dll to support tag substitution control.▶ Enhanced listing of tag order when assigning tags to controls.▶ Added global setting that prevents ability to navigate away from diagram when control window is open.	20220513
3.4.0.97	<ul style="list-style-type: none">▶ Added a new Tag Substitution Definition control used for tag mapping within Diagram Builder that automatically creates multiple Synthetic Diagrams from one root diagram.▶ Enhanced the Multifunction control by adding support for images in addition to text to display logical conditions of the control.▶ Enhanced the Hyperlink control by adding a setting to close the diagram that contains the hyperlink upon navigating to the linked diagram.▶ Addressed an issue with the Metering label in which certain significant digits would show misleading readings when rounding.▶ Addressed an image size limit that was not being enforced for all controls that support images. The enforced limit for images is now 3 MB.	20210407
3.3.1.217	<ul style="list-style-type: none">▶ Added a dedicated Alarms Viewer to the RTAC HMI.▶ Added an option on Diagram Builder to enable the automatic polling of records for the Alarms Viewer.	20200807
3.3.0.153	<ul style="list-style-type: none">▶ Added a new image-based control called Indirect Tag for indirect tagging implementation.▶ Added a new text-based control called Tag Link for indirect tagging implementation.▶ Enhanced the Breaker control by adding a hide logical command column and a customizable text field for the buttons within the Control Window.▶ Enhanced the Disconnect Switch control by adding a hide logical command column and a customizable text field for the buttons within the Command Window.▶ Enhanced the Multifunction control by adding a logical command column and a customizable text field for the buttons within the Command Window.▶ Enhanced the SOE viewer to retain filter selection after leaving a session and relaunching the HMI.▶ Addressed an issue with the Metering Label control that prevented it from displaying leading zeroes.▶ Addressed an issue with the Metering Label control that showed erratic values when very small magnitude numbers were presented.	20200604
3.2.10.31	<ul style="list-style-type: none">▶ Addressed an issue related to the rendering of the Phase Angle Gauge Control on HTML5.	20200305
3.2.9.95	<ul style="list-style-type: none">▶ Performed miscellaneous bug fixes and enhancement including the following:<ul style="list-style-type: none">➢ Fixed an issue that caused the disconnect switch and voltage regulator controls to incorrectly display their dimensions under certain conditions while doing copy/paste or undo operations.➢ Added a setting to the acknowledgeable annunciator tiles and the annunciator tiles to allow a user to enable or disable a bell symbol when a child diagram is in an alarm state.➢ Added a missing user scenario that caused the LED color to be inverted when a user opened a project with an older version of Diagram Builder that had an LED using false as the alarm condition.➢ Fixed an issue that caused the background of a diagram to change to white when a user opened the Diagram Properties of a diagram and selected the Appearance tab.➢ Added an enhancement to the gauge control that allows users to specify where they want to have the zero point of reference.	20190405

Software Version Number	Summary of Revisions	Manual Date Code
3.2.8.304	<ul style="list-style-type: none"> ► Performed miscellaneous bug fixes and enhancements including the following: <ul style="list-style-type: none"> ➢ Resolved an issue where some controls failed to preserve certain properties when saved and reloaded. ➢ Added support for logger utility and debug mode as troubleshooting aids on RTAC HMI in the browser. ➢ Added support for a modernized and redesigned HMI side bar on RTAC HMI in the browser. ➢ Miscellaneous back-end enhancements and bug fixes to improve product usability. ► Performed general maintenance. 	20181102
3.2.7.713	<ul style="list-style-type: none"> ► Added a new control called Multi Image that can display user-chosen images, depending upon the value/status of the incoming Tag. ► Added the ability to configure controls to remove plaintext visibility of user-entered value. Available for Analog Output, Integer Output, and Integer Step controls. ► Added the ability to configure controls to generate an alarm or not. Available for Status Label and Input LED controls. ► Added the ability to lock and unlock controls in Diagram Builder. ► Added new properties available for String Data Label: <ul style="list-style-type: none"> ➢ Set Height and Width of the control by entering numeric values. ➢ Set Background and Border Color for the control. ► Enhanced text field configuration for different states of a control. Available for Breaker, Multifunction Control, Annunciator Tile, Acknowledgeable Annunciator Tile, and Status Label. ► Added the ability to drag and drop diagram links for rearrangement in the Project Navigation window in Diagram Builder. ► Performed miscellaneous bug fixes and enhancements including the following: <ul style="list-style-type: none"> ➢ Ability to set initial zoom level for HMI diagrams as they appear in the browser. ➢ Ability to remove unused tags from the Diagram Builder project. ➢ Ability to configure the font colors for X- and Y-axis values for Static and Diagram Trends. ➢ Ability to configure time format on time axis for Static and Dynamic Trends. ➢ Removed the restriction on number of digits that can be input from Analog Output Control in RTAC HMI in the browser. 	20180710
3.2.6.310	<ul style="list-style-type: none"> ► Provided fix for Find and Replace functionality for it to work correctly and as designed. 	20180503
3.2.6.308	<ul style="list-style-type: none"> ► Added the Control Window feature to the Disconnect Switch control. ► Added the ability to associate two tags with the Breaker, Multifunction, and Disconnect Switch controls. ► Added the ability for the two SPS tags associated with the above mentioned controls to perform simple standard Boolean logic such as AND, OR, XOR, NOR, NAND, XNOR, and a custom Boolean logic called Four State. The standard Boolean logic allows viewing a two-state result for the two associated SPS tags and the custom Boolean logic allows viewing a four-state result for the two associated SPS tags. ► Performed miscellaneous bug fixes and enhancements including the following: <ul style="list-style-type: none"> ➢ Command details added to the Command confirmation popup on the RTAC HMI on a supported HTML5-based browser. ➢ Files with the extension .hprb are now automatically associated with Diagram Builder. ➢ The configured Description property of trend series for Trends is now correctly displayed. ➢ The properties of the Diagram Builder controls are now correctly displayed on French and Spanish operating systems. ➢ Feedback on the Analog Output control is now restricted to a rounded seven-digit value. ➢ Input from the Analog Output control in the RTAC HMI in the browser is now restricted to seven significant digits. 	20180320

Software Version Number	Summary of Revisions	Manual Date Code
3.2.5.698	<ul style="list-style-type: none"> ▶ Added support for the following new controls: Multifunction control, Current Transformer control, Potential Transformer control, and Directional Metering label. ▶ For controls supporting the Control Window (Dock): Enhanced Control Window functionality and features, including addition of an Auto-Close feature. ▶ Added the ability to choose whether to display the angle value for the Complex Metering Label. ▶ General enhancements and bug fixes to improve usability of RTAC HMI SOE viewer in terms of SOE settings, viewing SOE records, new alarm notification (which now navigates to the RTAC HMI SOE viewer instead of the RTAC web server SOE viewer when accessed from RTAC HMI screens), and performance on the local browser interface of the RTAC (where supported) so that the RTAC HMI does not need to be periodically restarted. ▶ Performed general maintenance and other miscellaneous bug fixes. 	20180206
3.2.1.656	<ul style="list-style-type: none"> ▶ Added support for Rotating Fan control. ▶ Added the ability to write alphanumeric strings from the RTAC HMI in the browser with two new controls: the String Output control and the Button control. ▶ Added the ability to restrict access to RTAC HMI diagrams in the browser with a new role-based security access feature. ▶ Added support for access to the RTAC HMI when using port forwarding on a supported HTML5-based browser. ▶ General enhancements to improve rendering of controls on the RTAC HMI on a supported HTML5-based browser. ▶ Performed general maintenance. 	20171107
3.1.1.562	<ul style="list-style-type: none"> ▶ Removed Digits property of Integer Status Label control in Diagram Builder. ▶ Removed unnecessary attributes from Print Preview feature on Log File viewer in Diagram Builder. ▶ Added the ability to allow the user to activate and use a manual pan and zoom control panel on the RTAC HMI in the browser. ▶ Updated rendering of Disconnect Switch on the RTAC HMI in the browser. ▶ Performed general maintenance. 	20170322
3.0.2.467	<ul style="list-style-type: none"> ▶ Added Pulse option for Command Value on Input/Output Control. ▶ Added Save to Template File option to enable saving of Diagrams in the ACSELERATOR Diagram Builder project without the existing Tag associations. ▶ Modified Tag Name property of controls such that the property field can now be edited. ▶ Removed the requirement of selecting Schema before tags can be imported from ACSELERATOR RTAC Database. ▶ Removed Lucida Grande font. ▶ Removed the option to create a Quick Launch Shortcut when installing the ACSELERATOR Diagram Builder software. ▶ Performed general maintenance. 	20160718
3.0.1.159	<ul style="list-style-type: none"> ▶ Added step controls for MMS data types. 	20151111
3.0.0.96	<ul style="list-style-type: none"> ▶ Removed license and registration requirements. 	20150623
2.4.2.7527	<ul style="list-style-type: none"> ▶ Resolved issue where Data Label integers could become truncated. 	20150401
2.4.1.7484	<ul style="list-style-type: none"> ▶ Resolved issue where a Diagram Builder project could become 1 KB in size. 	20140801
2.4.0.7330	<ul style="list-style-type: none"> ▶ Enhanced performance for Open/Save/Close operations. ▶ Added the Acknowledgeable Annunciator Tile. ▶ Introduced 64-bit installation. 	20140601
2.3.0.6826	<ul style="list-style-type: none"> ▶ Performed general maintenance. 	20131001
2.2.0.6582	<ul style="list-style-type: none"> ▶ Added RTAC HMI Sequence of Events (SOE) viewer. ▶ Performed general maintenance. 	20130501

Instruction Manual

The date code at the bottom of each page of this manual reflects the creation or revision date.

Table A.2 lists the instruction manual versions and revision descriptions. The most recent instruction manual revision is listed at the top.

Table A.2 Instruction Manual Revision History^a

Date Code	Summary of Revisions
20240816	Appendix A <ul style="list-style-type: none">► Updated for software version 3.9.1.229.
20240522	Section 1 <ul style="list-style-type: none">► Added <i>Automatically Upload Matching HMI Runtime Version to SEL HMI Updates</i>. Section 2 <ul style="list-style-type: none">► Added <i>Languages and New Project</i>.► Added <i>Importing System Tags Via the System Tags Import/Export Tool to Importing Tags</i>.► Added <i>Diagram Types to Working With the Diagram</i>.► Added <i>HMI-Specific Settings to Project Settings</i>.► Removed <i>Alarms from Project Settings</i>.► Added <i>HMI Export/Import and RTAC Connections to Settings</i>.► Added <i>Remote Connection to an RTAC Using a Chromium Browser to Clearing the Browser Cache for Runtime Files under Settings</i>. Section 4 <ul style="list-style-type: none">► Added Substitution Control and Linear Gauge to <i>Table 4.1: HMI Design Controls Overview</i>. Section 5 <ul style="list-style-type: none">► Added <i>HMI Preview and RTAC HMI to View the RTAC HMI in Runtime</i>. Appendix A <ul style="list-style-type: none">► Updated for software version 3.9.0.143. Appendix D <ul style="list-style-type: none">► Added Linear Gauge to <i>Table D.1: Performance Impacts of Typical Controls</i>.
20240227	Appendix A <ul style="list-style-type: none">► Updated for software version 3.8.0.58.
20231103	General <ul style="list-style-type: none">► Updated references to match new naming convention for Control Window. Appendix A <ul style="list-style-type: none">► Updated for software version 3.7.0.307.
20230609	General <ul style="list-style-type: none">► Reorganized and reissued entire manual. Section 1 <ul style="list-style-type: none">► Updated <i>Installing Diagram Builder</i>. Section 2 <ul style="list-style-type: none">► Updated <i>HMI Tags</i>.► Updated <i>Device Tags in HMI Tags</i>.► Updated <i>Figure 2.1: Initial Project Settings, Figure 2.14: General Project Settings, and Figure 2.16: Control Behavior Examples</i>.► Updated <i>Control Behavior in Settings</i>. Section 4 <ul style="list-style-type: none">► Added <i>Table 4.1: HMI Design Controls Overview</i>.

Date Code	Summary of Revisions
	Appendix A <ul style="list-style-type: none">► Updated for software version 3.6.0.160. Appendix B <ul style="list-style-type: none">► Updated <i>Browser Support</i>.► Updated <i>Table B.1: HTML5 Browser-Rendering Capabilities</i>.
20230303	Section 2 <ul style="list-style-type: none">► Updated <i>Project Settings</i> in <i>Settings</i>.► Updated <i>Figure 2.28: General Project Settings</i>. Appendix A <ul style="list-style-type: none">► Updated for software version 3.5.0.61.
20221103	Appendix A <ul style="list-style-type: none">► Updated for software version 3.4.3.304.
20220831	Appendix A <ul style="list-style-type: none">► Updated for software version 3.4.2.250.
20220513	Section 2 <ul style="list-style-type: none">► Updated <i>Figure 2.24: Lines Application Settings</i> and descriptive text.► Updated <i>Figure 2.30: Control Behavior Examples</i> and descriptive text. Appendix A <ul style="list-style-type: none">► Updated for software version 3.4.1.125.
20210407	Section 2 <ul style="list-style-type: none">► Added <i>Tag Substitution</i>. Section 4 <ul style="list-style-type: none">► Updated <i>Figure 4.6: Hyperlink Control Properties</i> and <i>Figure 4.252: Multifunction Control Properties</i>.► Added <i>Figure 4.255: Multifunction Control Image Properties</i>. Appendix A <ul style="list-style-type: none">► Updated for software version 3.4.0.97.
20200807	Section 2 <ul style="list-style-type: none">► Updated <i>Figure 2.28: General Project Settings</i>, <i>Figure 2.29: Request Groups Project Settings</i>, <i>Figure 2.30: Control Behavior Examples</i>, and <i>Figure 2.32: User Role Names and Diagram Access on the RTAC HMI in the Browser</i>.► Added <i>Alarms</i>. Section 3 <ul style="list-style-type: none">► Updated <i>Figure 3.17: Creating a Trend</i>, <i>Figure 3.22: Accessing Default Settings for Static and Dynamic Trends at Runtime</i>, <i>Figure 3.26: Runtime Popup Trend</i>, <i>Figure 3.29: Sequence of Events Viewer</i>, and <i>Figure 3.42: Current SOE Alarm Severity</i>.► Updated <i>Alarm Filters</i>.► Added <i>Alarms Viewer</i>.
20200604	Section 2 <ul style="list-style-type: none">► Added <i>HPRJ</i>, <i>HPRB</i>, and <i>HMID—Types of Files Used by Diagram Builder under Settings</i>. Section 3 <ul style="list-style-type: none">► Updated <i>Selecting Tags</i> under <i>Control Window</i>.► Added <i>Alarm Filters to Sequence of Events (SOE) Viewer</i>.► Added <i>HMI Read-Only Mode</i>.► Added <i>HMI Debug Mode</i>. Section 4 <ul style="list-style-type: none">► Added <i>Indirect Tag</i>.► Added <i>Indirect Tag Link</i>.
20200305	Appendix A <ul style="list-style-type: none">► Updated for software version 3.2.10.31.

Date Code	Summary of Revisions
20190405	<p>Section 2</p> <ul style="list-style-type: none"> ► Updated <i>Additional Runtime Indications</i>. ► Updated <i>Table 2.1: Compatible Operating Systems and Browsers</i>. ► Added <i>Clearing the Browser Cache for Runtime Files and Chromium under Settings</i>. <p>Section 4</p> <ul style="list-style-type: none"> ► Updated <i>Figure 4.55: Gauge Control Properties</i>, <i>Figure 4.56: Gauge Control Face Color Assignment</i>, <i>Figure 4.57: Gauge Control Face Color Assignment</i>, <i>Figure 4.58: Gauge Control Height Assignment</i>, <i>Figure 4.59: Gauge Control Width Assignment</i>, <i>Figure 4.60: Gauge Control Radius Assignment</i>, and <i>Figure 4.61: Gauge Control Indicators Assignment</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ► Updated for software version 3.2.9.95.
20181102	<p>Section 2</p> <ul style="list-style-type: none"> ► Updated <i>Figure 2.5: Import RTAC Tags From ACSELERATOR RTAC Database</i>, <i>Figure 2.6: Import RTAC Tags Direct From RTAC</i>, and <i>Figure 2.7: Select Imported Tags</i>. ► Added <i>Figure 2.18: Rearrange Diagram Navigation Link by Using Move Up and Move Down</i>, <i>Figure 2.19: Rearrange Diagram Navigation Link by Using Drag and Drop</i>, <i>Figure 2.42: Additional Runtime Indications</i>, and <i>Figure 2.43: Runtime Indication for the Presence of an Alarm Condition on the Child Diagram</i>. <p>Section 3</p> <ul style="list-style-type: none"> ► Updated <i>Figure 3.24: Runtime Popup Trend</i>. <p>Section 4</p> <ul style="list-style-type: none"> ► Updated <i>Figure 4.55: Gauge Control Properties</i>, <i>Figure 4.59: Gauge Control Width Assignment</i>, <i>Figure 4.60: Gauge Control Scale Radius Assignment</i>, <i>Figure 4.61: Example Scale Radius</i>, <i>Figure 4.62: Gauge Control Text Color Assignment</i>, and <i>Figure 4.63: Gauge Control Indicators Assignment</i>.
20180710	<p>Section 2</p> <ul style="list-style-type: none"> ► Updated <i>Figure 2.4: Import Tags</i> and <i>Figure 2.13: Diagram Properties</i>. ► Added <i>Removed Unused Tags from Diagram Builder Project</i> and <i>Locking Movement of Controls in Diagram Builder Project</i>. <p>Section 3</p> <ul style="list-style-type: none"> ► Added <i>Setting Defaults for Static and Dynamic Trends at Runtime</i>. ► Added <i>Figure 3.14: X-Axis Font Color</i>. <p>Section 4</p> <ul style="list-style-type: none"> ► Updated <i>Control Window</i>, <i>Status Label</i>, <i>String Data Label</i>, <i>Annunciator Tile</i>, <i>Breaker</i>, <i>Multifunction Control</i>, and <i>Trend Control</i>. ► Added <i>Multi Image</i>, <i>Boolean Tag Assignment for Multi Image Control</i>, and <i>Analog Tag Assignment for Multi Image Control</i>. <p>Section 5</p> <ul style="list-style-type: none"> ► Replaced <i>Figure 5.1: Breaker, Conductor, and Annunciator Tile Layout</i>, <i>Figure 5.2: Example Control Layout</i>, <i>Figure 5.3: Annunciator Tile Child Diagram Layout</i>, <i>Figure 5.5: Example Front-Panel Layout</i>, <i>Figure 5.11: Breaker Tag Assignment</i>, and <i>Figure 5.12: Breaker Text</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ► Updated <i>Table A.1: Software Version History</i>.
20180503	<p>Appendix A</p> <ul style="list-style-type: none"> ► Updated <i>Table A.1: Software Version History</i>.
20180320	<p>Section 2</p> <ul style="list-style-type: none"> ► Updated <i>Figure 2.14: Appearance Diagram Properties</i>, <i>Figure 2.18: Application Settings</i>, and <i>Figure 2.26: Control Behavior Examples</i>. <p>Section 4</p> <ul style="list-style-type: none"> ► Updated <i>Breaker</i>, <i>Disconnect Switch</i>, and <i>Multifunction Control</i> in <i>Miscellaneous Substation Controls</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ► Updated <i>Table A.1: Software Version History</i>.

Date Code	Summary of Revisions
20180206	<p>Section 3</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 3.23: Event Viewer Grid</i>, <i>Figure 3.28: Record Display Options</i>, <i>Figure 3.31: Filter Management</i>, <i>Figure 3.32: SOE Filtered Records</i>, and <i>Figure 3.33: Event Details</i>. ▶ Added <i>Export to Sequence of Events (SOE) Viewer</i>. <p>Section 4</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 4.144: Complex Metering Label Control</i> and <i>Figure 4.193: Breaker Control Properties</i>. ▶ Added <i>Directional Metering Label to Labels</i>. ▶ Added <i>Current Transformer</i> and <i>Potential Transformer</i> to <i>Substation Symbols</i>. ▶ Added <i>Multifunction Control</i> to <i>Miscellaneous Substation Controls</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ▶ Updated <i>Table A.1: Software Version History</i>.
20171107	<p>General</p> <ul style="list-style-type: none"> ▶ Added <i>Appendix C: Cybersecurity Information</i>. ▶ Added <i>Appendix D: HMI Design Best Practices</i>. <p>Section 2</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 2.1: Initial Project Settings</i>, <i>Figure 2.9: Assign Tag to Control</i>, <i>Figure 2.24: General Project Settings</i>, <i>Figure 2.25: Request Groups Project Settings</i>, <i>Figure 2.26: Control Behavior Examples</i>, and <i>Figure 2.35: Control Preview Tools</i>. ▶ Added <i>Roles</i> under <i>Alignment, Spacing, and Arrangement Tools</i> in <i>Working With the Diagram</i>. <p>Section 3</p> <ul style="list-style-type: none"> ▶ Added <i>Project Outline</i>. <p>Section 4</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 4.1: Image Control</i>, <i>Figure 4.5: Group Box Control</i>, <i>Figure 4.7: Label Control Properties</i>, <i>Figure 4.13: Shape Control</i>, <i>Figure 4.57: Analog Step Control</i>, <i>Figure 4.59: Binary Step Control</i>, <i>Figure 4.61: Integer Step Control</i>, <i>Figure 4.68: Analog Output Control</i>, <i>Figure 4.75: Breaker Bit Output Control</i>, <i>Figure 4.83: DNP Binary Output Control</i>, <i>Figure 4.91: Double Point Output Control</i>, <i>Figure 4.93: Input/Output Control</i>, <i>Figure 4.101: Integer Output Control</i>, <i>Figure 4.113: LED Control</i>, and <i>Figure 4.133: Remote Bit Output Control</i>. <p>Section 5</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 5.9: Project Settings</i> and <i>Figure 5.11: Breaker Tag Assignment</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ▶ Updated <i>Table A.1: Software Version History</i>.
20170322	<p>Section 4</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 4.95: Integer Status Label Properties</i>. <p>Appendix A</p> <ul style="list-style-type: none"> ▶ Updated <i>Table A.1: Software Version History</i>.
20160718	<p>Section 2</p> <ul style="list-style-type: none"> ▶ Updated <i>Importing Tags</i>, including <i>Figure 2.5: Import RTAC Tags From the ACSELERATOR RTAC Database</i>, <i>Figure 2.6: Import RTAC Tags Direct From RTAC</i>, and <i>Figure 2.7: Select Imported Tags</i>. ▶ Updated <i>Working With the Diagram</i> to include information on saving a diagram and web browser settings. <p>Section 3</p> <ul style="list-style-type: none"> ▶ Updated <i>Figure 3.14: Trend Selection</i>, and renamed it to <i>Creating a Trend</i>. ▶ Added information to <i>Dynamic Trend Design at Runtime</i>. ▶ Added <i>Sequence of Events Viewer</i>. <p>Section 4</p> <ul style="list-style-type: none"> ▶ Updated notes for firmware version R135. <p>Appendix A</p> <ul style="list-style-type: none"> ▶ Updated <i>Table A.1: Software Version History</i>. <p>Appendix B</p> <ul style="list-style-type: none"> ▶ Updated to remove references to Mozilla Firefox.

Date Code	Summary of Revisions
20151029	<p>Section 2</p> <ul style="list-style-type: none">▶ Updated <i>Figure 2.8: Place Tag on Diagram Palette</i>.▶ Updated <i>Figure 2.9: Assign Tag to Control</i>. <p>Section 4</p> <ul style="list-style-type: none">▶ Updated <i>Figure 4.7: Label Control Properties</i>, <i>Figure 4.13: Shape Control</i>, <i>Figure 4.51: Integer Step Control No Wrap</i>, <i>Figure 4.52: Integer Step Control Wrap</i>, <i>Figure 4.53: Integer Step Control Wrap With Overflow</i>, and <i>Figure 4.54: Analog Output Control</i>.▶ Added <i>Step Controls</i>. <p>Section 5</p> <ul style="list-style-type: none">▶ Updated <i>Figure 5.1: Breaker, Conductor, and Annunciator Tile Layout</i>, <i>Figure 5.2: Example Control Layout</i>, and <i>Figure 5.3: Annunciator Tile Child Diagram Layout</i>. <p>Appendix A</p> <ul style="list-style-type: none">▶ Added <i>Appendix A: Software and Manual Versions</i>.▶ Added <i>Table A.1: Software Version History</i> and <i>Table A.2: Instruction Manual Revision History</i>. <p>Appendix B</p> <ul style="list-style-type: none">▶ Added <i>Appendix B: Browser Support</i>.▶ Added <i>Table B.1: HTML5 and Silverlight Browser-Rendering Capabilities</i>.

^a Information about changes to earlier versions of the ACCELERATOR Diagram Builder SEL-5035 Software Instruction Manual is not available.

A P P E N D I X B

Browser Support

Table B.1 lists the present browser-rendering capabilities of SEL real-time automation controller (RTAC) firmware for accessing the RTAC human-machine interface (HMI).

Table B.1 HTML5 Browser-Rendering Capabilities

RTAC Firmware	Chrome	Opera	Microsoft Edge
≥R134 ^a	HTML5 (Chrome versions 40+)	HTML5 (Opera versions 27+)	HTML5 (Edge versions 13+)

^a SEL RTACs presently default to HTML5 for rendering if the RTACs have firmware version R134 or higher and are used with Google Chrome Version 40 (or higher), Microsoft Edge Version 13 (or higher), or Opera Version 27 (or higher).

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A P P E N D I X C

Cybersecurity Features

Ports and Services

ACCELERATOR Diagram Builder software does not open any listening network ports or services.

Diagram Builder connects to Port 5432 on the RTAC or a configurable port number (default 5433) opened by ACCELERATOR RTAC SEL-5033 Software.

Access Controls

Diagram Builder does not perform any password, account, or certificate management.

Alerts and Logging

Diagram Builder logs software-specific diagnostic information. This internal log is written to a file.

Internal Log Storage

The default location for Diagram Builder log files is C:\Program Files\SEL\AcCELERATOR\DiagramBuilder\bin\Logs\. Diagram Builder creates a new log file once the size of the current log file being written reaches a user-settable limit. This setting is available under **Logger Settings** on the **Log Viewer** in Diagram Builder. Diagram Builder creates a maximum of five log files in this manner before overwriting the oldest log file. The complete log size is limited by the free space on the hard disk on the machine on which Diagram Builder is installed. If the disk is full, Diagram Builder does not write to the log file.

Back Up and Restore

Saving and Restoring Settings

Diagram Builder settings are stored in the AppSettings.xml file (located by default at C:\Program Files\SEL\AcCELERATOR\DiagramBuilder\bin\). This file should only be modified within Diagram Builder. It may be manually backed up and restored. If deleted, the AppSettings.xml file will be regenerated with default values.

Decommissioning

Diagram Builder can be uninstalled by using SEL Compass®.

Revision Management

Appendix A: Software and Manual Versions provides a description of each revision. Diagram Builder can be installed and updated through the use of SEL Compass. Diagram Builder is also available as a download from selinc.com.

See *The SEL Process for Disclosing Security Vulnerabilities* at selinc.com/security_vulnerabilities/ for details on vulnerability disclosure.

Contact SEL

For further questions or concerns about product security, please contact SEL at security@selinc.com or +1-509-332-1890.

A P P E N D I X D

HMI Design Best Practices

Given the flexibility, tools, controls, and features such as SOE logging, animations, colors, trends in the ACCELERATOR Diagram Builder software and RTAC HMI, the performance and operator experience of the HMI can vary widely. Effective implementation of the RTAC HMI requires deliberate planning and testing of the project design, tailoring parameters for your specific application, prioritizing information while eliminating all content that does not provide key value, reserving the use of animations for creating impact or highlighting important information, and testing the HMI design completely before field installation.

This section provides information to assist you in your RTAC HMI design. While there is no single rule to specify the performance boundary of RTAC HMI, the presented information can assist you in optimizing the RTAC HMI experience for your users. Please note that the information and guidelines presented below are provided only as design aids. Recommended maximum values are not hard-coded limits and are provided only as best practice guidelines.

If you have questions about your specific application for the RTAC HMI, please contact the SEL factory for assistance from one of our engineers.

Factors That Impact RTAC HMI Performance

Type and Quantity of Controls in Use on the HMI Screens

Table D.1 classifies the performance impacts of various controls available in Diagram Builder. You can use the information to evaluate and optimize the performance of your RTAC HMI design.

Table D.1 Performance Impacts of Typical Controls

Diagram Builder Control	Performance Impact
Common	
Animation Enabled: Image, Multi Image, Shape	High
Hyperlink, Group Box, Label, Button	Low
Rotating Fan	Very High
Gauges	
Linear Gauge, Phase Angle Gauge	Moderate
Step	
Analog Step, Binary Step	Low
Integer Step	Moderate

Diagram Builder Control	Performance Impact
Substation	
Analog Output, Binary Counter Label, Complex Metering Label, Integer Output, Integer Status Label, Metering Label, String Output	Moderate
Animation Enabled: Acknowledgeable Annunciator Tile, Annunciator Tile, Breaker, Disconnect Switch, Status Label	High
Breaker Bit Output, Capacitor, DNP Binary Output, Double Point Output, Generator, Ground, Input Output, Input LED, LED Control, Mirrored Bit Output, Modbus Coil Output, Reactor, Remote Bit Output, String Data Label, Transformer, Voltage Regulator	Low
Conductor	Very High
Trended Tooltip Enabled: Complex Metering Label, Integer Status Label, Metering Label	Moderate to High
Trends	
Trend Control	Very High

The RTAC HMI also offers a Low Performance mode, which can be enabled or disabled by using the **HMI Settings** in the browser. When this mode is enabled, the performance demands that are placed on the RTAC CPU are reduced and you can evaluate the HMI performance in this mode as a part of the optimization process. Low Performance mode can be particularly useful if you are trying to optimize the RTAC HMI on a natively offered local interface on the RTAC.

Loading of the RTAC Hosting the HMI

If the RTAC hosting the RTAC HMI is heavily burdened by performing Automation Controller tasks, it may not have time to service the HMI, resulting in slower RTAC HMI updates and performance. Some parameters on the ACCELERATOR RTAC project that could impact the RTAC HMI performance are the amount of logic that the RTAC must process, the poll rate of field devices, Analog Dead Band settings, and the total number of tags.

Number of Tags Being Requested on RTAC HMI and How Fast the Data Are Being Requested

Design the system such that only essential data are collected because data collection and updates may require significant processing power and generate considerable traffic on the communication network. Diagram Builder provides Request Group Settings parameters for configuring request intervals per request group. The requests can further be classified as Integrity Polls and Event Polls and intervals can be independently set for each, further allowing you to customize your Request Group Design for RTAC HMI to fine-tune to your application.

Errors in Diagram Builder Configuration

Performance of the RTAC HMI can be adversely affected when non-existent tags are specified or if the specified tag types in the Diagram Builder project do not match the tag types in the associated ACCELERATOR RTAC project. You can use the **Project Report** feature to gain insight into tags that are expected to be in the project but which may not be, as well as the tags that may be of an unexpected type.

SOE Collection

The number of records being collected on the RTAC HMI SOE viewer, the frequency at which SOE records for collection are being generated on the system, and whether Auto-Refresh is enabled for RTAC HMI SOE collection all have a direct impact on the performance of RTAC HMI. Therefore, it is important to keep the record generation and update rate for RTAC HMI SOE data collection only as fast as necessary.

Trending

Trends can be a factor in CPU consumption because of features such as pausing and panning, curve fitting, and curve smoothing. When provisioning trends, it is important to consider how they will be used. Limit the number of trends on RTAC HMI and their plot time spans as necessary. Place multiple traces on a single trend rather than using individual trends with a single trace. RTAC HMI allows for a maximum of four traces per trend. Typically, you should not exceed eight trends in a single RTAC HMI project, which you can accomplish by adding as many as four traces on each trend and with static trends placed on different HMI diagrams rather than on one. If the application demands many trends, you can attempt splitting the RTAC HMI and using either two machines or an additional Virtual Machine to display the HMI. Ensure that you test your setup for satisfactory performance before incorporating it in the final design. As part of the testing process, you should allow the HMI to run for several days prior to commissioning to validate performance expectations.

Number of Concurrent RTAC HMI Sessions

You may notice the RTAC HMI performance beginning to degrade when you open additional concurrent RTAC HMI sessions. To avoid this, limit the number of concurrent sessions on larger HMI projects that contain many tags and controls.

Speed and Reliability of Communications Network in Use

There are practical limits to the quantity of data that a network can transmit. An unreliable or heavily burdened network will negatively impact the RTAC HMI performance.

The Computer Hardware on Which RTAC HMI Is Running

Performance is directly impacted by the amount of memory and the processor speed of the hardware. Upgrading to a more-capable platform could lead to better RTAC HMI performance (assuming all other potential performance impacts are equal).

Other Software Running on the Computer on Which RTAC HMI Is Running

The other software packages being run on the same computer as the RTAC HMI will additionally load the CPU and possibly the RTAC. Performance may be affected because of competition for resources on the computer and the RTAC. You may need to use multiple computers or RTACs to improve the HMI performance.

Level of HTML5 Support for the Browser in Use

Only use up-to-date versions of the recommended HTML5 browsers. See *Table B.1* for recommended browsers. Browser versions are continually updated by the browser vendors, which may introduce unforeseen consequences for the RTAC HMI. This could be the case when you access the RTAC HMI remotely versus via the local interface available on certain RTAC platforms. Contact your SEL representative if you determine that a browser is causing unsatisfactory RTAC HMI performance.



SCHWEITZER ENGINEERING LABORATORIES, INC.

2350 NE Hopkins Court • Pullman, WA 99163-5603 U.S.A.

Phone: +1.509.332.1890 • Fax: +1.509.332.7990

selinc.com • info@selinc.com