SequenceManager™

1756 ControlLogix, 1756 GuardLogix, 1769 CompactLogix, 1769 Compact GuardLogix, 1789 SoftLogix, Studio 5000 Logix Emulate
Important user information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

---

**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attention helps you identify a hazard, avoid a hazard, and recognize the consequence.

**Important:** Identifies information that is critical for successful application and understanding of the product.

---

Labels may also be on or inside the equipment to provide specific precautions.

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Preface

Studio 5000 environment

The Studio 5000 Automation Engineering & Design Environment™ combines engineering and design elements into a common environment. The first element is the Studio 5000 Logix Designer™ application. The Logix Designer application is the rebranding of RSLogix™ 5000 software and will continue to be the product to program Logix5000™ controllers for discrete, process, batch, motion, safety, and drive-based solutions.

The Studio 5000® environment is the foundation for the future of Rockwell Automation® engineering design tools and capabilities. The Studio 5000 environment is the one place for design engineers to develop all elements of their control system.

Additional resources

These documents contain additional information concerning related Rockwell Automation products.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Automation Wiring and Grounding Guidelines, 1770-4.1</td>
<td>Provides general guidelines for installing a Rockwell Automation industrial system.</td>
</tr>
</tbody>
</table>

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.
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System requirements

The following are the minimum and recommended system requirements to successfully install, configure, and run SequenceManager Event Console. These requirements assume that no other application is running on the computer, unless it is an application that is listed in the Tested third-party software section.

- Ensure that all selected hardware is on the compatibility list for any one of the following:
  - Microsoft® Windows™ Server 2008 Service Pack 2 (32-bit)
    Microsoft Windows Server 2008 R2 Service Pack 1 (64-bit)
  - Microsoft Windows Server 2012
    Microsoft Windows Server 2012 R2
  - Windows 7 Service Pack 1 (64-bit)
    Windows 8.1 (32-bit and 64-bit)
  - SQL Server 2008 R2
    SQL Server 2012 R2

Systems that do not meet the minimum requirements for the version of software being used are not covered under warranty.

Important: For more information about supported operating systems and other Rockwell Software product version support, refer to the Product Compatibility and Download Center (PCDC).

Tested third-party software

The following new software has been tested with the current version of SequenceManager Event Console.

Adobe

- Acrobat Reader XI (11)

Rockwell Software

- Logix Designer (formerly RSLogix 5000) version 28
- RSLinx Classic version 3.60
- RSLinx Enterprise version 5.74
- FactoryTalk Activation version 3.60 or later
- FactoryTalk Services Platform version 2.80.0.4 or later
- FactoryTalk View Site Edition (SE) version 8.1
Install SequenceManager Event Components

Install SequenceManager Event Components to start the event handling services.

**Important:** If this install is an upgrade to the Batch system and the BatchHistoryEx SQL database is already being used, back up the database before installing the SequenceManager Event Components.

**To install SequenceManager Event Components:**

1. Access the Product Compatibility and Download Center (PCDC) to download the SequenceManager Event Install.exe.

2. Run the SequenceManager Event Install.exe file to install the SequenceManager Event Components.

3. To read the end-user license agreement, select license terms and conditions. Then select the check box to accept the terms and conditions. Select Next.

4. Select the SequenceManager Event Components to install:

   - **Batch History Database and Reports**
     
     **Important:** The database is selected to migrate by default. If Overwrite is selected, the existing Batch history database will be deleted.

     - If SQL authentication is being used, select Use SQL Authentication and then enter the SQL Username and the SQL Password.

5. Select Install.

Close the installation window when the installation has complete.

**See also**

SequenceManager and related components overview on page 19
SequenceManager and related components overview

Use the SequenceManager to model and execute sequential manufacturing processes using the ControlLogix features described in the following tasks:

- Configure the coordination of Equipment Phase execution using the Equipment Sequence Editor.
- Execute Equipment Sequence programs using ControlLogix.
- Monitor and manage running Equipment Sequences using the Logix Designer application.
- Enable operators to monitor and manage running Equipment Sequences and Equipment Phases by adding SequenceManager ActiveX controls to FactoryTalk View SE displays.
- Subscribe and collect generated sequence events using SequenceManager Event Client Service and SequenceManager Event Archiving Service.
The following diagram illustrates the components that are part of the SequenceManager and their responsibilities.

See also

- Logix Designer, Sequence Editor, and Sequence Monitor on page 20
- ControlLogix Firmware on page 21
- SequenceManager Controls on page 21
- SequenceManager Event Handling applications on page 22

Logix Designer, Sequence Editor, and Sequence Monitor

The Equipment Sequence Editor is used to create Equipment Sequence programs. The sequence diagram defines a sequence of Equipment Phases to be run, the order of execution, and their parameter data necessary to make the product. Input and output parameters are defined in the Equipment Sequence using the Sequence Tag Editor. Equipment Sequence programs and their tags are fully integrated with all Logix program and tag authoring capabilities.

The Equipment Sequence Monitor is the online version of the Equipment Sequence Editor and is used to monitor and interact with Equipment Sequences.
that have been downloaded to the controller. The control engineer can do the following:

- Command the Equipment Sequence.
- Change the value of parameters and attributes.
- Interact with the executing sequence.

See also

SequenceManager and related components overview on page 19

ControlLogix Firmware

The Equipment Sequence program firmware implements all the code necessary to manage the use of Equipment Phase programs, shares data between a sequence program and one or more Equipment Phase programs, and coordinates execution of the Equipment Phases.

When an Equipment Sequence or sequence element changes status or an operator interacts with the Equipment Sequence, the firmware generates an event. Once an event is generated, it is published for external applications to receive.

See also

SequenceManager and related components overview on page 19

SequenceManager Controls

The SequenceManager ActiveX controls provide operator visualization of the Equipment Sequence program. There are three operator controls for viewing and interacting with the Equipment Sequences.

The Sequence Detail Control provides the operator with a detailed view of an Equipment Sequence, including its chart structure, steps, and transitions. The runtime status of the sequence program and its sequence elements are also shown. The operator can command the Equipment Sequence from this control.

The Sequence Summary Control displays the sequence program status for each of the Equipment Sequences downloaded to the controller. The Sequence Summary Control also allows the operator to view and command a selected Equipment Sequence.

The Sequence Parameters Control displays a table of all sequence parameters and step tags of a specified Equipment Sequence, and allows the operator to command a selected sequence parameter or step tag. To refine the display, configure the table to filter the information displayed.

See also

SequenceManager and related components overview on page 19
The SequenceManager Event Services Console provides the user interface for performing the following tasks:

- Start, stop, pause, and resume the SequenceManager Event Client Service and the SequenceManager Event Archiving Service.
- Display the status of the SequenceManager Event Client Service and the SequenceManager Event Archiving Service.
- Configure the SequenceManager Event Client Service settings and SequenceManager Event Archiving Service settings.

The SequenceManager Event Client, a service external to the controller, receives the event from the general event log. The Event Client saves generated raw events into a temporary file.

The SequenceManager Archiving Service processes the raw event files, localizing, translating, and assembling data into the formats used by PlantPAx Historian and reporting applications. This data is written to an .EVT file and there is an option to write to a SQL Server database.

PlantPAx applications read the generated events and process them.

Tip: The SequenceManager Event Handling applications are installed separately from the Logix Designer installation process.

See also

- SequenceManager and related components overview on page 19
- Logix Designer, Sequence Editor, and Sequence Monitor on page 20
- ControlLogix Firmware on page 21
- SequenceManager Controls on page 21
Equipment Sequence Editor overview

The following image identifies the main areas of the Equipment Sequence Editor.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equipment Sequence Editor toolbar</td>
<td>Use to add sequence elements to the Equipment Sequence diagram.</td>
</tr>
<tr>
<td>2</td>
<td>Equipment Sequence Diagram workspace</td>
<td>Use to construct and configure Equipment Sequence diagrams.</td>
</tr>
<tr>
<td>3</td>
<td>Sequence Tag Editor</td>
<td>Use to add and configure parameters for the equipment phase steps in the Equipment Sequence diagram.</td>
</tr>
<tr>
<td>4</td>
<td>Equipment Sequence tabs</td>
<td>Use to select and navigate different Equipment Sequence diagrams under the tasks.</td>
</tr>
</tbody>
</table>

See also

Equipment Sequence Editor on page 24
The Equipment Sequence Editor is contained within the routine window in the main Logix Designer application window. Use this editor to edit Equipment Sequence diagram routines. The routine window contains tabs for all open routines, a view for each routine, and the Equipment Sequence toolbar. When a new sequence diagram is first shown, it contains an initial step, linked to a transition with the default expression TRUE, linked to a terminal step.

The Equipment Sequence Editor layout consists of the Equipment Sequence Element toolbar, the Equipment Sequence Diagram workspace, and the Sequence Tag Editor.

**Equipment Sequence Element toolbar** - When offline and editing an Equipment Sequence, the Equipment Sequence Element toolbar adds steps, transitions, and branch structures to the sequence diagram.

**Equipment Sequence Diagram workspace** - Use to construct and configure Equipment Sequence diagrams.

**Sequence Tag Editor** - Use the Sequence Tag Editor to add and configure sequence parameters and configure step tag properties. All sequence parameters and step tags are listed in a table format. The Sequence Tag Editor is the grid that displays at the bottom of the Equipment Sequence diagram.

See also

Create an Equipment Sequence program on page 27
Steps to create Equipment Sequence diagrams

An Equipment Sequence diagram is a graphical representation of a sequence that coordinates the execution of equipment. Each diagram comprises basic sequence elements such as steps, links, and transitions structured in a specific topology. Each Equipment Sequence has one routine that is configured by adding elements and applying branch structures using buttons available from the Equipment Sequence Element toolbar in the Equipment Sequence Editor.

Perform these steps to create the Equipment Sequence.

<table>
<thead>
<tr>
<th>Step</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify and create Equipment Phases</td>
<td>Considering the equipment associated with an operational unit of equipment, identify the actions that equipment can perform.</td>
</tr>
<tr>
<td>2. Identify the manufacturing procedure to be automated</td>
<td>Analyze the manufacturing process and break it into a series of manufacturing actions or steps that are performed serially, conditionally, or simultaneously. Identify the conditions when one manufacturing step should stop and the next be started.</td>
</tr>
<tr>
<td>3. Configure the Sequence Diagram</td>
<td>Construct the diagram routine to model the manufacturing process. Each step represents one use of an Equipment Phase to perform an action. Code the conditions for starting and stopping actions as transition expressions.</td>
</tr>
<tr>
<td>4. Configure Sequence Parameters and Step Tags</td>
<td>Analyze the materials and ingredients used by each manufacturing action. The sequence input parameters provide data to the Equipment Sequence program. The data provided is available to the Equipment Phase input parameters via step input tags. Analyze the reporting requirements. Generated actual values should be stored into the Equipment Phase output parameters. The value of the Equipment Phase output parameter is copied to its associated step output tag when requested to do so or automatically when the phase becomes STOPPED, ABORTED, or COMPLETE. Sequence output parameters evaluate their expressions when the sequence becomes STOPPED, ABORTED, or COMPLETE.</td>
</tr>
</tbody>
</table>

An Equipment Sequence diagram is intended to control a specific piece of equipment. All steps within the sequence refer to existing Equipment Phase instances within the same controller.

See also

Equipment Sequence diagrams and Sequential Function Chart routines differences on page 25

Equipment Sequence diagrams and Sequential Function Chart routines differences

Use the following table to guide when to use an Equipment Sequence diagram instead of a Sequential Function Chart routine.

<table>
<thead>
<tr>
<th>Sequential Function Chart routine</th>
<th>Equipment Sequence diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a single routine.</td>
<td>Coordinates the execution of independent programs.</td>
</tr>
<tr>
<td>No concept of state beyond inhibited.</td>
<td>Has an internal state machine to manage sequence execution and display states that are useful to operators.</td>
</tr>
<tr>
<td>A step contains a list of structured text actions to perform.</td>
<td>A step has an internal state machine managing interactions between a sequence and the step’s associated Equipment Phase.</td>
</tr>
</tbody>
</table>
Transitions enable and disable scanning of a step's actions.

Operators specify tag values but do not expect to run the program interactively.

Program runs after download, unless inhibited.

See also

Equipment Sequence Editor on page 24
Equipment Sequence Diagrams

An Equipment Sequence diagram is a graphical representation of a sequence that coordinates the execution of equipment. Each diagram comprises basic sequence elements such as steps, links, and transitions structured in a specific topology. Each Equipment Sequence has one routine that is configured by adding elements and applying branch structures using buttons available from the Equipment Sequence Element toolbar in the Equipment Sequence Editor.

See also

Steps to create Equipment Sequence diagrams on page 25

Create an Equipment Sequence program

Equipment Sequence programs:

- Describes the order in which Equipment Phases run and when they are started and stopped.
- Run as a program containing only one routine—the sequence diagram.
- Use sequence input parameters and sequence output parameters.
- Displays the same states as a phase. The current state is based on active sequence elements.
Add steps, transitions, links, divergent and convergent branches to manually construct Equipment Sequences. Equipment Sequences are created in either simple series, loop, simultaneous, or selective structures.

**To create Equipment Sequence programs:**

1. Define a new Equipment Sequence.
2. Configure Equipment Sequence properties.
4. Create a Sequence Parameter using the New Parameter or Tag dialog box.

| Important: | When the Equipment Sequence scan rate is significantly longer than the Equipment Phase scan rate, sequence events triggered by step state changes may not be generated. It is advisable to avoid phase state changes occurring in less than the sequence scan rate, if having those event records is necessary. |

See also

- Define a new Equipment Sequence on page 28
- Configure Equipment Sequence properties on page 30
- Equipment Sequence Diagrams on page 27
- Create a Sequence Parameter using the New Parameter or Tag dialog box on page 31

**Define a new Equipment Sequence**

In New Equipment Sequence, define the properties of an Equipment Sequence.

**Before you begin:**

- Go offline with the controller.

**To define a new Equipment Sequence:**

1. Go to File > New Component > Equipment Sequence to enter properties for the new Equipment Sequence.
2. In Name, enter a name for the Equipment Sequence.
3. (Optional) In Description, enter a description for the Equipment Sequence.
4. (Optional) To make the Equipment Sequence program a child of an existing program in the logical model, select the Parent program. Otherwise, select None.

5. From Schedule In, choose the task to schedule the Equipment Sequence.

The list contains only tasks in which the Equipment Sequence can be scheduled. If you created the Equipment Sequence by right-clicking a task in the Controller Organizer, that task is selected by default.

6. (Optional) To give the Equipment Sequence a version string for event reporting purposes, select from the menus for Major and Minor, and enter text in Extended Text.

- **Major**: The major revision number of the Equipment Sequence. The default value is 1.
- **Minor**: The minor revision number of the Equipment Sequence. The default value is 0.
- **Extended Text**: Enter additional revision information. For example, entering c in this field, makes the Equipment Sequence version 1.0c. The maximum number of displayable characters is 40. Any characters exceeding the limit are ignored.

7. (Optional) To continue describing the Equipment Sequence revision, use the Revision Note.

For example, list the changes made to the Equipment Sequence since the last revision.

8. (Optional) To inhibit this Equipment Sequence and prevent it from being owned or commanded, select Inhibit Sequence. The check box is cleared by default.

An Equipment Sequence’s icon displays in the Controller Organizer with the inhibited indicator:

9. (Optional) To open the Equipment Sequence Editor upon creation of a sequence, select Open Sequence Diagram. The check box is selected by default.

10. To configure additional Equipment Sequence attributes upon creation of a sequence, select Open properties. The check box is clear by default. Click OK to open Equipment Sequence Properties.
Configure Equipment Sequence properties

Configure Equipment Sequence properties in the Equipment Sequence Properties dialog box, Configuration tab.

Before you begin:

- Go offline with the controller.

All transitions following the selective divergence are active and evaluate their expressions with every scan of the sequence.

To configure Equipment Sequence properties:

1. Open the Equipment Sequence Properties dialog box by right-clicking the Equipment Sequence name in the Controller Organizer or Logical Organizer and selecting Properties.

2. Click the Configuration tab and revise the properties as necessary.

   a. (Optional) Select Retain sequence ID when resetting sequence to retain the sequence ID when resetting the Equipment Sequence. If this option is not selected, a RESET command clears the Sequence ID value of an Equipment Sequence.

   b. (Optional) Select the Generate sequence events option to generate sequencing events recording the manufacturing process. This includes operator commands, changes in sequence attributes, and changes in sequencing parameters and step tag values.

   c. (Optional) If you selected the Generate sequence events option, enter a number for the Unit ID option. The Unit ID is an integer value assigned to represent the equipment unit the sequence is coordinating. This value is recorded with sequence events to identify the equipment coordinated.

   d. (Optional) When starting sequence, there are two options:

      - Use initial value of the tag: Select this option to reinitialize all sequencing parameter and step tag value fields with their configured Initial Value field when a START command is sent to the Equipment Sequence.

See also

Configure Equipment Sequence properties on page 30
• Use current value of the tag: Select this option to retain the value of all sequencing parameter and step tag value fields when a START command is sent to the Equipment Sequence.

e. (Optional) When resetting sequence, there are two options:

• Restore the tag to its initial value: Select this option to reinitialize all sequencing parameter and step tag value fields with their configured Initial Value field when a RESET command is sent to the sequence.

• Maintain current value of the tag: Select this option to retain the value of all sequencing parameter and step tag value fields when a RESET command is sent to the sequence.

See also

Equipment Sequence Diagrams on page 27

Sequence input parameters define the set of parameters that must be provided to an Equipment Sequence program to coordinate manufacturing a product. The sequence output parameters record process variables set during execution.

Before you begin:

• Go offline with the controller.

To create a sequence parameter:

1. In the Equipment Sequence, right-click Parameters and Local Tags.

2. Select New Parameter.

3. In Name, enter the name of the sequence parameter.

4. (optional) In Description, enter a description of the sequence parameter.

5. In Usage, select one of the following:

   • Input Parameter

   • Output Parameter

6. In Data Type, click  to access the Select Data Type dialog box and select one of the sequence parameter data types.
Sequence parameters only allow these system provided data types: `SEQ_DINT`, `SEQ_SINT`, `SEQ_INT`, `SEQ_REAL`, `SEQ_BOOL`, and `SEQ_STRING`.

7. (optional) In **Parameter Connection**, choose a single connection for the sequence parameter.

8. **Scope** shows the new Equipment Sequence where the new parameter is created.

9. In **External Access**, choose whether the sequence parameter will have **Read/Write**, **Read Only**, or no (**None**) access from external applications such as HMIs.

   **Tip:** It is recommended to have input parameters use **Read/Write** access, and output parameters use **Read Only** access. Often, inputs are assigned by an operator and outputs need to maintain the integrity of the value assigned to it by the sequence.

10. Verify the **Sequencing** check box is selected. This is the default.

11. Click **Create** for create options. Select:

   - **Create and Close** to close the dialog box after creating a tag (default).
   - **Create and Open New** to save the tag created and open another empty **New Tag** dialog box.
   - **Create and Keep Open** to save the tag created and keep the dialog box open with the values still showing.

12. To configure or change the following sequence parameter attributes, go to the **Tag Editor**:

   - Sequencing flag
   - Data Type
   - Description
   - External Access
   - Connections

   For each sequence parameter, the **Description** and **Connections** may be configured for **Value**, **Valid**, and **Initial Value**.

13. To configure or change the following sequence parameter attributes, go to the **Sequence Tag Editor**:

   - Value
• Initial Value
• Expression (only available on sequence output parameters)
• Description

Tip: The following boxes in the New Parameter and Tag dialog box are not configurable, because they do not apply to sequence parameters:
• Base Tag
• Alias
• Style
• Constant

See also

Example: Construct an Equipment Sequence diagram

Following is an example of how to create an Equipment Sequence diagram. In this example, the Equipment Sequence adds material, mixes material, and empties the mixer by doing the following:

• Prepares for mixing by adding 25% of Material_A from Tank 1 at 500 gallons per minute.
• Adds and mixes material through three different execution paths, simultaneously:
  • Finishes adding Material_A from Tank 1 at 25 gallons per minute, using a transfer of control.
  • Adds Material_B from Tank 2 or Tank 3, using a selective divergence.
  • Mixes Material_A with Material_B.
• Empties the mixer after all materials are added and the mixing is complete.

In the following example, an Equipment Sequence diagram is constructed to add material quickly from a tank, then simultaneously continues to add material and mix material, then empties the mix.

To construct this example of an Equipment Sequence diagram:

1. Prepare the Equipment Sequence diagram.
2. Prepare for mixing.
3. Configure simultaneous branches to add and mix material.
4. Converge the simultaneously executed paths.
5. Empty the tank after materials are added and mixed.
6. Finish the Equipment Sequence diagram.

See also

Prepare the Equipment Sequence diagram on page 34
Configure simultaneous branches to add and mix material on page 35
Converge the simultaneously executed paths on page 38

Prepare the Equipment Sequence diagram

To prepare the Equipment Sequence diagram:

1. In the Equipment Sequence that was created, delete the link between Tran_000 and the end step.

2. Move the end step above the transition, so you can find it later.

3. Create sequence input parameters to specify how much Material_A and Material_B are to be added in later steps.
4. To prepare for mixing, configure the step and transition to begin adding Material_A.

See also

Configure simultaneous branches to add and mix material on page 35

Converge the simultaneously executed paths on page 38

Use simultaneous and selective branches to add and mix material.

To configure simultaneous branches to add and mix material:

1. On the Equipment Sequence toolbar, click Add Simultaneous divergence with elements branch to add the ingredients and mix the ingredients. This adds two out of the three required steps, so you must add a disconnected step and link it to the simultaneous divergence branch.
This creates three simultaneous paths: one to add Material_A, one to add Material_B, and one to mix the ingredients.

2. For each step, rename the default step name and then select the Equipment Phase.

The Equipment Sequence must choose to add Material_B from either Tank 2 or Tank 3.

3. Add a selective divergence to choose between two paths.
The transition expressions test a tag to determine which path to use and run the correct Equipment Phase. The tank to be used is a sequence input parameter, Add_B_From_Tank. The value 2 means add material from Tank 2 and the value 3 means to add material from Tank 3. The sequence input parameter is created and configured in a later step.

4. Add the selective convergence branch to bring the two separate tank paths back together.

See also

Converge the simultaneously executed paths on page 38
Converge simultaneously executed paths.

To converge the simultaneously executed paths:

1. Add a step underneath the selective convergence so all three paths can be merged back together. The simultaneous convergence branch requires all preceding branches to end in steps.

2. After adding and configuring the additional step, add the simultaneous convergence branch.

3. Now that the three separate paths are merged back together with materials added and mixed, empty the tank and dump the mixture by adding and configuring a disconnected transition and a step and transition pair.
4. To finish the Equipment Sequence diagram, move the end step below the Empty_Mixer_1 step. Then automatically align the sequence elements in the diagram so that the layout is less cluttered and clearly visible.

See also

Example: Construct an Equipment Sequence diagram on page 33
Sequence Execution & Monitoring

Sequence execution is responsible for coordinating:

- The execution of phases in the order specified by the sequence diagram.
- The transition expressions to specify when steps are attached to phases, started, stopped, reset, and attached.
- The step activation to trigger passing Equipment Sequence input data to the Equipment Phase.
- The COMPLETE, STOPPED, or ABORTED triggers passing output data from the Equipment Phase to the Equipment Sequence.
- Generating events to record changes in status and operator interactions.

Equipment Sequence programs are IDLE until they are started. Resetting an Equipment Sequence returns them to an IDLE state. Sequence parameters and step tags can be initialized manually or configured as a sequence property.

Monitoring is performed from the Logix Designer application and the SequenceManager Controls. The Equipment Sequence Monitor is the equivalent of the Sequence Detail Control and the Sequence Parameter Control. The rendering of status is the same. Command interactions are the same with the exception of ownership; the Logix Designer application overrides ownership of the Equipment Sequence and the SequenceManager Controls request ownership.

Open the Equipment Sequence Monitor by opening an Equipment Sequence diagram from the Controller Organizer or Logical Organizer, and going on line with the controller. The Equipment Sequence Monitor is the routine window.

The Equipment Sequence Monitor is the online version of the Equipment Sequence Editor and is used to monitor and interact with Equipment Sequences that have been downloaded to the controller. The control engineer can do the following:

- Command the Equipment Sequence.
- Change the value of parameters and attributes.
- Interact with the executing sequence.
See also

SequenceManager and related components overview on page 19

Equipment Sequence Editor on page 24

Sequence Tag Monitor

Open the Sequence Tag Monitor by opening an Equipment Sequence diagram from the Controller Organizer or Logical Organizer, and going on line with the controller. The Sequence Tag Monitor is the grid in the bottom of the diagram.

Use the Sequence Tag Monitor to view and edit sequence parameters and assign step tag values while the controller is online. All sequence parameters and step tags are listed in a table format.

The attributes that can be edited in the Sequence Tag Monitor are: Value, InitialValue, and Description, based on the tag’s External Access configuration. In the Sequence Tag Monitor, parameter expressions can be enabled, disabled, or forced to evaluate.

See also

Sequence Execution & Monitoring on page 41

Step states in an Equipment Sequence

When a step is not active, the step state is inactive. When a step is active, and attached to an Equipment Phase, the step state mirrors the state of the Equipment Phase. The step state is also represented by the color of the step.

Steps with a Do Nothing phase only have two displayed step states: RUNNING and IDLE.

<table>
<thead>
<tr>
<th>Step States</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABORTING</td>
<td>ABORTING means the Equipment Phase’s ABORTING routine is executing.</td>
</tr>
<tr>
<td>ABORTED</td>
<td>ABORTED means the Equipment Phase’s ABORTING routine is finished.</td>
</tr>
<tr>
<td>HOLDING</td>
<td>HOLDING means the Equipment Phase’s HOLDING routine is executing.</td>
</tr>
<tr>
<td>HELD</td>
<td>HELD means the Equipment Phase’s HOLDING routine is finished.</td>
</tr>
<tr>
<td>RESETTING</td>
<td>RESETTING means the RESETTING logic is executing.</td>
</tr>
<tr>
<td>RESTARTING</td>
<td>RESTARTING means the RESTARTING routine is executing.</td>
</tr>
<tr>
<td>RUNNING</td>
<td>RUNNING means the RUNNING routine is executing.</td>
</tr>
<tr>
<td>STOPPING</td>
<td>STOPPING means the STOPPING routine is executing.</td>
</tr>
<tr>
<td>STOPPED</td>
<td>STOPPED means the STOPPING routine is finished.</td>
</tr>
<tr>
<td>COMPLETE</td>
<td>COMPLETE means the RUNNING routine is finished.</td>
</tr>
<tr>
<td>IDLE</td>
<td>IDLE means the step is active and attached to the associated Equipment Phase, but the Equipment Phase is not executing a routine.</td>
</tr>
<tr>
<td>INACTIVE</td>
<td>INACTIVE means that the step is not active and is not attached to its associated Equipment Phase.</td>
</tr>
</tbody>
</table>
Step execution in an Equipment Sequence

Each step in an Equipment Sequence diagram represents a specific action. Step types include initial steps, Equipment Sequence steps, No phase steps, and end steps.

Each step executes differently.

**Initial step** - The initial step is activated when the Equipment Sequence starts execution and immediately becomes COMPLETE. The initial step may be activated or deactivated with a change active step command.

**Equipment Sequence step execution** - The Equipment Sequence step automatically loads step input tag values into the phase input parameters when the Equipment Sequence attaches to the step, depending on the configuration of the Equipment Phase. The step commands the Equipment Phase to start and shows status changes of the Equipment Phase in the status of the step. The step automatically copies phase output parameter values into step output tags when the Equipment Phase becomes COMPLETE, STOPPED, or ABORTED, depending on the configuration of the Equipment Phase.

**No phase step** - The step immediately becomes COMPLETE when executed.

**End step** - The end step is activated when the preceding transition starts it and immediately becomes COMPLETE. The end step may be activated or deactivated with an active step change command.

See also

- [Step execution in a selective sequence](#) on page 43
- [Step execution in a simultaneous sequence](#) on page 45

Step execution in a selective sequence

In a selective branch, only the step in the path or branch under the first transition to evaluate as TRUE is executed. Other paths or branches are ignored. Sequence execution continues in the selected path until that path’s final transition.

**Step execution in a selective branch**

The following table describes how and when steps in a selective sequence execute - the active step is shaded in gray. This sequence execution example uses a simple step (A-F) sequence with one selective branch.
### Active step | Sequence example | Description
--- | --- | ---
Initial step | | When the sequence is commanded to START, the initial step becomes active.

Step A | | After Transition 0 becomes TRUE, the initial step is STOPPED, RESET, and deactivated. Control is passed to Step A, which is made active and is STARTED. Transition 0 becomes inactive and Transition 1 becomes active.

Step B | | After Transition 1 becomes TRUE, Step A is STOPPED, RESET, and deactivated. Control is passed to Step B, which is made active and is STARTED. Transition 1 becomes inactive and both Transition 2 and Transition 4 become active.

Step C | | If Transition 2 becomes TRUE first, Transition 4 is deactivated. Step B is STOPPED, RESET, and deactivated. Control is passed to Step C, which is made active and is STARTED. Transition 2 becomes inactive, and Transition 3 becomes active.
Step E

After Transition 3 becomes TRUE, Step C is STOPPED, RESET, and deactivated. Control is passed to Step E, which is made active and is STARTED. Transition 6 is made active, and Transition 3 is deactivated.

Step F

After Transition 6 becomes TRUE, Step E is STOPPED, RESET, and deactivated. Control is passed to Step F, which is made active and is STARTED. Transition 7 is made active, and Transition 6 is deactivated.

End step

After Transition 7 becomes TRUE, Step F is STOPPED, RESET, and deactivated. Control is passed to the end step, which is activated. The end step immediately becomes COMPLETE. This indicates that the entire sequence is COMPLETE.

See also

Step execution in a simultaneous sequence on page 45

Step execution in a simultaneous sequence

In a simultaneous branch, the steps immediately following a simultaneous divergence branch start execution together. Step execution continues in all paths until the transition following the simultaneous convergence evaluates as TRUE. To execute across the simultaneous convergence branch, all steps immediately preceding the convergence must be active and the transition (Transition 3 in the example) immediately following the convergence must evaluate as TRUE.
### Step execution in a simultaneous branch

The following table describes how and when steps in a simultaneous sequence execute - the active step is shaded in gray. This sequence execution example uses a simple five step (A-E) sequence with one simultaneous branch.

<table>
<thead>
<tr>
<th>Active step</th>
<th>Sequence example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial step</td>
<td>![Sequence Diagram]</td>
<td>When the sequence is commanded to START, this step becomes active.</td>
</tr>
<tr>
<td>Step A</td>
<td>![Sequence Diagram]</td>
<td>After Transition 0 becomes TRUE, the initial step is STOPPED, RESET, and deactivated. Control is passed to Step A, which is made active and is STARTED. Transition 0 becomes inactive and Transition 1 becomes active.</td>
</tr>
<tr>
<td>Step B &amp; Step C</td>
<td>![Sequence Diagram]</td>
<td>After Transition 1 becomes TRUE, Step A is STOPPED, if it is still RUNNING, RESET and deactivated. Steps B and C become active and are STARTED at the same time. Transition 1 becomes inactive and Transition 2 becomes active.</td>
</tr>
<tr>
<td>Step C &amp; Step D</td>
<td>![Sequence Diagram]</td>
<td>After Transition 2 becomes TRUE, Step B is STOPPED, RESET, and deactivated. Step D is activated and STARTED. Step C remains active. Transition 2 becomes inactive and Transition 3 becomes active, because all the steps immediately preceding the transition are active.</td>
</tr>
</tbody>
</table>
Steps C and D are active, so Transition 3 evaluates its expression. After Transition 3 becomes TRUE, Steps C and D are STOPPED, RESET, and deactivated and Step E is activated and STARTED. Transition 3 becomes inactive and Transition 4 becomes active.

After Transition 4 becomes TRUE, Step E is STOPPED, RESET, and deactivated. The end step is activated and STARTED. The end step immediately becomes COMPLETE. This indicates that the entire sequence is COMPLETE. Transition 4 becomes inactive.

**See also**

*Step execution in a selective sequence* on page 43

**Transition display states**

Transition display states show how the transition execution relates to the overall Equipment Sequence execution.

<table>
<thead>
<tr>
<th>Transition Display State</th>
<th>Transition Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLE</td>
<td>GRAY</td>
<td>The transition is not actively executing.</td>
</tr>
<tr>
<td>ARMED</td>
<td>GREEN</td>
<td>The transition is actively evaluating its expression.</td>
</tr>
<tr>
<td>FIRING</td>
<td>GREEN</td>
<td>The transition expression has evaluated TRUE. The previous steps is STOPPED and the next steps is started.</td>
</tr>
<tr>
<td>STOPPED</td>
<td>BLUE</td>
<td>The transition has completed processing a STOP command and has stopped the transition’s execution.</td>
</tr>
<tr>
<td>ABORTED</td>
<td>PURPLE</td>
<td>A Equipment Sequence transition in the ABORTED state has been disabled by an ABORT command and will not advance an Equipment Sequence chart.</td>
</tr>
<tr>
<td>HELD</td>
<td>YELLOW/BROWN</td>
<td>An Equipment Sequence transition in the HELD state has been halted by a HOLD command or HELD because of an Equipment Sequence failure and will not initiate or advance the Equipment Sequence transition firing process until issued a RESTART command. If the transition has been HELD due to an Equipment Sequence failure, the failure should be cleared before issuing a RESTART command.</td>
</tr>
<tr>
<td>HOLDING</td>
<td>YELLOW/BROWN</td>
<td>An Equipment Sequence transition in the HOLDING state is advancing the Equipment Sequence transition firing process. This transitional state is only visible until the scan processing the HOLD command has finished.</td>
</tr>
</tbody>
</table>

**See also**

*Transition firing states* on page 48
Transition firing states

The firing attribute is a subset of the FIRING state and gives a visual indication of the current state.

This firing attribute is visible when the transition expression has evaluated TRUE. The firing process requires several interactions with different phases and is an asynchronous process. Some phases may have programs that can take a long time to finish running (stopping a motor for example), so the firing object shows what the transition is doing. The displayed Firing Attribute values are: COMMITTED, STOPPING, RESETTING, PENDING, and PAUSED.

<table>
<thead>
<tr>
<th>Firing Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACQUIRING</td>
<td>The Equipment Sequence is acquiring the right to command the Equipment Phase. For every step that follows the transition, the Equipment Sequence must attach to each associated Equipment Phase before the steps can be activated.</td>
</tr>
<tr>
<td>COMMITTED</td>
<td>The transition is committed to firing because the transition expression has evaluated TRUE, but the transition cannot activate the following steps because it is in Manual mode or the Equipment Sequence is in the PAUSED substate.</td>
</tr>
<tr>
<td>STOPPING</td>
<td>As part of firing, the Equipment Sequence commands all the active preceding steps to stop. The transition firing state is STOPPING until all commanded steps are STOPPED.</td>
</tr>
<tr>
<td>RESETTING</td>
<td>As part of firing, the Equipment Sequence commands all the preceding steps that are STOPPED to RESET. The transition firing state is RESETTING until all the commanded steps are IDLE.</td>
</tr>
<tr>
<td>PENDING</td>
<td>The transition is not able to fire because the Equipment Phases of the steps above or below the transition are not in the correct state to permit the transfer of control function.</td>
</tr>
<tr>
<td>PAUSED</td>
<td>The transition is committed to fire, but cannot because the Equipment Sequence has been PAUSED. The transition is waiting for a RESUME command.</td>
</tr>
<tr>
<td>POST SCANNING</td>
<td>The transition is at the end of the firing process. On the next scan of the Equipment Sequence chart, the transition advances the chart.</td>
</tr>
</tbody>
</table>

See also

Transition display states on page 47

Transition execution

When a transition is activated, it evaluates its expression. If the expression is TRUE, it stops all the preceding steps that are active, resets and detaches from all the preceding steps, and attaches to the following steps. Once it attaches to the following steps, it starts those steps.

See also

Step states in an Equipment Sequence on page 42

Transition display states on page 47

Transition firing states on page 48

Quality of Data

Quality of Data is the concept that a sequence parameter or step tag can have a value that is not known to be correct. There are three cases:

- Step output tag has not been updated yet. There are three ways the update can occur.
• When the Equipment Phase has not requested to load a value to the step output tag (PXRQ instruction).
• The Equipment Phase has not run to a COMPLETE, STOPPED, or ABORTED state for a configured automatic update to occur.
• The step output has read/write external access (inherited from the Equipment Phase output parameter) and the operator assigns a value.
• Sequence output parameter has not been updated yet. There are three ways the update can occur.
  • The sequence enters the COMPLETE, STOPPED, or ABORTED state, causing the sequence parameter’s expression to evaluate.
  • The operator commands the parameter expression to evaluate.
  • The output has read/write external access and the operator assigns a value.
• An expression contains a tag with an invalid quality of data.
• Step input tags and sequence output parameters can have a configured expression that may reference a sequence parameter or step tag whose Valid member is FALSE.

If your application needs to discern data integrity, use Quality of Data to test the validity of sequence parameter data.

These system provided data types implement the Quality of Data concept:

• **Valid** – Specifies the validity of the contents of the sequence parameter or step tag’s Value member as a BOOL:  1 = Valid and 0 = Invalid. When the Valid attribute is 1, then the Value member of the parameter or sequence is known to be correct. When it is 0, the Value member is not known to be correct. If the Value is known not to be valid, the invalid symbol ☉ is shown.

• **InitializeAsValid** - When an Equipment Sequence is initialized, the Valid attribute is set to the value of the InitializeAsValid attribute.

The Valid attribute is the quality of data of the sequence input parameter. Because these parameters may not have expressions, the Valid attribute is always TRUE.

See also

[How sequence output parameter and step input tag expressions evaluate](#) on page 50

[How step tags update](#) on page 50
How sequence output parameter and step input tag expressions evaluate

Step tag input expressions evaluate at the beginning of each scan, sequence output parameter expressions evaluate when the sequence enters a terminal (STOPPED, ABORTED, COMPLETE) state. Step tag input expression and sequence output parameter expressions can be commanded to evaluate using the Force Expression Evaluation command.

See also

How step tags update on page 50
How sequence parameters update on page 51

How step tags update

Step input tags

Step input tags update by directly assigning a value using Logix Designer or the Sequence Parameter Control, depending on the configured External Access value. Then a sequence’s tags are initialized by moving the Initial Value attribute value into the Value attribute, by using either the START or RESET command in Logix Designer or the Initialize Parameters command in Logix Designer or the Sequence Parameter Control. The configured parameter expression is evaluated on each scan. The step input tag’s expression must be enabled for evaluation to update the Value attribute.

Step output tags

Step output tags update by directly assigning a value using Logix Designer or the Sequence Parameter Control, depending on the configured External Access value. Then a sequence’s tags are initialized by moving the Initial Value attribute value into the Value attribute, by using either the START or RESET command in Logix Designer or the Initialize Parameters command in Logix Designer or the Sequence Parameter Control. Then the associated Equipment Phase output parameter value is loaded when one of the following occurs:

- The phase is configured to update the state to change to a terminal state (COMPLETE, STOPPED, or ABORTED)
- The scanning Equipment Phase routine executes a Equipment Phase External Request (PXRQ) instruction requesting the output parameter value be copied to the step output tag.

See also

How sequence parameters update on page 51
Sequence Parameters Control on page 81
How sequence parameters update

Sequence input parameters

Sequence input parameters update by executing a configured Connection, performed by the firmware every scan. Then by directly assigning a value using Logix Designer or the Sequence Parameter Control, depending on the configured External Access value. Then a sequence’s tags are initialized by moving the Initial Value attribute value into the Value attribute, by using either the START or RESET command in Logix Designer or the Initialize Parameters command in Logix Designer or the Sequence Parameter Control.

Sequence Output Parameters update:

Sequence output parameters update by directly assigning a value using Logix Designer or the Sequence Parameter Control, depending on the configured External Access value. Then a sequence’s tags are initialized by moving the Initial Value attribute value into the Value attribute, by using either the START or RESET command in Logix Designer or the Initialize Parameters command in Logix Designer or the Sequence Parameter Control. The associated Equipment Phase output parameter value is loaded when the phase is configured to update to the state to change to a terminal state (COMPLETE, STOPPED, or ABORTED). The sequence output parameter’s expression must be enabled to update the Value attribute after evaluation.

See also

How step tags update on page 50
Sequence Parameters Control on page 81

Pause, auto pause, and resume commands

Use the Pause and Auto Pause buttons to test and troubleshoot Equipment Sequence or Equipment Sequence step execution.

The Pause and Auto Pause button commands:

- The Equipment Sequence to pause execution of the sequence when active transition expressions evaluate TRUE.
- The Equipment Sequence step and its associated phase to enable pausing when a PPD instruction is executed.

When the Pause and Auto Pause buttons are toggled on, the button background is a light blue with a dark blue outline.

The Resume button commands:

- The Equipment Sequence to resume execution of the sequence.
- The Equipment Sequence step and its associated phase to resume execution.
Ownership

Ownership is having the right to command an Equipment Sequence or an Equipment Phase.

Both Equipment Sequences and Equipment Phases must be owned to be commanded. The ownership commands are Attach (SATT) and Detach (SDET).

Internal sequencers (programs), external sequencers (FactoryTalk Batch), and operators always use an Attach instruction to command an Equipment Sequence. Logix Designer always uses an Override (SOVR) instruction to command an Equipment Sequence. A program might successfully attach an Equipment Sequence but be unable to command it because Logix Designer has overridden ownership.

The ownership override commands are:

- **Attach**: Operators, internal sequencers, and external sequencers attach to an Equipment Sequence or Equipment Phase to control it.
- **Override**: A Logix Designer application always takes ownership of an Equipment Sequence or Equipment Phase by overriding an existing Attach.
- **Detach**: Operators, internal sequencers, external sequencers, and Logix Designer Detach to release the right to control the Equipment Sequence or Equipment Phase.

If the Equipment Sequence is attached by another sequencer, an external sequencer, or an operator, an Override takes precedence without waiting for other owners to release the Equipment Sequence. Any existing attachment remains and resumes control once the Override is gone.

If the Equipment Phase is attached by an Equipment Sequence, an Override interrupts the Equipment Sequence’s ability to coordinate the Equipment Phase. This is a sequencing failure condition and the Equipment Sequence is HELD.

Only one attachment is allowed on an Equipment Phase or Equipment Sequence. If the Equipment Phase or Equipment Sequence is not already attached to, attaching will grant the attaching sequencer ownership (and commanding privilege). If the Equipment Phase or Equipment Sequence is already attached to, then other potential owners trying to attach to the same Equipment Phase or Equipment Sequence fail.
Ownership types

Ownership types are the ways a sequence or phase may be owned—enabling the owner to command them. Each ownership type is stored independently on the phase or sequence so one type of ownership does not remove another.

<table>
<thead>
<tr>
<th>Relative Priority</th>
<th>Ownership Type</th>
<th># Allowed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Logix Designer Override</td>
<td>Up to 15</td>
<td>Logix Designer application always takes ownership by overriding all other potential users. Up to 15 different Logix Designer applications may attach to a single Equipment Phase or Equipment Sequence at one time.</td>
</tr>
<tr>
<td>Second</td>
<td>Attach</td>
<td>1</td>
<td>A request to attach fails if the Equipment Sequence or Equipment Phase is already attached.</td>
</tr>
</tbody>
</table>

Ownership user types

There are four user types: Logix Designer, External Sequencer, Internal Sequencer, and Operator. The attachment type accompanies an attach request to take ownership.

<table>
<thead>
<tr>
<th>Types of users</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logix Designer</td>
<td>A control engineer using Logix Designer overrides ownership of the Equipment Phase or Equipment Sequence.</td>
<td>Equipment Phase Monitor within Logix Designer Sequence Editor within Logix Designer</td>
</tr>
<tr>
<td>Internal Sequencer</td>
<td>A program running within a ControlLogix controller.</td>
<td>Programs, Equipment Sequences, Equipment Phases</td>
</tr>
<tr>
<td>Operator</td>
<td>An operator logged into a FactoryTalk View Site Edition display interacting with Equipment Sequence through the SequenceManager Controls. When an attachment of Operator type exists, all operator displays may command the Equipment Sequence.</td>
<td>Sequence Detail, Sequence Summary</td>
</tr>
<tr>
<td>External Sequencer</td>
<td>An application outside ControlLogix that interacts with sequenced objects.</td>
<td>FactoryTalk Batch Server</td>
</tr>
</tbody>
</table>

See also

The SequenceManager Controls on page 69
Use the change mode to toggle an Equipment Sequence between **Automatic** and **Manual** mode.

### Mode effect on sequence commands

The following table shows the mode effect on sequence commands.

<table>
<thead>
<tr>
<th>Command</th>
<th>Automatic Mode</th>
<th>Manual Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start, Hold, Stop, Abort, Restart, Reset</td>
<td>Allowed</td>
<td>Ignored</td>
</tr>
<tr>
<td>Pause, Auto Pause, Resume</td>
<td>Allowed</td>
<td>Ignored</td>
</tr>
<tr>
<td>Clear Failures on a sequence</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>Force Transition Expression to Evaluate TRUE</td>
<td>Allowed</td>
<td>Ignored</td>
</tr>
<tr>
<td>Change Active Step</td>
<td>Ignored</td>
<td>Allowed</td>
</tr>
</tbody>
</table>

### Mode effects on step commands

Commanding a step is the same as commanding the Equipment Phase, except it is done through the sequence. The following table shows the mode effect on step commands.

<table>
<thead>
<tr>
<th>Command</th>
<th>Automatic Mode</th>
<th>Manual Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start, Hold, Stop, Abort, Restart, Reset</td>
<td>Ignored</td>
<td>Allowed</td>
</tr>
<tr>
<td>Pause, Auto Pause, Resume</td>
<td>Ignored</td>
<td>Allowed</td>
</tr>
<tr>
<td>Clear Failures on a sequence</td>
<td>Ignored</td>
<td>Allowed</td>
</tr>
<tr>
<td>Force Transition Expression to Evaluate TRUE</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
</tbody>
</table>

### See also

**Equipment Sequence failures** on page 54

Failures originate from two sources, Equipment Phases and Equipment Sequences. An Equipment Phase generates a failure by executing a Phase Failure (PFL) instruction, maintained by the Failure attribute. The Equipment Sequence generates a failure by detecting a problem that impairs its ability to coordinate active sequence elements, maintained by the Internal Failure attribute.

A failure propagates up the hierarchy of sequence elements from the point it originated; Equipment Phases notify steps and steps notify the Equipment Sequence. Failure status is maintained at each of these layers:

- The Equipment Phase backing tag has a Failure member.
- The step backing tag has a Failure member and an Internal Failure member.
- The Equipment Sequence backing tag has a Failure member and an Internal Failure member.
A failure is considered a serious problem that warrants holding the execution of the sequence, all active elements, and any phases to which they are attached until the cause of the failure is corrected. This can occur in either Automatic or Manual mode.

**Phase-generated failures**

Phase-generated failures are the result of the phase logic executing a PFL instruction. The instruction includes a failure code created and managed by the user. The failure is stored on the Failure member of the phase’s backing tag. The failure is detected by the step, setting the Failure member on the step’s backing tag. Finally, the failure on the step is detected by the sequence, setting the Failure member on the sequence.

**Sequence-generated failures**

Sequence-generated failures are detected by the sequencing engine as it executes. The failure is detected by the step and is stored on the Internal Failure member of the step’s backing tag. That failure is detected by the step, setting the Internal Failure member on its backing tag.

**Clear failures**

The Clear Failures command resets the failure and internal failure members of the sequence and step backing tags. If a phase failure is being cleared, the Clear Failures command is forwarded to the phase. Sequences, like phases, cannot be restarted until all their failures are cleared. Note that if the cause of the failure has not been resolved, the next scan of the Equipment Sequence engine will likely regenerate the failure.

You need to do the following sequence of actions in order to recover from an Equipment Sequence failure:

- Correct the cause of the failure.
- Clear the failure status from the sequence, step, and phase involved in the failure.
- Restart the sequence.

**See also**

[Change modes effect on sequence and step commands](#) on page 54
SequenceManager event handling applications

The event handling components are split between the controller and a supporting PC. The sequence program, running in the firmware of the controller, generates events. An external workstation hosts the SequenceManager Event Client Service, which subscribes to SequenceManager events and writes them to a raw event data file. The SequenceManager Event Archiving Service converts the raw events data into readable form, writes the data to an .EVT file, and populates tables in a database for PlantPAx reporting.

SequenceManager Event Console

- Start, stop, pause, and resume the SequenceManager Event Client Service and the SequenceManager Event Archiving Service.
- Display the status of the SequenceManager Event Client Service and the SequenceManager Event Archiving Service.
- Configure the SequenceManager Event Client Service settings and SequenceManager Event Archiving Service settings.

SequenceManager Event Client

The SequenceManager Event Client receives events from multiple controllers. Each event received is written directly to a raw event file.

SequenceManager Event Archiving Service

SequenceManager Event Archiving Service is responsible for reading events from the raw event file. Each event is translated and localized into readable strings, then the data is stored into sequence specific event files (.EVT files). Another option is for data to be stored into the BatchHistoryEx data table in the SQL Server for PlantPAx event data handling.

See also

SequenceManager and related components overview on page 19

SequenceManager events

SequenceManager events record status changes, processing actions, and user interactions as the Equipment Sequence executes. These events have importance at runtime because they indicate the current status of various aspects of a
manufacturing process and have historical importance because the data is a record of exactly what transpired.

The three event types recorded by the SequenceManager are:

- **Sequence Command Events** record commands to change state, change pause state, change sequence mode, change ownership, clear failures, change active step, override transition expression, and enable and disable sequence tag expressions.

- **Process Data Update Events** record the value of system values updating, including the state, pause, mode, ownership, and failure.

- **Parameter Update Events** record changes in value or status of sequence parameters and step tags, including operator updates to parameters and step tag values, operators changing the status of sequence parameter or step tag expressions, phase updates to step tag values, and phase requests for step tag data.

Keep the following considerations in mind when using SequenceManager events:

- **Equipment Phases and Equipment Sequences** should be run in a periodic task.

- **Equipment Sequence programs** can be in the same periodic task as the Equipment Phase programs, or in separate tasks.

- **Generating events** affects the performance of an Equipment Sequence. Only generate events when records for executing the sequence are required.

- **Avoid generating more than 60 events and alarms combined per second.**

- **Configure sets of sequence parameters and step tags to not exceed the memory capacity of the controller.**

- **Equipment Phases can execute faster than an Equipment Sequence can record events.**

  An Equipment Sequence coordinates Equipment Phases that run in fractions of a second. But, the firmware event generation systems cannot keep up. When it is important to reliably record events, it is best that the phase takes at least 10 seconds to run to completion.

- **When steps are started and completed, use automatic storing of input and output data.** A phase executing PXRQ instructions to read input or write outputs from or to an Equipment Sequence faster than every 10 seconds may lose events.

The benchmark of a fast Equipment Sequence program is tested as:
• 18 Steps with three parallel paths of simultaneous execution
• 225 Parameters
• Generating 334 events
• For a sequence running 60 seconds
• For an ES completing in approximately 60 seconds

With this phase and sequence configuration, events are not lost when burst of alarms are processed.

The benchmark is primarily for testing how fast Equipment Sequence can run without losing events. The execution speed of a sequence depends upon the execution speed of the Equipment Phases. Phases that complete their execution in less than 10 seconds may lose events depending upon the number of alarms being generated.

• Equipment Phases can be configured to get Input Parameters when they start and to store Output Parameters when they complete. This is the most efficient way to move data between an Equipment Sequence> and an Equipment Phase.

**Important:** When **Generate Events** is enabled, the Logix Designer application checks that there is enough memory to generate the Sequence Parameter and Step Tag value events. The checks occur when the sequence program is verified, when a sequence program is imported and exported as a component, and when the controller is online and the sequence program’s **Generate Events** attribute is enabled.

If the amount of memory required is not available, the sequence does not verify, generates an import error, and the import is not allowed or the **Generate Events** attribute is not enabled, respectively.

---

**SequenceManager Event Services Console overview**

Use the **SequenceManager Event Services Console** dialog box to start, stop, pause, resume, configure, and view the status of the **SequenceManager Event Client Service** and the **SequenceManager Event Archiving Service**.

Once the services are started, they run until they are stopped. The cost in CPU time for running the services is minimal because they are event-driven: the **SequenceManager Event Client Service** is driven only by Equipment Sequence events, and the **SequenceManager Event Archiving Service** is driven only by end-of-sequence events.

**See also**

- SequenceManager Event Handling applications on page 22
SequenceManager Event Services Console commands

Use the following options on the SequenceManager Event Services Console dialog box to control the event services.

### SequenceManager Event Client Service

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>Starts the SequenceManager Event Client Service.</td>
</tr>
<tr>
<td>Stop</td>
<td>Stops the SequenceManager Event Client Service.</td>
</tr>
<tr>
<td>Pause</td>
<td>Causes the SequenceManager Event Client Service to change from the Running to the Paused state. The SequenceManager Event Client Service does not process raw event files when it receives an event notification from the SequenceManager Event Archiving Service.</td>
</tr>
<tr>
<td>Resume</td>
<td>Causes the SequenceManager Event Client Service to change from the Paused to the Running state. When the SequenceManager Event Client Service is resumed, it causes the SequenceManager Event Archiving Service to notify the SequenceManager Event Client Service that there are event records to be processed.</td>
</tr>
<tr>
<td>Settings</td>
<td>Opens the Service Settings dialog box where you configure the service settings.</td>
</tr>
<tr>
<td>Process Orphaned Sequences</td>
<td>Opens the Process Orphaned Sequences dialog box to allow the specification of a last modification time of the raw event files. Any raw event files not modified since the last modification time are identified as orphaned incomplete raw event files, so the event client can close these raw event files and pass them to the SequenceManager Event Archiving Service.</td>
</tr>
</tbody>
</table>

### Service Status

Identifies the status of the service. The following statuses can appear for each service:

- **The service is not installed** — The SequenceManager Event Console is installed but it cannot find an installation of the SequenceManager Event Client Service or the SequenceManager Event Archiving Service.
- **The service is running** — The service has been started and is running.
- **The service is starting** — The service has been commanded to start and is beginning to run.
- **The service is stopping** — The service has been commanded to stop and is in the process of stopping.
- **The service is not running** — The service is installed but has not been commanded to start.
- **The service is stopped** — The service is stopped.
- **The service is paused** — The service is paused.
- **The service pause is pending** — The service is in the process of pausing.
- **The service continue is pending** — The service resuming execution is pending.

### Path to Executable

The path where the service executable file is installed. The SequenceManager Event Client Service executable file is *SeqEventClientService.exe*.
SequenceManager Event Archiving Service

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>Starts the SequenceManager Event Archiving Service.</td>
</tr>
<tr>
<td>Stop</td>
<td>Stops the SequenceManager Event Archiving Service.</td>
</tr>
<tr>
<td>Pause</td>
<td>Causes the SequenceManager Event Archiving Service to change from the Running to the Paused state. The SequenceManager Archiving Service does not process raw event files when it receives an event notification from the SequenceManager Event Client Service.</td>
</tr>
<tr>
<td>Resume</td>
<td>Causes the SequenceManager Event Archiving Service to change from the Paused to the Running state. When the SequenceManager Event Archiving Service is resumed, it causes the SequenceManager Client Service to notify the SequenceManager Archiving Service that there are event records to be processed.</td>
</tr>
<tr>
<td>Settings</td>
<td>Opens the Service Settings dialog box where you configure the service settings.</td>
</tr>
</tbody>
</table>
| Service Status | Identifies the status of the service. The following statuses can appear for each service:
  - The service is not installed — The SequenceManager Event Console is installed but it cannot find an installation of the SequenceManager Event Client Service or the SequenceManager Event Archiving Service.
  - The service is running — The service has been started and is running.
  - The service is starting — The service has been commanded to start and is beginning to run.
  - The service is stopping — The service has been commanded to stop and is in the process of stopping.
  - The service is not running — The service is installed but has not been commanded to start.
  - The service is stopped — The service is stopped.
  - The service is paused — The service is paused.
  - The service pause is pending — The service is in the process of pausing.
  - The service continue is pending — The service resuming execution is pending. |
| Path to Executable | The path where the service executable file is installed. The SequenceManager Event Archiving Service executable file is SeqEventArchivingService.exe. |

See also

- SequenceManager Event Services Console overview on page 59
- Configure settings for the SequenceManager Event Client Service on page 66
- Configure settings for the SequenceManager Event Archiving Service on page 62

Configure Microsoft SQL Server for Reporting Services for SequenceManager Events

Reporting within SequenceManager Events requires the setup of Reporting Services.

To configure the Microsoft SQL Server for Reporting Services for SequenceManager Events:

1. From the Windows Start menu, select All Programs > Microsoft SQL Server 2012 (or 2008 R2) > Configuration Tools > Reporting Services Configuration Manager.
2. At the prompt, select Connect. The Reporting Services Configuration Manager opens.

3. Select Report Manager URL.

4. Select the URLs link to open the Home - Report Manager page in a web browser. If the link is not active, select Apply to activate the link.

If this is the first time the Report Manager page is accessed, warning messages may appear. To continue, select Close for any warning.


7. On the New Role Assignment page:
   a. In the Group or user name box, enter the domain\user name that was used when installing SQL Server.
   b. Select the Role check box to select all of the roles.
   c. Select OK.

The new role is added to the list on the SQL Server Security page.

See also

Configure settings for the SequenceManager Event Archiving Service on page 62

Configure settings for the SequenceManager Event Archiving Service

When using the SequenceManager Event Services Console to start the event handling services, configure the settings for the SequenceManager Event Archiving service.

Before you begin:

- Configure Microsoft SQL Server for Reporting Services for SequenceManager Events.

To configure settings for the SequenceManager Event Archiving service:

1. Access the Product Compatibility and Download Center (PCDC) to download the SequenceManager Event Install.exe.

2. Select the SequenceManager Event Install.exe file to install the SequenceManager Event Services Console.
If reports will be run, prior to installing the SequenceManagerEvent Components, install and configure SQL Server Reporting services.

3. From the **Start** menu navigate to **Rockwell Software > SequenceManager > Sequence Event Manager Components > Event Services Console**, right-click and select to **Run as Administrator**.

**Important:** If **Run as administrator** is not used, the settings will not be enabled and will not be available to be configure.

4. In the **SequenceManager Event Services Console** dialog box, In the **SequenceManager Event Archiving Service** area, if the **Service Status** is: **The Service is running**, in the **Process Event Client Service notifications** area, select **Stop**. The service must be stopped before you can configure the settings.

5. Under **SequenceManager Event Archiving Service**, select **Settings** to open the **SequenceManager Event Archiving Service Settings** dialog box.

6. For **Output Event Directory**, select **Browse** to navigate to the directory where the archiving service can write the translated .EVT event data files. If the directory is not valid, an error icon appears.

7. For **Log File Directory**, click **Browse** to choose the directory where the archiving service writes log information about its execution. This log can be used to track service operation. If the directory is invalid, an error icon appears.

8. For **Log Level**, select the check boxes for the types of event messages that the archiving service should log.

9. For **Maximum Log File Size (Lines)**, enter the number of lines, starting at 1000 and up to 50000, that the log file can contain before a new log file is started.

10. For **Maximum Number of Logs (Files)**, enter the maximum number of log files to keep. The oldest log file is deleted when client service reaches the limit. The minimum value is 1, the maximum value is 1000, and the default value is 100.

11. (Optional) Select **Save Events in Database** to configure the archiving service to write the translated events into an .EVT file and into the BatchHistoryEX database. When you select the check box, the settings under **Save Events in Database** become active.

   - (Optional) **Delete Output Event Files after Archiving** – Configures the archiving service to delete the output event files after they are
archived to a database. The number of output event files grows as sequences execute and, if they are not deleted, they can consume a large amount of disk space.

- **Archived Output Event Directory** – Select Browse to choose the directory for archived Batch event files. When the Delete Output Event Files after Archiving option is not selected, archived event files are moved into this directory.

- **Archiver Ini File** – Select Browse to choose the directory that contains the .ini file that describes how the archiving service should run. The .ini file is used by the SequenceManager Event Archiving Service to keep track of the number of records that have been successfully processed and saved into the database. This number is needed for error recovery.

- **Database Connection String** – This connection string is used by the archiving service to connect and log into the BatchHistoryEX database. The Database Connection String can be created by selecting Browse to open the Microsoft Data Source dialog box. From the Microsoft Data Source dialog box:
  - Create a new Machine Data Source.
  - Select the SQL Server driver.
  - Connect to the SQL database instance.
  - Change the default database to BatchHistoryEx.

The installation package needs to configure the database connection, create the database to store the events, and create the stored procedures needed to process the events. Select Browse to open the Select Data Source dialog box. Select an existing data source or create a new data source. After you specify the data source, the database connection string is automatically generated for the connection.

- **Table Name** – Enter a name for the table where the archiving service writes the sequence events in the BatchHistoryEX database. The default table name is BHBatchHis.

- **Maximum Records per Transaction** – Enter the number of event records, starting at 1 and up to 10000, that are written in a single archive transaction.

See also

- [SequenceManager Event Archiving Service settings](#) on page 65
- [SequenceManager Event Services Console overview](#) on page 59
Configure settings for the Sequence Manager Event Archiving Service settings

Use the following settings in the Sequence Manager Event Archiving Service Settings dialog box to configure the archiving service.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Event Directory</td>
<td>The directory where the archiving service can write the translated .EVT event data files. If the directory is not valid, an error icon appears.</td>
</tr>
<tr>
<td>Log File Directory</td>
<td>The directory where the service logs execution information that technical support can use during troubleshooting, if necessary. If the directory is invalid, an error icon appears.</td>
</tr>
<tr>
<td>Log Level</td>
<td>The types of event messages that the archiving service should log. Event types include Error, Warning, Information, and Debug.</td>
</tr>
<tr>
<td>Maximum Log File Size (Lines)</td>
<td>The maximum number of lines that each log file can contain. When the log file hits this limit, the archiving service starts a new log file. The minimum value is 1000, the maximum value is 50000, and the default value is 10000.</td>
</tr>
<tr>
<td>Maximum Number of Logs (Files)</td>
<td>The maximum number of log files to keep before the service begins deleting log files as new files are created. Enter a value starting at 1 and up to 1000. The default value is 100.</td>
</tr>
<tr>
<td>Save Events in Database</td>
<td>Configures the archiving service to write the translated events into an .EVT file and into the BatchHistoryEX database. If selected, the settings under Save Events in Database become active.</td>
</tr>
<tr>
<td>Delete Output Event Files after Archiving</td>
<td>Configures the archiving service to delete the output event files after they are archived to a database.</td>
</tr>
<tr>
<td>Archived Output Event Directory</td>
<td>The directory that contains the archived Batch event files.</td>
</tr>
<tr>
<td>Archiver .ini File</td>
<td>The .ini file is used by the Sequence Manager Event Archiving Service to keep track of the number of records that have been successfully processed and saved into the database. This number is needed for error recovery.</td>
</tr>
<tr>
<td>Database Connection String</td>
<td>This connection string is used by the archiving service to connect and log into the BatchHistoryEX database. The installation package needs to configure the database connection, create the database to store the events, and create the stored procedures needed to process the events.</td>
</tr>
<tr>
<td>Table Name</td>
<td>A name for the table where the archiving service writes the sequence events in the PlantPAx Historian database. The default table name is BHBatchHis.</td>
</tr>
<tr>
<td>Maximum Records per Transaction</td>
<td>The number of event records, from 1 to 10000, that are written in a single archive transaction.</td>
</tr>
</tbody>
</table>

See also

- Configure settings for the Sequence Manager Event Archiving Service on page 62
- Sequence Manager Event Services Console overview on page 59
- Configure settings for the Sequence Manager Event Client Service on page 66
Configure settings for the SequenceManager Event Client Service

Configure the settings for the SequenceManager Event Client Service before starting the event handing services.

To configure settings for the SequenceManager Event Client Service:

1. Access the [Product Compatibility and Download Center (PCDC)](https://www.rockwellautomation.com/support/downloads.html) to download the [SequenceManager Event Install.exe](https://www.rockwellautomation.com/support/downloads.html).

2. Select the [SequenceManager Event Install.exe](https://www.rockwellautomation.com/support/downloads.html) file to install the SequenceManager Event Services Console.

3. From the Start menu navigate to Rockwell Software > SequenceManager > Sequence Event Manager Components > Event Services Console, right-click and select to Run as Administrator.

   **Important:** If Run as administrator is not used, the settings will not be enabled and will not be available to be configure.

4. In the SequenceManager Event Services Console dialog box, In the SequenceManager Event Archiving Service area, if the Service Status is: The Service is running, in the Process Event Client Service notifications area, select Stop. The service must be stopped before you can configure the settings.

5. In the SequenceManager Event Client Service area, select Settings to open the SequenceManager Event Client Service Settings dialog box.

6. For Sequence Raw Event Directory, select Browse to choose the directory to which the service will write raw event data files. If the directory is not valid, an error icon appears.

7. For Log File Directory, select Browse to choose the directory to which the service will write log files. If the directory is not valid, an error icon appears.

8. For Log Level, select the check boxes for the types of event messages that the client service should log.

9. For Maximum Log File Size (Lines), enter the number of lines, starting at 1000 and up to 50000, that the log file can contain before a new log file is started.

10. For Maximum Log File Size (Files), enter the number of files to be kept, starting at 1 and up to 1000. When this number of files is reached, the oldest log file is deleted.

11. (optional) In the Controller Connection Configuration area, select Add to open the Browse for Controller dialog box.
a. Select a controller on the network tree and select **OK**. Repeat this step for each controller that the client service connects to. The maximum number of controllers that can be configured is one, three, or ten controllers.

The controllers are added to the controllers list in the **Controller Connection Configuration** area.

12. Check the controller connection status. The status can be:

- **Good** - The controller is connected and in a good state for subscribing and receiving events.
- **Bad** - The controller is connected, but not in a state for subscribing and receiving events. For instance, the controller is in Program mode, a project is being downloaded, or there is a major fault.
- **Lost** - The connection failed. The cause of the lost connection must be determined and resolved.
- **Unknown** - The connection status cannot be determined. This status is shown only at design time and it can take up to 30 seconds to determine a connection status.

If the controller connection fails, attempt to reestablish connection by adjusting the values in the **Timeout (Milliseconds)** and **Number of Retries** boxes.

- **Timeout** - The time limit that data does not pass between the controller and the Event Client Service before marking the connection as Lost. Increase this value to attempt to reestablish connection.
- **Number of Retries** - The number of times the Timeout value can expire before the connection is determined to be lost and the status changes to Lost. Increase this value to attempt to reestablish connection.

13. (optional) To delete a controller, select one or more controllers in the list and select **Delete**.

14. (optional) To test the connection on a controller, select one or more controllers in the list and select **Test**.

**See also**

- [SequenceManager Event Client Service settings](#) on page 68
- [SequenceManager Event Services Console Overview](#) on page
### SequenceManager Event Client Service settings

Use the following settings in the **SequenceManager Event Client Service Settings** dialog box to configure the client service.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence Raw Event Directory</td>
<td>The directory to which the service writes raw event data files, which have a .raw extension. If the directory is not valid, an error icon appears. The SequenceManager Event Archiving Service converts the raw events data into readable form, writes the data to an .EVT file, and populates tables in a database for PlantPAx reporting.</td>
</tr>
<tr>
<td>Log File Directory</td>
<td>The directory where the service logs execution information that technical support can use during troubleshooting, if necessary. If the directory is invalid, an error icon appears.</td>
</tr>
<tr>
<td>Log Level</td>
<td>The types of event messages that the client service should log. Event types include Error, Warning, Information, and Debug.</td>
</tr>
<tr>
<td>Maximum Log File Size (Lines)</td>
<td>The maximum number of lines that each log file can contain. When the log file hits this limit, the client service starts a new log file. The minimum value is 1000, the maximum value is 50000, and the default value is 10000.</td>
</tr>
<tr>
<td>Maximum Number of Logs (Files)</td>
<td>The maximum number of log files to keep before the service begins deleting log files as new files are created. Enter a value starting at 1 and up to 1000. The default value is 100.</td>
</tr>
<tr>
<td>Controllers</td>
<td>Client service subscribes to controllers. The number of controllers the client service can subscribe to is dependent on the license. The license can be for either one controller, three controllers, or 10 controllers. The client service receives events from the controllers and caches them in raw event data files.</td>
</tr>
<tr>
<td>Timeout (Milliseconds)</td>
<td>The time that the service attempts to contact a controller before marking the connection as Lost. The suggested timeout value is 8000 to 16000 milliseconds. The minimum value is 500, and the maximum value is 30000.</td>
</tr>
<tr>
<td>Number of Retries</td>
<td>The number of attempts the service makes to contact a controller before marking the connection as Lost. The suggested value is 4, which is also the minimum value. The maximum value is 512.</td>
</tr>
<tr>
<td>Add</td>
<td>Add controllers that the client service subscribes to, depending on the license: one controller, three controllers, or 10 controllers.</td>
</tr>
<tr>
<td>Delete</td>
<td>Delete currently selected controllers. A minimum of 1 controller must be selected or this button is not an available option.</td>
</tr>
<tr>
<td>Test</td>
<td>Test the connection between the SequenceManager Event Client Service and the selected controllers. At least one controller must be selected.</td>
</tr>
</tbody>
</table>

**See also**

- [SequenceManager Event Services Console overview](#) on page 59
- [Configure settings for the SequenceManager Event Client Service](#) on page 66
- [Configure settings for the SequenceManager Event Archiving Service](#) on page 62
Chapter 7

The SequenceManager Controls

The SequenceManager sequences a series of Equipment Phases to the Control Logix platform. The operator views and interacts with the Equipment Sequences downloaded to a Logix controller through three types of controls:

- Sequence Detail Control
- Sequence Summary Control
- Sequence Parameters Control

Sequence Detail Control

The Sequence Detail Control provides the operator with a detailed view of an Equipment Sequence, including its chart structure, steps, and transitions. The runtime status of the sequence program and its sequence elements are also shown. The operator can command the Equipment Sequence from this control.

Sequence Summary Control

The Sequence Summary Control displays the sequence program status for each of the Equipment Sequences downloaded to the controller. The Sequence Summary Control also allows the operator to view and command a selected Equipment Sequence.

Sequence Parameters Control

The Sequence Parameters Control displays a table of all sequence parameters and step tags of a specified Equipment Sequence, and allows the operator to command a selected sequence parameter or step tag. To refine the display, configure the table to filter the information displayed.

See also

- Sequence Detail Control on page 73
- Sequence Summary Control on page 71
- Sequence Parameters Control on page 81
Sequence Summary Control

Use the Sequence Summary Control to see status information for the Equipment Sequences downloaded to a controller. Select a sequence in the list and command it.

See also

Sequence Summary command controls on page 71

Configure the Sequence Control to communicate with a controller on page 71

Configure the Sequence Summary Control

To configure the Sequence Summary Control to communicate with a controller or to use VBA, customize several settings in the control Property Panel. There is also the option to customize display options.

Before you begin:

- Open the FactoryTalk View Site Edition (SE) application.
- Open a display. If the display already has the Sequence Summary Control added, configure or reconfigure the Sequence Summary Control. If the display does not have the Sequence Summary Control added, add the Sequence Summary Control to the display and then configure it.

Sequence Summary command controls

Use the following commands to control an Equipment Sequence using the Sequence Summary Control. The availability of some commands depends on the selected Equipment Sequence owner, state, mode, and failure status. Click More to display all the commands on the toolbar.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![icon]</td>
<td>Take Ownership</td>
<td>Take ownership of the Equipment Sequence. Taking ownership means that this application now has the right to command this Equipment Sequence; other internal sequencers, external sequencers, and operators are not allowed to command this sequence. The Logix Designer application can override ownership.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Release Ownership</td>
<td>Release ownership of the Equipment Sequence. Releasing ownership makes the sequence available to internal sequencers, external sequencers, and operators for attachment.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Set ID</td>
<td>Opens the Set Sequence ID dialog box where you can assign an identifier to the Equipment Sequence. This command is enabled only when an Equipment Sequence is idle.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Start</td>
<td>Start execution of the Equipment Sequence.</td>
</tr>
</tbody>
</table>
### Hold
Hold all attached phases for the Equipment Sequence and stop evaluating transitions until the Equipment Phase runs its HOLDING routine.

### Restart
Continue execution of the Equipment Sequence from the HELD state.

### Stop
Stop all attached phases and active transitions for the Equipment Sequence. Any attached Equipment Phases run their STOPPING routines.

### Abort
Abort all attached phases and active transitions for the Equipment Sequence. Any attached Equipment Phases run their ABORTING routines.

### Reset
Reset any remaining active phases for the Equipment Sequence.

### Clear Failures
Clear the failure flags on the Equipment Sequence.

### Pause
Pause execution of the Equipment Sequence. When the active transition evaluates TRUE, it does not transition to the FIRING state until you click Resume. The Resume command resets the Pause flag so the sequence will continue execution uninterrupted.

### Auto-Pause
Automatically pause the Equipment Sequence as transitions evaluate TRUE. The Resume command resets the Pause flag. The Auto-Pause flag immediately causes the Pause flag to be turned on again, so the sequence pauses when the next transition expression evaluates TRUE.

### Resume
Continue execution of the Equipment Sequence.

### Automatic
Put the Equipment Sequence in Automatic mode, which allows the sequencing engine to automatically fire transitions and execute the Equipment Sequence.

### Manual
Put the Equipment Sequence in Manual mode, in which the sequencing engine does not automatically fire transitions, and an operator commands the Equipment Sequence step by step. On the toolbar, only the Release Ownership, Pause, Auto-Pause, and Automatic commands are enabled.

---

**See also**

[Sequence Summary Control](#) on page 71
Sequence Detail Control

Use the Sequence Detail Control to see a detailed view of an Equipment Sequence, including its chart structure, steps, and transitions. You can also view the runtime status of the Equipment Sequence and the sequence elements.

See also

- Sequence Detail Control status header area on page 75
- Sequence Detail Control command controls on page 73
- A monitored transition in the Sequence Detail Control on page 78
- A monitored step in the Sequence Detail Control on page 77

Configure the Sequence Detail Control

To configure the Sequence Detail Control to communicate with a controller, customize several settings in the control Property Panel.

Before you begin:

- Open the FactoryTalk View SE application.
- Open a display. If the display already has the Sequence Detail Control added, configure or reconfigure the Sequence Detail Control. If the display does not have the Sequence Detail Control added, add the Sequence Detail Control to the display and then configure it.

See also

- Sequence Detail Control on page 73

Sequence Detail Control command controls

Use the following commands to control an Equipment Sequence using the Sequence Detail Control. The availability of some commands depends on the selected Equipment Sequence owner, state, mode, and failure status. Click More to display all the commands on the toolbar.

The following commands are always displayed:

- Take/Release ownership
- Set ID
Chapter 9  Sequence Detail Control

- Initialize parameters
- Start
- Hold
- Restart
- Stop
- Abort
- Reset
- More/Less

These commands are available after selecting the More button and can be hidden by selecting the Less button:

- Clear Failures
- Pause/Cancel Pause
- Auto Pause/Cancel Auto Pause
- Resume
- Enter/Exit Manual
- Step change
- Force transition

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Icon" /></td>
<td>Take Ownership</td>
<td>Take ownership of the Equipment Sequence. Taking ownership means that this application now has the right to command this Equipment Sequence; other internal sequencers, external sequencers, and operators are not allowed to command this sequence.</td>
</tr>
<tr>
<td><img src="image2" alt="Icon" /></td>
<td>Release Ownership</td>
<td>Release ownership of the Equipment Sequence. Releasing ownership means that internal sequencers, external sequencers, and operators with attachments are allowed to command this sequence.</td>
</tr>
<tr>
<td><img src="image3" alt="Icon" /></td>
<td>Set ID</td>
<td>Opens the Set Sequence ID dialog box where you can assign an identifier of up to 82 characters to the Equipment Sequence. This command is enabled only when an Equipment Sequence is idle.</td>
</tr>
<tr>
<td><img src="image4" alt="Icon" /></td>
<td>Start</td>
<td>Start execution of the Equipment Sequence.</td>
</tr>
<tr>
<td><img src="image5" alt="Icon" /></td>
<td>Hold</td>
<td>Halt all connected phases for the Equipment Sequence and stop evaluating transitions until the Equipment Phase runs its Hold routine.</td>
</tr>
<tr>
<td><img src="image6" alt="Icon" /></td>
<td>Restart</td>
<td>Continue execution of the Equipment Sequence from the HELD state.</td>
</tr>
<tr>
<td><img src="image7" alt="Icon" /></td>
<td>Stop</td>
<td>Stop all connected phases and active transitions for the Equipment Sequence.</td>
</tr>
<tr>
<td><img src="image8" alt="Icon" /></td>
<td>Abort</td>
<td>Abort all connected phases and active transitions for the Equipment Sequence.</td>
</tr>
<tr>
<td><img src="image9" alt="Icon" /></td>
<td>Reset</td>
<td>Reset any remaining active phases for the Equipment Sequence.</td>
</tr>
<tr>
<td><img src="image10" alt="Icon" /></td>
<td>Clear Failures</td>
<td>Clear the failure flags on the Equipment Sequence.</td>
</tr>
<tr>
<td><img src="image11" alt="Icon" /></td>
<td>Pause</td>
<td>Pause execution of the Equipment Sequence. When the active transition evaluates TRUE, it does not transition to the FIRING state until you click Resume.</td>
</tr>
</tbody>
</table>
Auto-Pause

Automatically pause the Equipment Sequence as transitions evaluate TRUE. When you click Resume, the next transitions fire, but the Equipment Sequence pauses again after each transition evaluates TRUE.

Resume

Continue execution of the Equipment Sequence.

Enter Manual

Put the Equipment Sequence in Manual mode, in which the sequencing engine does not automatically fire transitions, and an operator commands the Equipment Sequence step by step. On the toolbar, only the Release Ownership, Pause, Auto-Pause, and Automatic commands are enabled.

Exit Manual

Put the Equipment Sequence in Automatic mode, which allows the sequencing engine to automatically fire transitions and execute the Equipment Sequence.

See also

Sequence Detail Control on page 73

Sequence Detail Control status header area

The header area of the Sequence Detail Control shows live data values for the currently loaded Equipment Sequence.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1 | Owners | This box shows the current owner of the displayed Equipment Sequence and visual indication of ownership overrides.  
- Blank: No ownership.  
- Logix Designer (<number>): The <number> indicates the number of Logix Designer applications that have overridden ownership of the sequence.  
- Operator: A user through the SequenceManager Detail of the SequenceManager Summary ActiveX controls has attached to the sequence.  
- Internal Sequencer: A program running within the controller has used the Attach to Equipment Sequence (SATT) command to attach to the sequence.  
- External Sequencer: An application outside the controller, the FactoryTalk Batch Server, has attached to the sequence. |
| 2 | Unit ID | Indicates the integer value currently assigned to the sequence. Configured on the Sequence Properties Dialog Box, Configuration tab, that represents the equipment unit the sequence is coordinating. |
| 3 | Sequence ID | A string entered by the operator or control engineer using the Set ID button to specify an identifier for this execution of the equipment sequence. Once the sequence is executing (not in an IDLE state), the Sequence ID cannot be changed. |
State

Shows the current state of the displayed Equipment Sequence. States are:
- IDLE
- RESTARTING
- RUNNING
--resetting
- HOLDING
- STOPPING
- ABORTING
- HELD
- STOPPED
- ABORTED
- COMPLETE

Substate

Displays the state of the bits in Pause Control. The following states are:
- Paused
- Pause Enabled
- Auto Pause Enabled
- Paused, Auto Pause Enabled

Mode

Shows the current execution mode of the displayed Equipment Sequence, either Automatic or Manual.

Sequence Detail Control

The footer section on the Sequence Detail Control contains the following settings and status indicators.

The communication, failure, and unscheduled/inhibited icons are also displayed in the upper left corner of the diagram window, in the status bar, and on any step or tag the status is detected.

<table>
<thead>
<tr>
<th>Setting or Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoom control</td>
<td>Adjusts the zoom on the control window.</td>
</tr>
<tr>
<td>Auto-Scroll</td>
<td>Turn Auto-Scroll on or off.</td>
</tr>
<tr>
<td>Sequence name</td>
<td>The name of the Equipment Sequence.</td>
</tr>
</tbody>
</table>
Status bar

Displays the following status icons:

- There is a communication problem with the controller, the SequenceManager Server Service application, the live data server, or the tags.
- No known communication problem.
- There is a failure in the Equipment Sequence.
- No known failure in the Equipment Sequence.
- The controller is in Program, Remote Program, or an unknown mode.
- The controller is in Run, Remote Run, or an unknown mode.
- The Equipment Sequence or task is inhibited, or the Equipment Sequence is unscheduled.
- The Equipment Sequence is scanning, or the status is unknown.

See also

Sequence Detail Control on page 73

A monitored step in the Sequence Detail Control

A monitored equipment sequence step shows several functions:

- The user-configured step name and the Equipment Phase name.
- The step execution state.
- If the step is a source or target for a transfer of control.
- If the step has a failure.
- The step is executing.
- If the step or associated phase is paused.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Failure</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>2</td>
<td>Step Name</td>
</tr>
</tbody>
</table>
| 3    | Pause status| The symbol shows that:  
|      |             | - A pause of the phase logic is pending.  
|      |             | - An auto-pause of the phase logic is pending.  
|      |             | - The associated Equipment Phase is paused.  
|      |             | - The associated Equipment Phase is paused and auto-pause is pending. |
| 4    | Equipment Phase Name | Each step is configured to reference one phase. The name of the phase is displayed so you know which equipment phase is executing. |
| 5    | Transfer of Control (TOC) | A step that has been configured as the source to transfer ownership to a following target step, without stopping the execution of the phase. The symbol shows:  
|      |             | - When the top bar is filled, this step is the beginning of a TOC step pair.  
|      |             | - When the bottom bar is filled, this step is the end of a TOC step pair.  
|      |             | - When both top and bottom bars are filled, this step is the end of a TOC step pair and the beginning of another TOC step pair.  
|      |             | When transfer of control is not configured, the symbols are not drawn. |
| 6    | Step State  | When a step is active, and attached to its phase, the step state mirrors the state of the phase. The set of displayed states are: INACTIVE, NOT CONNECTED (active but not attached), IDLE, RESTARTING, RUNNING, RESETTING, HOLDING, STOPPING, ABORTING, HELD, STOPPED, ABORTED, and COMPLETE.  
|      |             | **Tip:** <No phase> steps have no associated phase and only have two displayed states: RUNNING and IDLE.  
|      |             | The step state is also represented by the color of the step. |

### A monitored transition in the Sequence Detail Control

A transition has several displayed attributes and status. The transition name and expression are defined when the sequence is configured and static when the sequence is online. The display state and firing attribute are dynamic and update as the transition executes.

A transition can be monitored in the Sequence Detail Control to track its progress and status.
## Transition Display State

The transition display state is indicated by the color of the transition. For more information about transition display states, see below for Transition display states.

## Transition Expression

Transition expressions define the criteria to STOP, RESET, and detach all preceding steps and their associated Equipment Phases and attach and START the following Equipment Phases and steps. The expression must always evaluate to either TRUE or FALSE.

## Transition Firing Attribute

The Transition Firing Attribute is only displayed when the transition is in the FIRING state, which means the expression has evaluated TRUE. The firing attribute is a subset of the FIRING state and gives a visual indication of the current state.

### See also

Transition display states on page 47
Chapter 10

Sequence Parameters Control

Use the Sequence Parameters Control to see a list of the step tags and sequence parameters in an Equipment Sequence. Select tags and parameters in the list to modify them or view more information about them.

See also

Modify step tags or sequence parameters using the Sequence Parameters Control on page 81

Configure the Sequence Parameters Control

To configure the Sequence Parameters Control, customize several settings in the control Property Panel.

You can configure the Sequence Parameters Control to communicate with a controller, to use VBA scripting, or (to) change display options.

Before you begin:

- Open the FactoryTalk View Site Edition (SE) application.
- Open a display. If the display already has the Sequence Parameters Control added, configure or reconfigure the Sequence Parameters Control. If the display does not have the Sequence Parameters Control added, add the Sequence Parameters Control to the display and then configure it.

See also

Sequence Parameters Control on page 81

Modify step tags or sequencing parameters using the Sequence Parameters Control

Select a step tag or sequencing parameter from the list on the Sequence Parameters Control to modify, disable or enable, force evaluation of, or view more information about the step tag or sequencing parameter.

Tip: To modify settings for tags and parameters, the external value for the tags and parameters must be set to Read/Write. Use the Tag Editor in the Logix Designer application to change the external value for a tag or parameter.

To modify a tag or parameter:

1. Select the tag or parameter.
2. In the **Value** box, type the new value for the tag or parameter.

3. To disable or enable a tag or parameter, click **Expression** and then click **Disable Expression** or **Enable Expression**. When you disable a tag or parameter, the disabled icon 🚫 appears in the **Expression** box. To re-enable a disabled tag or parameter, click **Expression** and then click **Enable Expression**. When you re-enable a disabled expression, the disabled icon disappears from the **Expression** box.

4. To force evaluation of a tag or parameter, click **Expression** and then click **Force Evaluation**. The **Force Evaluation** button is disabled when any of the following is true:
   - The Equipment Sequence is in the IDLE state.
   - The controller is in Program mode.
   - The Equipment Sequence or its assigned task is disabled.
   - The Equipment Sequence is unscheduled.

**To view more information for a tag or parameter:**

1. Select the tag or parameter.

2. Click **View Expression** to display the complete expression. Click **View Description** to display the complete description.

**See also**

[Sequence Parameters Control](#) on page 81
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Rockwell Automation support

Rockwell Automation provides technical information on the web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States or Canada</td>
<td>1.440.646.3434</td>
</tr>
<tr>
<td>Outside United States or Canada</td>
<td>Use the Worldwide Locator available at <a href="http://www.rockwellautomation.com/locations">http://www.rockwellautomation.com/locations</a>, or contact your local Rockwell Automation representative.</td>
</tr>
</tbody>
</table>

New product satisfaction return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

<table>
<thead>
<tr>
<th>Location</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.</td>
</tr>
<tr>
<td>Outside United States</td>
<td>Please contact your local Rockwell Automation representative for the return procedure.</td>
</tr>
</tbody>
</table>

Documentation feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the feedback form, publication RA-DU002.