Reference Manual

Allen-Bradley

Logix5000 Controllers Import/Export

1756 ControlLogix, 1756 GuardLogix, 1769 CompactLogix, 1769 Compact GuardLogix, 1789 SoftLogix, 5069 CompactLogix, Studio 5000 Logix Emulate

Allen-Bradley • Rockwell Software

Rockwell Automation

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.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice. If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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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. Attentions help 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.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Summary of changes

This manual contains new and updated information. This table contains the changes made to this revision.

Change	Topic
Updated the list of supported controller models.	Supported controllers on page 17
Added the TrackingGroups attribute for Add-On Instructions, routines, and tags.	Add-On Instruction attributes on page 86, FBD_routine attributes on page 160, RLL Routine attributes on page 148, SFC_Routine attributes on page 182, ST_Routine attributes on page 202, Tag attributes on page 108
Added the IsEncrypted Encoded Add-On Instruction attribute.	Encoded data attributes on page 95
Added the IsEncrypted and TrackingGroup Add-On Instruction definition attributes.	Add-On Instruction attributes on page 86
Added the EncryptionInfo and EncryptedAOIContent Add-On Instruction definition elements.	Add-On Instruction elements on page 86
Added the EncryptionInfo, EncryptedContent, and EncryptedSegments routine elements.	FBD_routine attributes on page 160, RLL Routine attributes on page 148, SFC_Routine attributes on page 182, ST_Routine attributes on page 202
Added the Encryption Key attributes for routines and Add-On Instructions.	Encryption key attributes on page 96
Added the Encrypted Content attributes for routines and Add-On Instructions.	Encrypted content attributes on page 96
Added the Encryption Information elements for routines and Add-On Instructions.	Encryption Information elements on page 95

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Chapter 12

Define an Equipment Sequence routine

This manual details how to import and export controller projects. You should be familiar with how the Logix-based controller stores and processes data. This manual is one of a set of related manuals that show common procedures for programming and operating Logix5000™ controllers.

For a complete list of common procedures manuals, refer to the Logix5000 Controllers Common Procedures Programming Manual, publication 1756-PM001.

The term Logix5000 controller refers to any controller that is based on the Logix5000 operating system.

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.

Supported controllers

The supported controllers list includes:

- 1756-L71
- 1756-L71S
- 1756-L72

- 1756-L72S
- 1756-L73
- 1756-L73S
- 1756-L74
- 1756-L75
- 1756-L81E
- 1756-L82E
- 1756-L83E
- 1756-L84E
- 1756-L85E
- 1769-L16ER-BB1B
- 1769-L18ER-BB1B
- 1769-L18ERM-BB1B
- 1769-L19ERM-BB1B
- 1769-L24ER-QB1B
- 1769-L24ER-QBFC1B
- 1769-L27ERM-QBFC1B
- 1769-L30ER
- 1769-L30ERM
- 1769-L30ERMS
- 1769-L30ER-NSE
- 1769-L33ER
- 1769-L33ERM
- 1769-L33ERMS
- 1769-L36ERM
- 1769-L36ERMS
- 1769-L37ERMO
- 1769-L37ERMOS
- 5069-L306ER,
- 5069-L306ERM,
- 5069-L310ER,

- 5069-L310ERM,
- 5069-L310ER-NSE,
- 5069-L320ER,
- 5069-L320ERM,
- 5069-L330ER,
- 5069-L330ERM,
- 5069-L340ER,
- 5069-L340ERM
- 5069-L350ERM
- 5069-L380ERM
- 5069-L3100ERM
- 5069-L46ERMW
- Emulate 5570

Additional resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications webpage, available at http://ab.rockwellautomation.com	Provides declarations of conformity, certificates, and other certification details.

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.

Legal Notices

Copyright Notice

End User License Agreement (EULA)

You can view the Rockwell Automation End-User License Agreement ("EULA") by opening the License.rtf file located in your product's install folder on your hard drive.

Trademark Notices

Other Trademarks

Warranty

This product is warranted in accordance with the product license. The product's performance may be affected by system configuration, the application being performed, operator control, maintenance, and other related factors. Rockwell Automation is not responsible for these intervening factors. The instructions in this document do not cover all the details or variations in the equipment, procedure, or process described, nor do they provide directions for meeting every possible contingency during installation, operation, or maintenance. This product's implementation may vary among users.

This document is current as of the time of release of the product; however, the accompanying software may have changed since the release. Rockwell Automation, Inc. reserves the right to change any information contained in this document or the software at any time without prior notice. It is your responsibility to obtain the most current information available from Rockwell when installing or using this product.

Environmental Compliance

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page

Contact Rockwell

Customer Support Telephone — 1.440.646.3434
Online Support — http://www.rockwellautomation.com/support/

Import and export files

Introduction

This document describes how to use the import/export feature that is included with the Logix Designer application.

With a Logix controller, you can import and export an entire project or import and export parts of a project. Select the import/export format based on what you want from the content.

If you want:	Then use this format:
The entire controller project	L5K or L5X
Individual portions of the controller project	L5X
Tags and logic comments	CSV or TXT

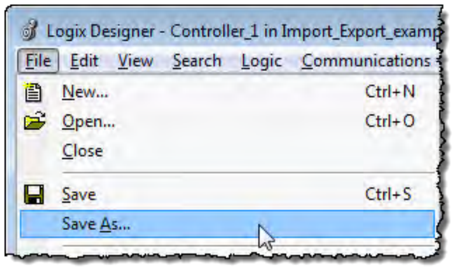
This chapter shows how to perform the import/export operations.

Export a Project to an .L5K Text File

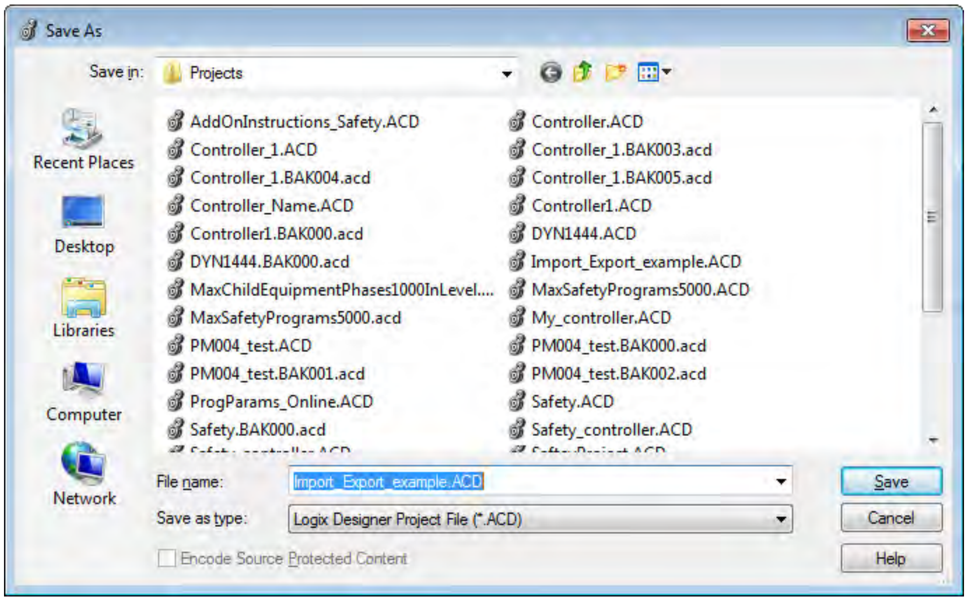
You can export a project to a text file and use any text editor that supports UTF8 file format to modify the project. The exported file will be an .L5K format.

Do these steps to export a project to an .L5K text file.

1. Make sure the project you want to export is open.
2. In the Logix Designer application, click **File > Save As**.



The **Save As** dialog box opens.



3. Browse to where you want to save the file.

4. In the **File name** field, type the name of the text file.

5. From the **Save as type** list, click the .L5K file format and click **Save**.

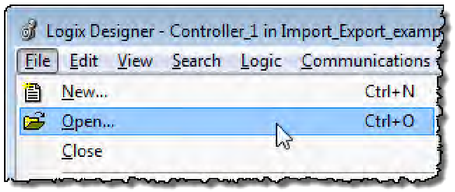
Important:	The application automatically saves any unsaved edits when you click **OK**.

Import an .L5K text file

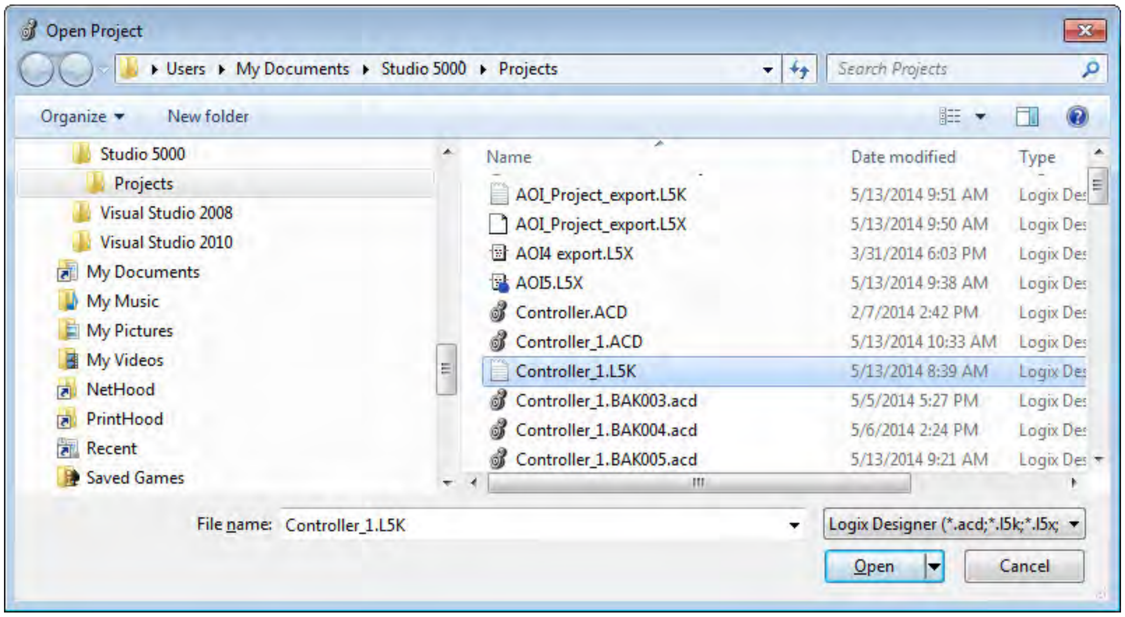
Import controller information from a saved text file that has an .L5K extension. This lets you use any text editor to create a project.

Do these steps to import an .L5K text file into a project.

1. In the Logix Designer application, from the **File** menu, choose **Open**.


Logix Designer - Controller_1 in Import_Export_examp
File Edit View Search Logic Communications
New... Ctrl+N
Open... Ctrl+O
Close

The **Open Import Project** dialog box opens.

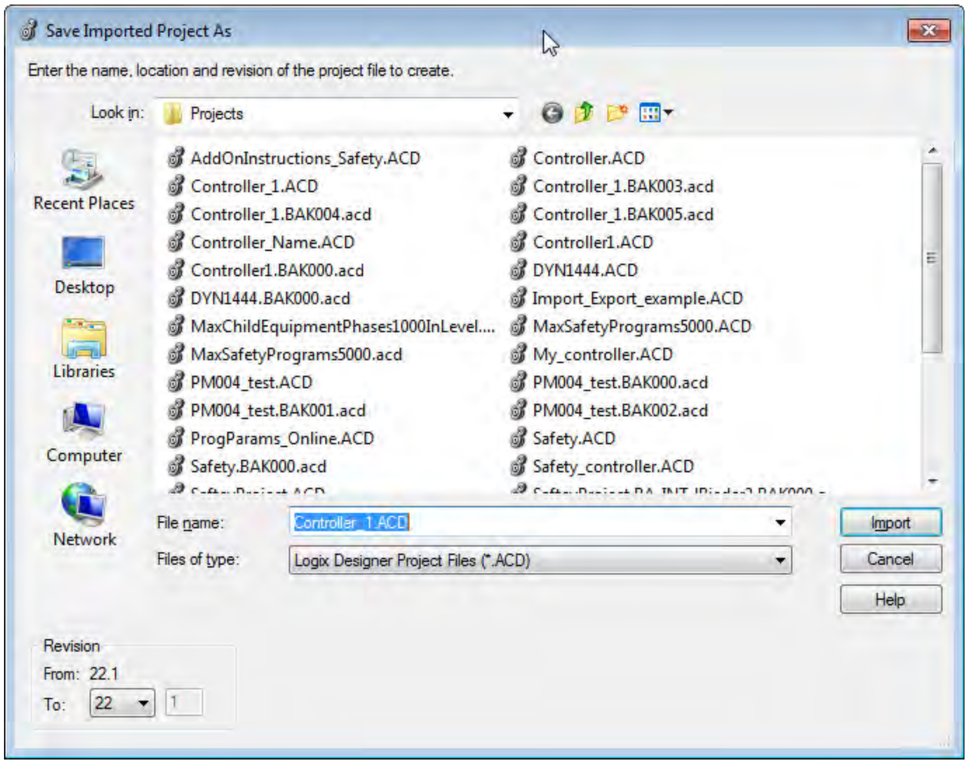


Name	Date modified	Type
AOI_Project_export.L5K	5/13/2014 9:51 AM	Logix Des
AOI_Project_export.L5X	5/13/2014 9:50 AM	Logix Des
AOI4 export.L5X	3/31/2014 6:03 PM	Logix Des
AOI5.L5X	5/13/2014 9:38 AM	Logix Des
Controller.ACD	2/7/2014 2:42 PM	Logix Des
Controller_1.ACD	5/13/2014 10:33 AM	Logix Des
Controller_1.L5K	5/13/2014 8:39 AM	Logix Des
Controller_1.BAK003.acd	5/5/2014 5:27 PM	Logix Des
Controller_1.BAK004.acd	5/6/2014 2:24 PM	Logix Des
Controller_1.BAK005.acd	5/13/2014 9:21 AM	Logix Des

File name: Controller_1.L5K
Logix Designer (*.acd;*.l5k;*.l5x;

2. Select the .L5K text file you want to import and click **Open**.

The **Save Imported Project As** dialog box opens.



Enter the name, location and revision of the project file to create.

Look in: Projects

AddOnInstructions_Safety.ACD
Controller_1.ACD
Controller_1.BAK004.acd
Controller_Name.ACD
Controller1.BAK000.acd
DYN1444.BAK000.acd
MaxChildEquipmentPhases1000InLevel....
MaxSafetyPrograms5000.acd
PM004_test.ACD
PM004_test.BAK001.acd
ProgParams_Online.ACD
Safety.BAK000.acd
Controller.ACD
Controller_1.BAK003.acd
Controller_1.BAK005.acd
Controller1.ACD
DYN1444.ACD
Import_Export_example.ACD
MaxSafetyPrograms5000.ACD
My_controller.ACD
PM004_test.BAK000.acd
PM004_test.BAK002.acd
Safety.ACD
Safety_controller.ACD

File name: Controller_1.ACD
Files of type: Logix Designer Project Files (*.ACD)

Revision
From: 22.1
To: 22 1

3. Browse to where you want to save the imported project.

4. In the **File name** box, type the name for the imported project and click **Import**.

Important:	If you import a project that has forces, the project defaults to **Forces Disabled**, even if the project was exported with **Forces Enabled**. When you import an .L5K file, the project changes so that you cannot go online and access a previously downloaded controller. You must first upload from or download to the controller. See Maintaining Controller Access on page 36.

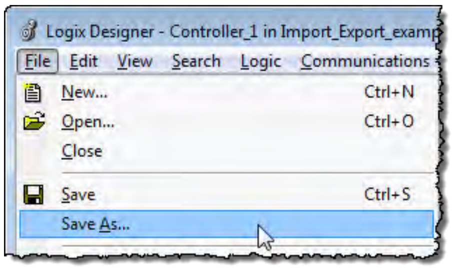
Export a Project to an .L5X XML File

You can export a project to an XML file and use a text or XML editor to modify the project. The exported file will be an .L5X format.

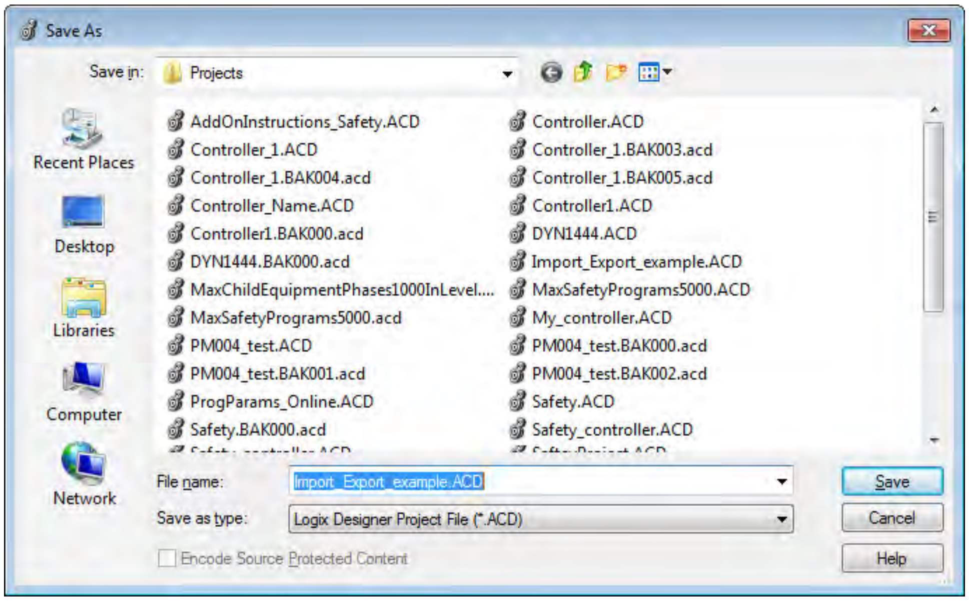
Do these steps to export from a project to an .L5X XML file.

1. Make sure the project you want to export from is already open.

2. In the Logix Designer application, click **File > Save As**.


Logix Designer - Controller_1 in Import_Export_examp
File Edit View Search Logic Communications
New... Ctrl+N
Open... Ctrl+O
Close
Save Ctrl+S
Save As...

The **Save As** dialog box opens.



3. In the **File name** box, type the name of the file.

4. From the **Save as type** list, click **.L5X file format** and click **Save**.

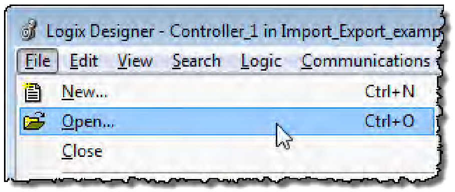
Important:	The application automatically saves any unsaved edits when you click **OK**.

Import an .L5X XML File

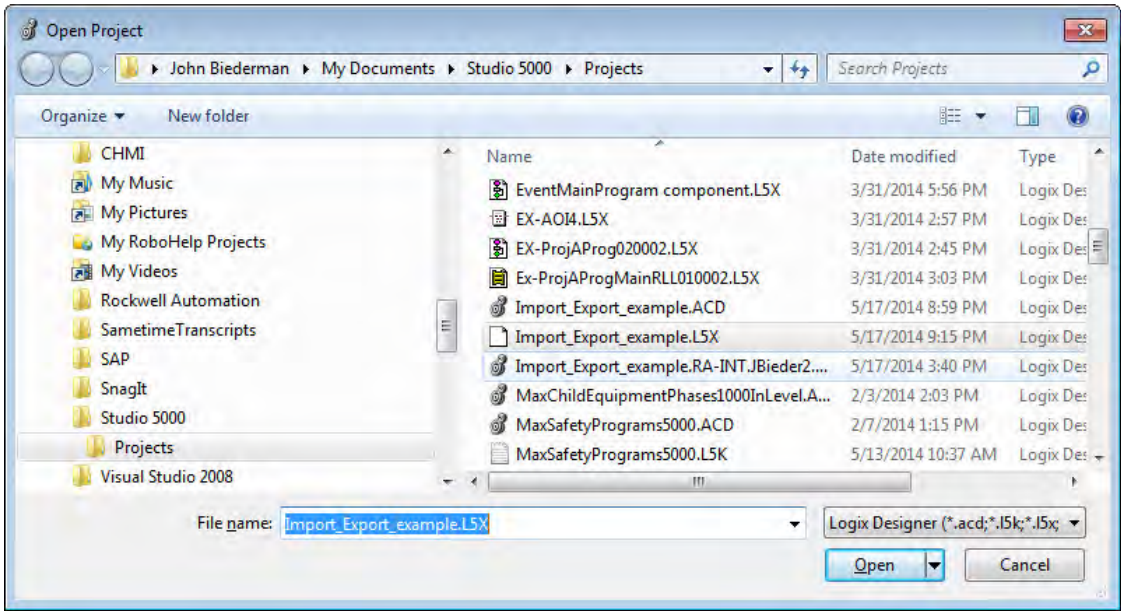
Import controller information from a saved XML file that has an .L5X extension and is a full controller export. This lets you use any editor to create a project.

Do these steps to import a controller .L5X XML file into a project.

1. In the Logix Designer application, click **File** > **Open**.



The **Open Project** dialog box opens.



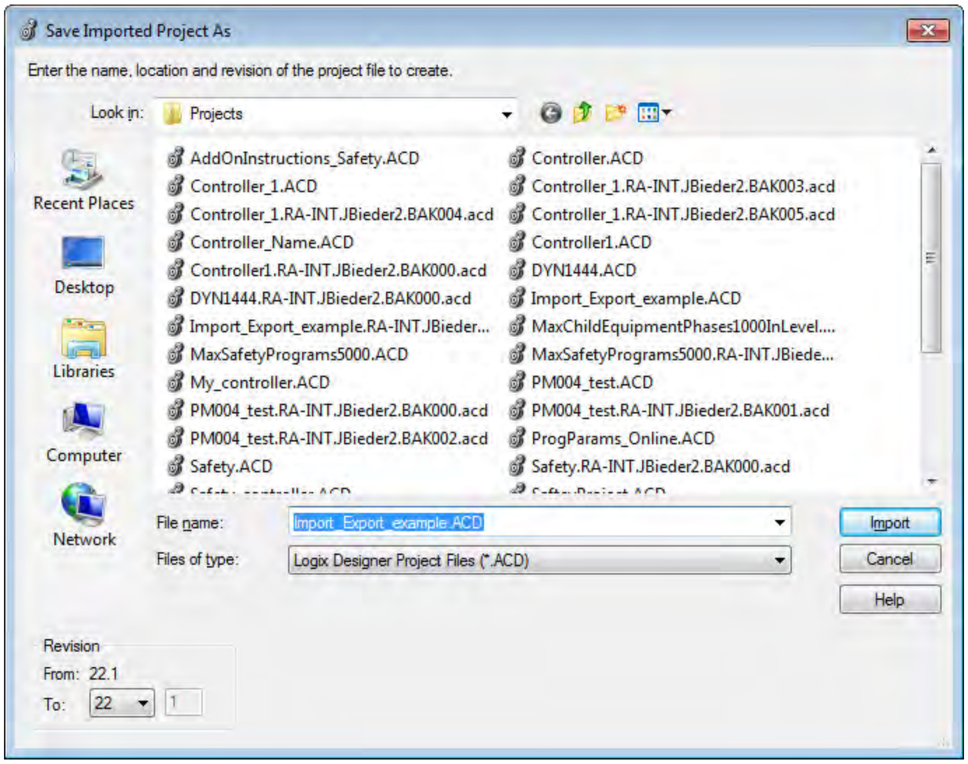
Name	Date modified	Type
EventMainProgram component.L5X	3/31/2014 5:56 PM	Logix Des
EX-AOI4.L5X	3/31/2014 2:57 PM	Logix Des
EX-ProjAProg020002.L5X	3/31/2014 2:45 PM	Logix Des
Ex-ProjAProgMainRLL010002.L5X	3/31/2014 3:03 PM	Logix Des
Import_Export_example.ACD	5/17/2014 8:59 PM	Logix Des
Import_Export_example.L5X	5/17/2014 9:15 PM	Logix Des
Import_Export_example.RA-INT.JBieder2....	5/17/2014 3:40 PM	Logix Des
MaxChildEquipmentPhases1000InLevel.A...	2/3/2014 2:03 PM	Logix Des
MaxSafetyPrograms5000.ACD	2/7/2014 1:15 PM	Logix Des
MaxSafetyPrograms5000.L5K	5/13/2014 10:37 AM	Logix Des

File name: Import_Export_example.L5X

Logix Designer (*.acd;*.l5k;*.l5x;

2. In the **File name** box, select the .L5X controller file you want to import and click **Open**.

The **Save Imported Project As** dialog box opens.


Save Imported Project As
Enter the name, location and revision of the project file to create.
Look in: Projects
Recent Places
Desktop
Libraries
Computer
Network
AddOnInstructions_Safety.ACD
Controller_1.ACD
Controller_1.RA-INT.JBieder2.BAK004.acd
Controller_Name.ACD
Controller1.RA-INT.JBieder2.BAK000.acd
DYN1444.RA-INT.JBieder2.BAK000.acd
Import_Export_example.RA-INT.JBieder...
MaxSafetyPrograms5000.ACD
My_controller.ACD
PM004_test.RA-INT.JBieder2.BAK000.acd
PM004_test.RA-INT.JBieder2.BAK002.acd
Safety.ACD
Controller.ACD
Controller_1.RA-INT.JBieder2.BAK003.acd
Controller_1.RA-INT.JBieder2.BAK005.acd
Controller1.ACD
DYN1444.ACD
Import_Export_example.ACD
MaxChildEquipmentPhases1000InLevel....
MaxSafetyPrograms5000.RA-INT.JBiede...
PM004_test.ACD
PM004_test.RA-INT.JBieder2.BAK001.acd
ProgParams_Online.ACD
Safety.RA-INT.JBieder2.BAK000.acd
File name: Import_Export_example.ACD
Files of type: Logix Designer Project Files (*.ACD)
Import
Cancel
Help
Revision
From: 22.1
To: 22 1

3. Browse to where you want to save the imported project.

4. In the **File name** box, type the name for the project and click **Import**.

Important:	If you import a project that has forces, the project defaults to **Forces Disabled**, even if the project was exported with **Forces Enabled**. When you import an .L5X file, the project changes so that you cannot go online and access a previously downloaded controller. You must first upload from or download to the controller. See Maintaining Controller Access on page 36.

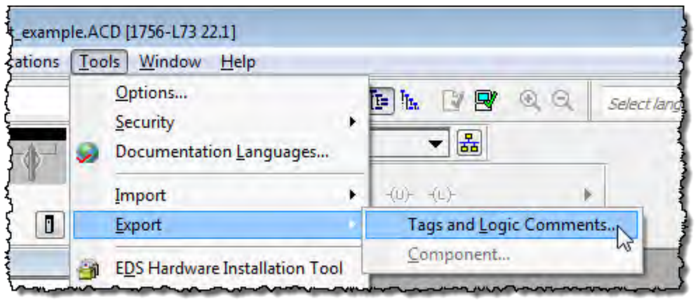
Export to a .CSV or .TXT file

When you have a project open, you can export tags and logic comments to a structured file that separates values with commas (.CSV file) or that separates values with tabs (.TXT Unicode file). You can then use other applications, such as Microsoft Excel or Notepad, to edit the tags and logic comments.

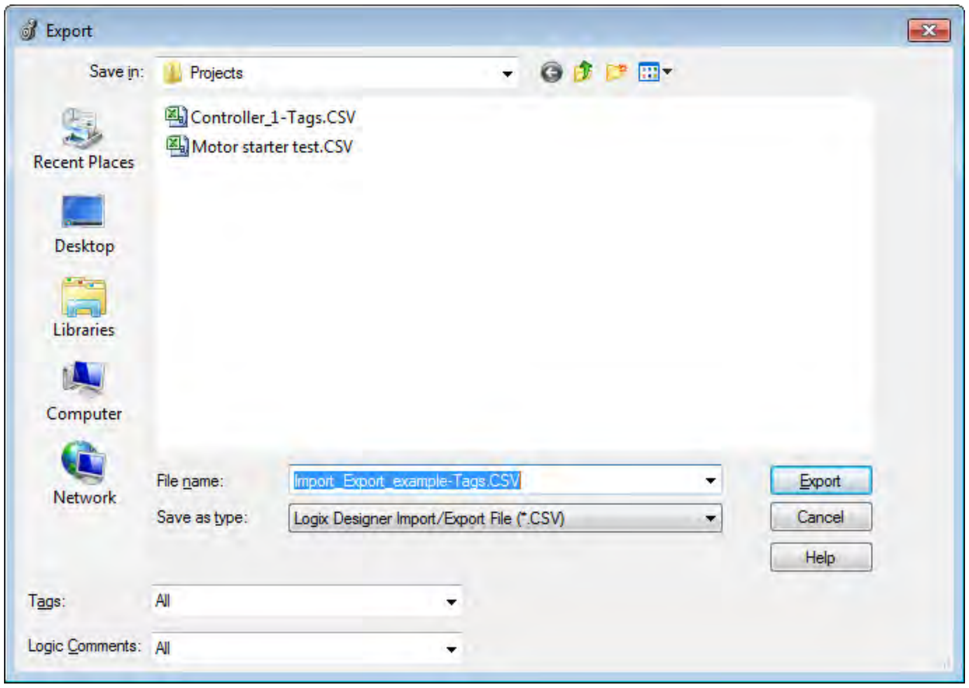
Do these steps to export tags and logic comments to a structured file.

1. Make sure the project from which you want to export tags and comments is already open.

2. In the Logix Designer application, click **Tools** > **Export** > **Tags and Logic Comments**.


_example.ACD [1756-L73 22.1]
ations
Tools
Window
Help
Options...
Security
Documentation Languages...
Import
Export
EDS Hardware Installation Tool
Tags and Logic Comments...
Component...
Select lang

The **Export** dialog box opens.



File name: Import_Export_example-Tags.CSV

Save as type: Logix Designer Import/Export File (*.CSV)

Tags: All

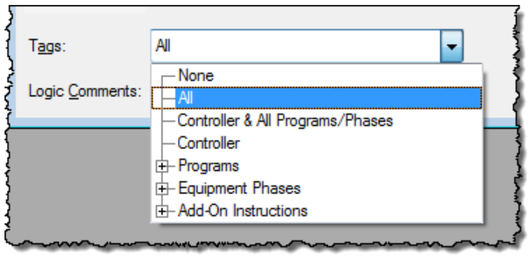
Logic Comments: All

3. In the **File name** box, type the name of the file to be exported.

4. From the **Save as type** list, click **.CSV** or **.TXT** format.

   The .TXT import/export format supports double-byte characters, so you can use this format for all languages, including Chinese, Japanese, and Korean. The .CSV import/export format does not support double-byte characters.

5. From the **Tags and Logic Comments** list, set the scope of the tags and logic comments to be exported.



6. Click **Export**.

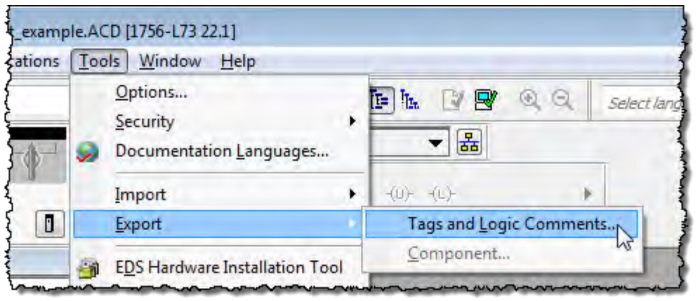
Scope	Exported Material
All	All the tags (controller-scope, program-scope, equipment phase, and Add-On Instruction) or logic comments in the project
Controller and All Programs/Phases	Tags only; all controller-scope, program-scope, and equipment phase tags
Controller	Tags only; the controller-scoped tags of the project
All Programs/Phases	Logic Comments only; all program and equipment phase comments
Programs Equipment Phases Add-On Instructions	The tags or logic comments of a specific program, equipment phase, or Add-On Instruction

Import a .CSV or .TXT file

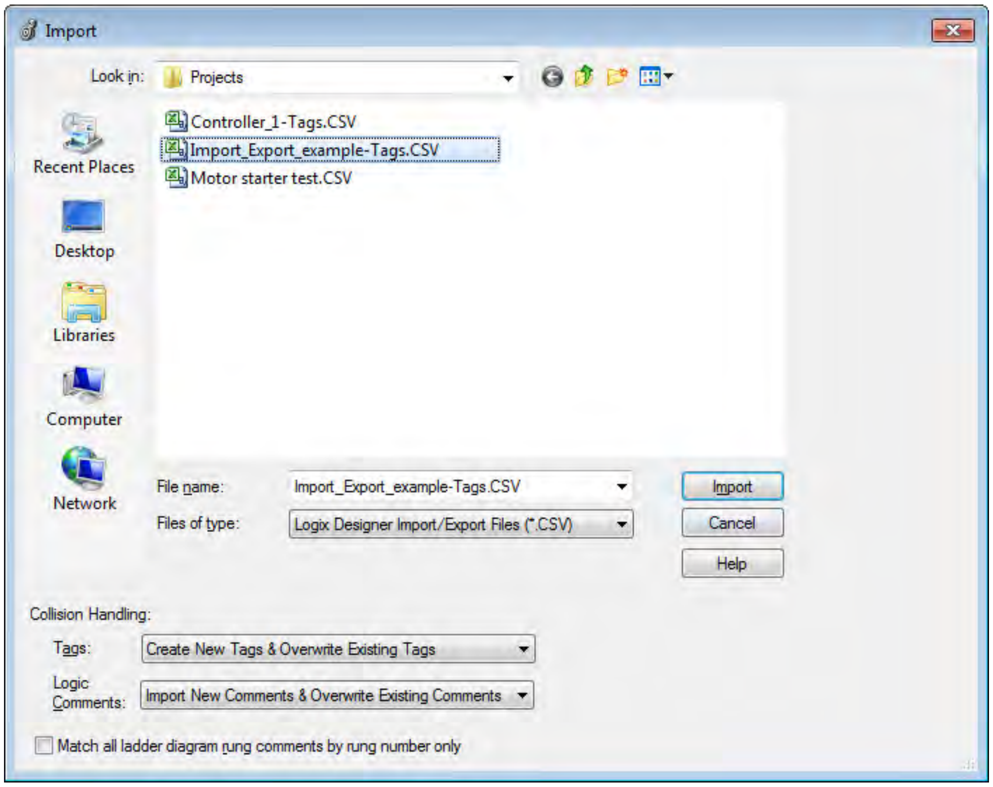
When you are offline and have a project open, you can import tags and logic comments from a saved .CSV file or .TXT file. This lets you use other applications, such as Microsoft Excel or Notepad, to create and edit tags and logic comments.

Do these steps to import tags and logic comments from a saved .CSV file or .TXT file into a project.

1. In the Logix Designer application, click **Tools > Import > Tags and Logic Comments**.


_example.ACD [1756-L73 22.1]
ations Tools Window Help
Options...
Security
Documentation Languages...
Import
Export
EDS Hardware Installation Tool
Tags and Logic Comments...
Component...
Select lang

The **Import** dialog box opens.



File name: Import_Export_example-Tags.CSV

Files of type: Logix Designer Import/Export Files (*.CSV)

Collision Handling:

Tags: Create New Tags & Overwrite Existing Tags

Logic Comments: Import New Comments & Overwrite Existing Comments

☐ Match all ladder diagram rung comments by rung number only

2. In the **File name** box, select the .CSV or .TXT file you want to import.

3. From the **File of type** list, select **.CSV** or **.TXT** format.

Tip: Use the **File of type** list to filter .CSV or .TXT files in the **Import** dialog box.

4. From the **Tags** lists, specify how you want to handle tag collisions.

Important: When you import tags, the tags in the import file may have the same name as tags that are already in the open project. This condition is a collision.

If you want to:	From the Tags menu select:
Replace tags in the project with tags from the import file, in addition to adding any new tags from the import file	**Create New Tags & Overwrite Existing Tags**
Keep tags that are in the project and discard colliding tags in the import file, in addition to adding any new tags from the import file	**Create New Tags & Overwrite Existing Tags**
Replace tags in the project with tags from the import file, but do not add any new tags from the import file	**Create New Tags & Overwrite Existing Tags**

Important: If you delete tags from the .CSV or .TXT file and import the file, the process does not delete the tags from the controller project. Use the programming software to delete tags from the controller project.

5. From the **Logic Comments** list, specify how you want to handle logic comment collisions.

Important: When you import logic comments, the possibility exists for the comments in the import file to differ from the comments in the open project when both are matched to the same logic.

If you want to:	From the Logic Comments list select:
Replace comments in the project with comments from the import file, in addition to adding any new comments from the import file	**Import New Comments & Overwrite Existing Comments**
Keep comments that are in the project and discard colliding comments in the import file, in addition to adding any new comments from the import file	**Import New Comments & Preserve Existing Comments**
Replace comments in the project with comments from the import file, but do not add any new comments from the import file	**Skip New Comments & Overwrite Existing Comments**

6. Choose how to match comments to logic and click **Import**.

If you want rung comments applied to:	Then:
The next rung that has the instruction, as specified in the Owning Element, as its last instruction on the rung	Make sure that the **Leave the Match all ladder diagram rung comments by rung only** check box is cleared. This is the default and recommended option. The Location element is ignored.
The rung number specified in the Location element	Select the **Match all ladder diagram rung comments by rung only** check box. This overrides the default and recommended option. The Owning Element is ignored.

Important: If a .CSV file or .TXT file contains changes to tags, including aliases, when you import the file that the project changes such that you cannot go online and access a previously downloaded controller. You must first upload from or download to the controller.
If you only modify comments or descriptions before you import a .CSV file or .TXT file, you can go online with the controller.

Export source-protected logic

Starting with version 20, you can configure how source-protected content is exported in .L5K and .L5X files.

By default, source-protected content is now exported in an encrypted format to prevent viewing or modifying components in the system. A check box option on the **Workstation Options** dialog box enables Add-On Instructions and routines to be exported in a readable, cleartext format if the source keys for those components are present in the sk.dat file. This lets you modify protected content in a third-party tool, such as an XML editor.

Important: You must enable your workstation for source protection to use the cleartext option on the **Workstation Option** dialog box. Otherwise, the check box, is not available and source-protected content is exported in an encrypted format.

Perform a partial or full-project export in cleartext when these parameters are available:

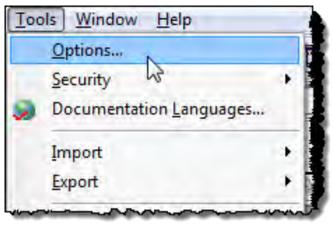
- Your workstation has source protection enabled.
- The **Workstation Option** dialog box (**Always Encode Source Protection Content On Export**) is not selected.
- The sk. dat file has been specified and it contains the source key (password) for the content. For details, see the Logix5000 Controllers Security Programming Manual , publication 1756-PM016.

If any of these requirements are absent, the content is exported in an encrypted format.

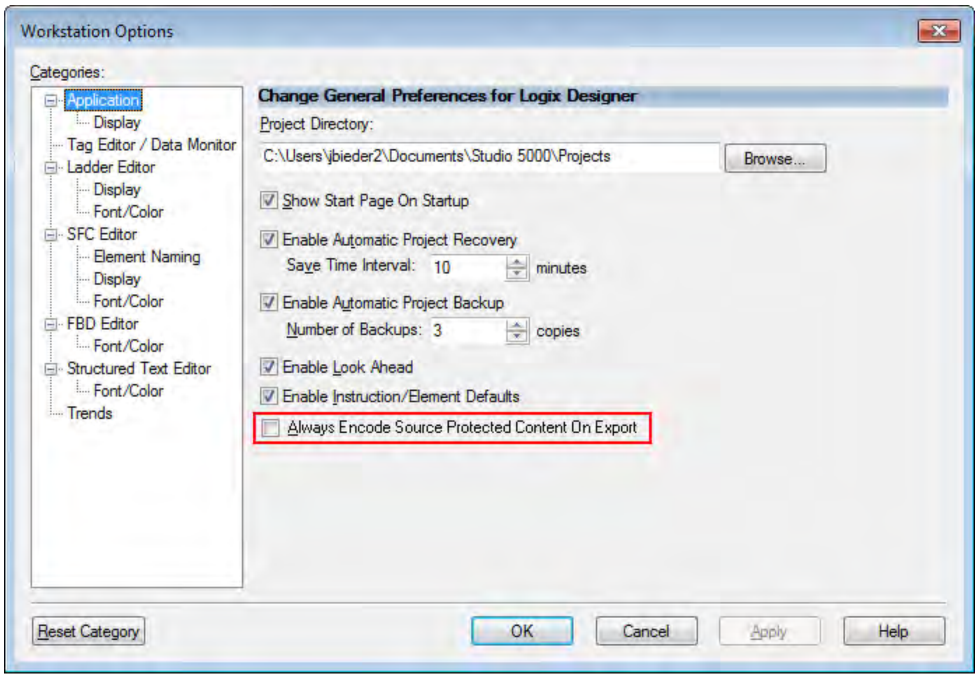
Export in a Cleartext Format

Use the same procedure for partial exporting a component or a full project in readable text. Do these steps.

1. Open a project in the Logix Designer application that contains the content that you want to export.
2. On the **Menu** bar, click **Tools** > **Options**.



The **Workstation Options** dialog box opens with the export check box option **if** your personal computer is enabled for source protection.



Project Directory: C:\Users\jbieder2\Documents\Studio 5000\Projects

[✓] Show Start Page On Startup
[✓] Enable Automatic Project Recovery
Save Time Interval: 10 minutes
[✓] Enable Automatic Project Backup
Number of Backups: 3 copies
[✓] Enable Look Ahead
[✓] Enable Instruction/Element Defaults
[ ] Always Encode Source Protected Content On Export

3. Clear the **Always Encode Source Protected Content On Export** check box.

   There is a similar check box on the **Save As** and **Export** component dialog boxes that you must clear to export in cleartext from those dialog boxes.

   If you select the **Always Encode Source Protected Content On Export** check box on the **Workstation Options** dialog box, the application always exports source-protected content in an encrypted format, even when source keys for the content are present.

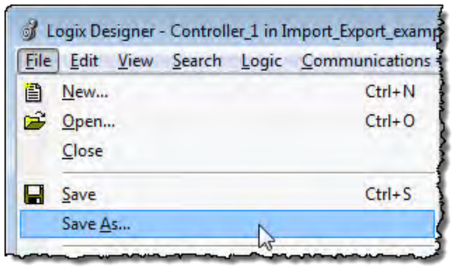
Important:	You cannot copy source-protected content from version 21 of the application and paste into earlier software versions. The pasting function is disabled in previous software versions when source-protected content is placed on the clipboard.

4. Click **OK**.

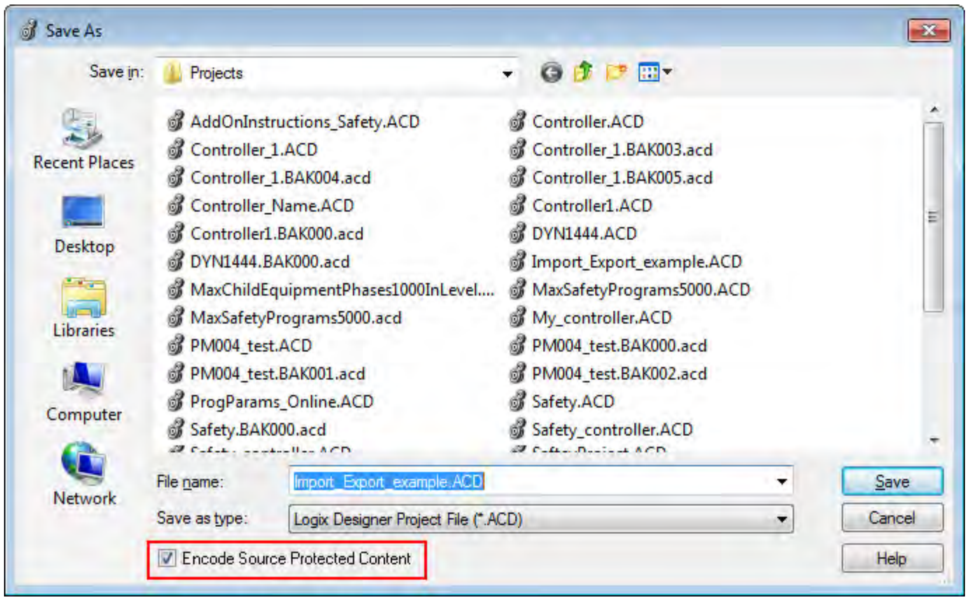
5. Take one of these actions:

   - To export a component, right-click the component and choose **Export Routine**. The component **Export** dialog box opens. Clear the **Encode Source Protected Content** check box. Click the **Export** button.
   - To save data for exporting as an .L5X or .L5K file, proceed to step 6.

6. On the **Menu** bar, click **File > Save As**.



The **Save As** dialog box opens.



File name: Import_Export_example.ACD

Save as type: Logix Designer Project File (*.ACD)

☑ Encode Source Protected Content

7. From the **Save as type** list, select the **.L5K** or **.L5X** option, depending on your file type.

   The **Encode Source Protected Content** check box is available when you choose the .L5K or .L5X option.

Important:	The **Encode Source Protected Content** check box is only enabled when the **Always Encode Source Protected Content on Export** check box in the **Workstation Options** dialog box is cleared. The **Encode Source Protected Content** check box also appears on the component dialog box.

8. Clear **Encode Source Protected Content** check box to export content in cleartext.

9. Click **Save**.

   See examples of encoded and unencoded codes for Add-On Instructions and Routines on page 99 on page 94 and page 145 on page 142, respectively.

Maintaining controller access

The controller manages project status to provide Logix Designer application with the information to decide whether you can go online with a controller.

Information	Description
Creation Stamp	The controller creates a creation stamp when you create, and import, a project and download the project to the controller. The creation stamp in the controller and the project file must match to enable Logix Designer application to go online with a controller. If a project is exported to an .L5K file and then imported, the resulting project .ACD file gets a new creation stamp. This means that the Logix Designer application views the imported project as different from the file that was exported. The result is that you cannot use the new, imported project file to access a controller that was downloaded with the original file, before it was exported. At this point, your only options are to download again from the imported project file or to upload the controller contents to another project .ACD file and merge with the documentation from one of the older project .ACD files.
Download Stamp	The controller creates a download stamp on each download and stores this stamp in both the project and the controller. When the creation stamp and the download stamp in the controller match those in the project file, Logix Designer application can use the project to let you access the controller online. If you change a project file when offline, that also clears the download stamp. This can occur when you import from an .L5X file or if you import a .CSV file that creates a new tag or modifies a tag data type. When you reset the download stamp, you can either download the project to the controller or upload the contents from the controller. If you choose to upload, you lose any changes made through import. Note that description and rung comment changes in a .CSV file do not reset the download stamp, so you can perform some .CSV file imports and still maintain access to the controller.
Change Log	Each time you change a controller online, the controller stores details about the change in a change log. If there are more than 1000 changes made to the project file since you last went online with the controller, you must either download the project to the controller or upload the contents from the controller. If you choose to upload, you lose any changes made through import.

Given this status information, these situations prevent you from going online with a controller.

Situations When You Cannot Go Online with a Controller	Possible Recovery
• More than 1000 controller edits were made. • A download of another project copy with identical creation stamps occurred. • Changes were made to the offline project, excluding documentation and tag value changes. • A controller nonvolatile storage load occurred and the loaded image has the same creation stamp but a different download stamp. • A controller nonvolatile storage load occurred and the loaded image has the same creation and download stamps but the change log is dated earlier than the project file.	• Full download to the controller • Upload from the controller to a new project • Upload from the controller and merge with an existing project.
• The project was exported and then reimported. In this case, the software considers it a different project and it has its own unique stamps. • A different project, with different stamps, was downloaded. • A controller nonvolatile storage load occurred, and the image was generated from a completely different project file, with different stamps.	• Full download to the controller • Upload from the controller to a new project. An upload/merge of documentation is not possible in these cases.

.L5X file structure

The .L5X import/export file consists of the components listed in the table. The .L5X format for each component is described in subsequent chapters of this reference manual.

Component	Description	Chapter
<RSLogix5000Content>	Describes version and export information	This chapter, see example below
<Controller>	The controller	Chapter 2 Defining a Controller Component on page 49
<DataTypes>	User-defined and I/O data structures	Chapter 3 Defining a Datatype Component on page 63
<Modules>	Modules in the controller organizer	Chapter 4 Defining a Module Component on page 69
<AddOnInstructionDefinitions>	Add-On Instructions	Chapter 5 Defining an Add-On Instruction Component on page 85
<Tags>	Controller-scope tags	Chapter 6 Defining a Tag Component on page 105
<Programs>	Programs	Chapter 7 Defining a Program Component on page 137
<Routines>	Ladder logic, function block diagram, sequential function chart, and structured text routines	Chapter 8 Defining a Ladder Logic Routine on page 147 Chapter 9 Defining a Function Block Diagram Routine on page 159 Chapter 10 Defining a Sequential Function Chart Routine on page 181 Chapter 11 Defining a Structured Text Routine on page 201
<Tasks>	Controller tasks	Chapter 12 Defining a Task Component on page 221
<ParameterConnection>	Parameter connections	Chapter 13 Defining a Parameter Connection on page 225
<ParameterConnections>	Program parameter connections	Chapter 14 Defining a Parameter Connection on page 225
<Trends>	Any trend configured for the controller project	Chapter 15 Defining a Trend Component on page 229
<QuickWatchLists>	All quick watch lists configured in the controller project	Chapter 16 Defining a Watch List Component on page 235
<CommPorts>, <CST>, and <WallClockTime>	Controller configuration objects	Chapter 17 Defining Controller Configuration Objects on page 237

The Controller component is the overall structure of the import/export file. It contains the configuration information and logic of the controller project. Preceding the Controller component is an optional XML declaration and a required root element tag (RSLogix5000Content) that includes Logix Designer application version information.

```
  <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00" TargetName="Controller_1"
    TargetType="Controller" ContainsContext="false" Owner="User, RA" ExportDate="Sun May 18
    13:02:10 2014" ExportOptions="DecoratedData ForceProtectedEncoding AllProjDocTrans">
```

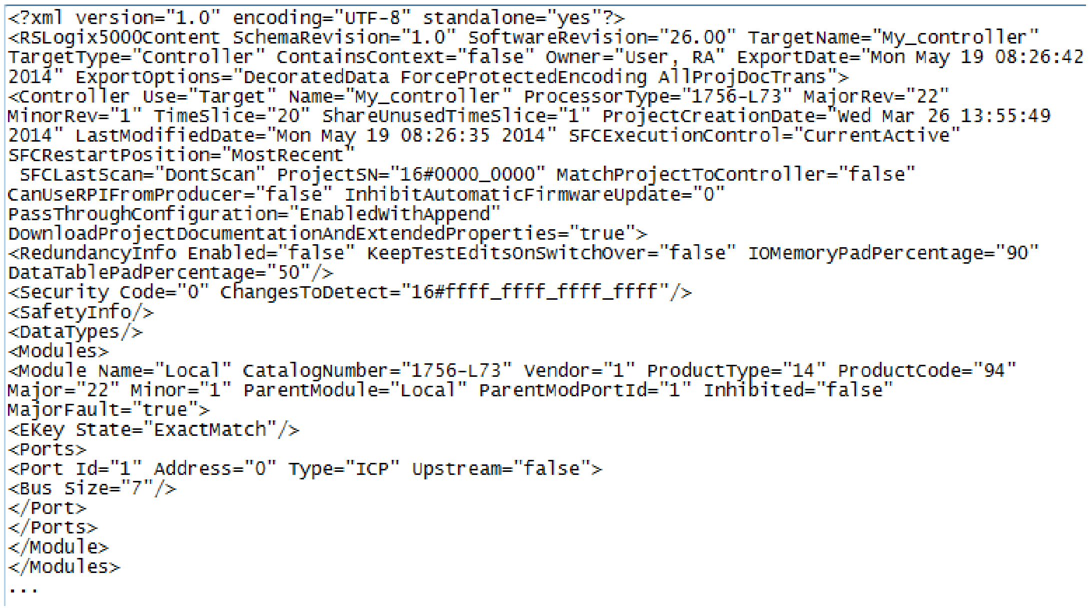
All components in an .L5X import/export file follow this structure.

```
<component_type [attribute_list]>
   [body]
</component_type>
```

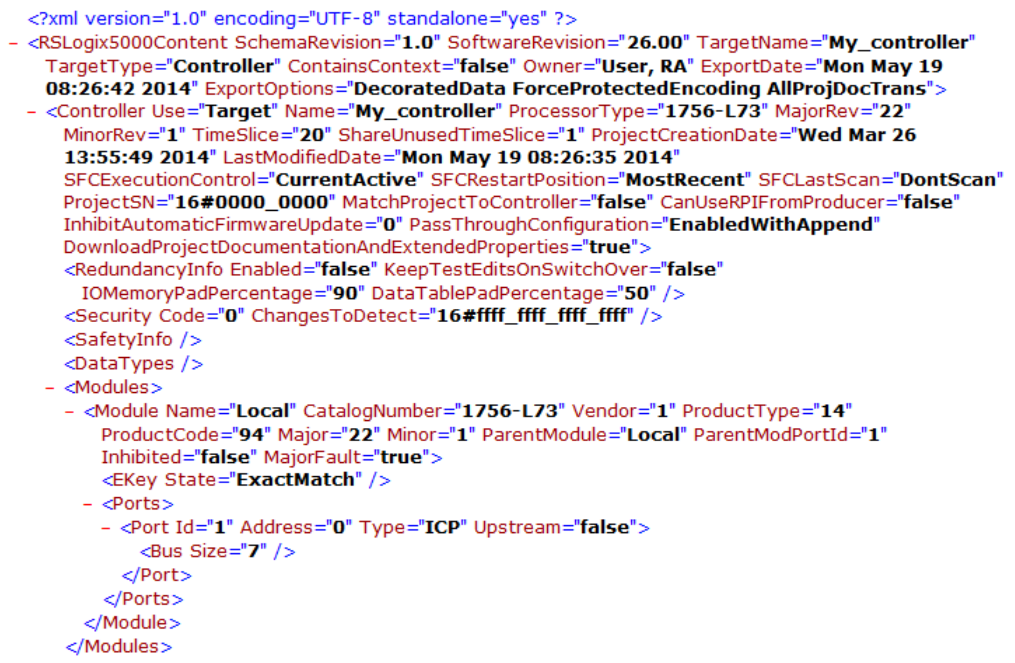
Item	Description
<component_type>	The component begin tag.
attribute_list	List of attributes for the component in the form: attribute_name="attribute_value" Separate attributes with a space.

Item	Description
body	The content of the component. The content could include any subcomponents, for example, routines contained within a program, or a description of the component. The content could also include information about the component, for example, the data for a tag component. The body of the component is optional.
Internet Explorer®</component_type>Internet ExplorerInternet Explorer	The component end tag. A component with no content in the body may combine its begin and end tag as one tag: (<component_type attribute_list />

The .L5X file is an ASCII file that is structured by using Extensible Markup Language (XML). In addition to being able to open and modify the .L5X file in a text editor, such as Notepad, you can also view the contents of the file in Internet Explorer® and other tools that work with .XML files.

If you use:	You see:
A text editor, such as Notepad	A text file, such as:  Edit this file in the text editor.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00" TargetName="My_controller"
TargetType="Controller" ContainsContext="false" Owner="User, RA" ExportDate="Mon May 19 08:26:42
2014" ExportOptions="DecoratedData ForceProtectedEncoding AllProjDocTrans">
<Controller Use="Target" Name="My_controller" ProcessorType="1756-L73" MajorRev="22"
MinorRev="1" TimeSlice="20" ShareUnusedTimeSlice="1" ProjectCreationDate="Wed Mar 26 13:55:49
2014" LastModifiedDate="Mon May 19 08:26:35 2014" SFCExecutionControl="CurrentActive"
SFCRestartPosition="MostRecent"
 SFCLastScan="DontScan" ProjectSN="16#0000_0000" MatchProjectToController="false"
CanUseRPIFromProducer="false" InhibitAutomaticFirmwareUpdate="0"
PassThroughConfiguration="EnabledWithAppend"
DownloadProjectDocumentationAndExtendedProperties="true">
<RedundancyInfo Enabled="false" KeepTestEditsOnSwitchOver="false" IOMemoryPadPercentage="90"
DataTablePadPercentage="50"/>
<Security Code="0" ChangesToDetect="16#ffff_ffff_ffff_ffff"/>
<SafetyInfo/>
<DataTypes/>
<Modules>
<Module Name="Local" CatalogNumber="1756-L73" Vendor="1" ProductType="14" ProductCode="94"
Major="22" Minor="1" ParentModule="Local" ParentModPortId="1" Inhibited="false"
MajorFault="true">
<EKey State="ExactMatch"/>
<Ports>
<Port Id="1" Address="0" Type="ICP" Upstream="false">
<Bus Size="7"/>
</Port>
</Ports>
</Module>
</Modules>
...
```

If you use:	You see:
An Internet browser, such as Internet Explorer	An .XML file, such as:  In the Internet browser, you can view only the file. Click the plus (+) and minus (-) to expand and collapse the viewable content. To edit the file, open the file in a text editor.

```
  <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00" TargetName="My_controller"
    TargetType="Controller" ContainsContext="false" Owner="User, RA" ExportDate="Mon May 19
    08:26:42 2014" ExportOptions="DecoratedData ForceProtectedEncoding AllProjDocTrans">
  - <Controller Use="Target" Name="My_controller" ProcessorType="1756-L73" MajorRev="22"
      MinorRev="1" TimeSlice="20" ShareUnusedTimeSlice="1" ProjectCreationDate="Wed Mar 26
      13:55:49 2014" LastModifiedDate="Mon May 19 08:26:35 2014"
      SFCExecutionControl="CurrentActive" SFCRestartPosition="MostRecent" SFCLastScan="DontScan"
      ProjectSN="16#0000_0000" MatchProjectToController="false" CanUseRPIFromProducer="false"
      InhibitAutomaticFirmwareUpdate="0" PassThroughConfiguration="EnabledWithAppend"
      DownloadProjectDocumentationAndExtendedProperties="true">
      <RedundancyInfo Enabled="false" KeepTestEditsOnSwitchOver="false"
        IOMemoryPadPercentage="90" DataTablePadPercentage="50" />
      <Security Code="0" ChangesToDetect="16#ffff_ffff_ffff_ffff" />
      <SafetyInfo />
      <DataTypes />
    - <Modules>
      - <Module Name="Local" CatalogNumber="1756-L73" Vendor="1" ProductType="14"
          ProductCode="94" Major="22" Minor="1" ParentModule="Local" ParentModPortId="1"
          Inhibited="false" MajorFault="true">
          <EKey State="ExactMatch" />
        - <Ports>
          - <Port Id="1" Address="0" Type="ICP" Upstream="false">
              <Bus Size="7" />
            </Port>
          </Ports>
        </Module>
      </Modules>
```

.L5X file conventions

The import/export feature L5X format is structured by using the Extensible Markup Language (XML). The XML specification is an open standard and is widely documented elsewhere. The only special convention used to describe the L5X format in this document is that items shown in square brackets ([ ]) are optional.

White space characters include spaces, tabs, carriage returns, new line, and form feeds. These characters can occur anywhere in an import/export file, except in keywords or names. If white space characters occur outside of descriptions, they are ignored.

Internal file comments

Enter internal file comments to document your .L5X import files by using the XML commenting format. The import process ignores these comments. Place comments anywhere in an import/export .L5X file except within XML tag elements. You cannot next a comment within another comment.

An XML comment begins with the character sequence <!-- and ends with the character sequence -->. The comment appears between the begin and end character sequence. The character sequence -- may not appear within a comment. The text of the comment is ignored by the XML parser. This is an example.

```
<!-- This is a comment that includes an XML start tag element,
<mytag>. The start tag is ignored by the parser. -->
```

Component Descriptions

Descriptions of components are optional. Unlike internal file comments, descriptions of components are imported. To add a description to a component, add a <Description> start tag element as the first sub-element of the component and then the description as a CDATA element in the body of the <Description> element.

Component descriptions are brought into the project without being processed by the XML parser for markup language. The description text is contained in a CDATA element, a standard in the XML specification. A CDATA element begins with the character sequence <![CDATA[and ends with the character sequence]]>. None of the text within the CDATA element is interpreted by the XML parser. The CDATA element preserves formatting so there is no need to use control characters to enter formatted descriptions.

```
<Task Name="Task1" Type="PERIODIC" Rate="1000" Priority="10"
Watchdog="500" DisableUpdateOutputs="false"
InhibitTask="false">
   <Description>
      <![CDATA[
         This is a task description with
         a line feed and “ a quote.
      ]]>
   </Description>
</Task>
```

Boolean attribute values

Many boolean attributes in the L5K format may have a value of 1 (enabled) or 0 (disabled). In the L5X format, these same attributes have a value of true (enabled) or false (disabled). Throughout this manual, a value of true or false should be specified in the L5X format for any attributes that indicate a value of 1 or 0.

Data display style

Tags and data types support a radix attribute that specifies how to display the associated numerical information in the Logix Designer application.

Radix Display Option	Example (based on 15 decimal)
Binary (uses a 2# prefix)	2#0000_0000_0000_1111
Octal (uses a 8# prefix)	8#000_017
Decimal	15
Hex (uses a 16# prefix)	16#000F
Ascii	‘$00$0F’
Exponential	1.5000000e+01
Float	15.0

Data formats

The Logix Designer application imports the data in tags, modules, and data structures (default values) with a <Data> element. You can import the <Data> element in three different formats from the .L5X file: raw, L5K, and decorated format. The format is indicated by a Format attribute.

```
<Tag Name="bINTtag" TagType="Base" DataType="INT"
   Radix="Decimal">
   <Data>05 00</Data>
   <Data Format="L5K">
      <![CDATA[5 ]]>
   </Data>
   <Data Format="Decorated">
      <DataValue DataType="INT" Radix="Decimal" Value="5"/>
   </Data>
</Tag>
```

The application exports all data values in both raw and decorated data format to the .L5X export file, with the exception that the InputTag under a module connection does not have the raw data format exported.

If multiple formats are present in the .L5X file, they must appear in the order of raw, L5K (if present), and decorated format. The data overwrites previous values if different. For example, if the decorated data is manipulated in the .L5X file, the decorated data values overwrite the raw data on import.

Raw data format

Raw data format is a hex dump of the data and includes hidden (config) data. It is not intended to be readable. It is exported in the same format for all types of data types. The raw data format is the default format. A format attribute is not present if the <Data> element is in raw format.

Data Type	Raw Data Export Format
Atomic	Example: an INT tag `<Data>05 00</Data>`
Array of an Atomic Data Type	Example: an array of 4 INT tags `<Data>02 00 03 00 04 00 05 00</Data>`
Structure Data Type	Example: a TIMER tag `<Data>00 00 00 00 01 00 00 00 05 00 00 00</Data>`
Array of a Structure Data Type	Example: an array of 3 TIMER tags `<Data>00 00 00 00 01 00 00 00 05 00 00 00 00 00 00 02 00 00 00 07 00 00 00 00 00 00 00 05 00 00 00 09 00 00 00</Data>`

L5K Data Format

L5K data format is the same data format that appears in an .L5K file, wrapped in a CDATA element. It is exported in the same format for all types of data types. It is indicated by the Format="L5K" attribute in the <Data> start tag element.

The L5K data format is not exported during a full project or component L5X format. However, it is imported if present in an .L5X file. This format is provided to enable customers to leverage the L5K data format as they convert their auto generation tools from L5K to L5X format.

Data Type	**L5K Data Export Format**

Atomic	Example: an INT tag
	`<Data Format="L5K">`
	`  <![CDATA[5 ]]>`
	`</Data>`

Array of an Atomic Data Type	Example: an array of 4 INT tags
	`<Data Format="L5K">`
	`  <![CDATA[[2,3,4,5] ]]>`
	`</Data>`

Structure Data Type	Example: a TIMER tag
	`<Data Format="L5K">`
	`  <![CDATA[[0,1,5] ]]>`
	`</Data>`

Array of a Structure Data Type	Example: an array of 3 TIMER tags
	`<Data Format="L5K">`
	`  <![CDATA[[[0,1,5],[0,2,7],[0,5,9]] ]]>`
	`</Data>`

Decorated Data Format

Decorated data format is verbose and provides a human readable format of the data. It was added to the L5X format in version 17 of the application, for both L5X full project and L5X component exports and is recommended over the L5K format. The format of the data varies by data type. The decorated data format is indicated by the Format="Decorated" attribute in the <Data> start tag element.

Data Type	**Decorated Data Export Format**

Atomic	Example: an INT tag
	`<Data Format="Decorated">`
	` <DataValue DataType="INT" Radix="Decimal" Value="5"/>`
	`</Data>`

Array of an Atomic Data Type	Example: an array of 4 INT tags
	`<Data Format="Decorated">`
	`  <Array DataType="INT" Dimensions="4" Radix="Decimal">`
	`    <Element Index="[0]" Value="2"/>`
	`    <Element Index="[1]" Value="3"/>`
	`    <Element Index="[2]" Value="4"/>`
	`    <Element Index="[3]" Value="5"/>`
	`  </Array>`
	`</Data>`

Data Type	**Decorated Data Export Format**

Structure Data Type	Example: a TIMER tag
	`<Data Format="Decorated">`
	`  <Structure DataType="TIMER">`
	`    <DataValueMember Name="PRE" DataType="DINT" Radix="Decimal"`
	`      Value="1"/>`
	`    <DataValueMember Name="ACC" DataType="DINT" Radix="Decimal"`
	`      Value="5"/>`
	`    <DataValueMember Name="EN" DataType="BOOL" Value="0"/>`
	`    <DataValueMember Name="TT" DataType="BOOL" Value="0"/>`
	`    <DataValueMember Name="DN" DataType="BOOL" Value="0"/>`
	`  </Structure>`
	`</Data>`

Data Type	Decorated Data Export Format
Array Structure Data Type	Example: an array of 3 TIMER tags

```
<Data Format="Decorated">
  <Array DataType="TIMER" Dimensions="3">
    <Element Index="[0]">
      <Structure DataType="TIMER">
        <DataValueMember Name="PRE" DataType="DINT" Radix="Decimal"
          Value="1"/>
        <DataValueMember Name="ACC" DataType="DINT" Radix="Decimal"
          Value="5"/>
        <DataValueMember Name="EN" DataType="BOOL" Value="0"/>
        <DataValueMember Name="TT" DataType="BOOL" Value="0"/>
        <DataValueMember Name="DN" DataType="BOOL" Value="0"/>
      </Structure>
    </Element>
    <Element Index="[1]">
      <Structure DataType="TIMER">
        <DataValueMember Name="PRE" DataType="DINT" Radix="Decimal"
         Value="2"/>
        <DataValueMember Name="ACC" DataType="DINT" Radix="Decimal"
         Value="7"/>
        <DataValueMember Name="EN" DataType="BOOL" Value="0"/>
        <DataValueMember Name="TT" DataType="BOOL" Value="0"/>
        <DataValueMember Name="DN" DataType="BOOL" Value="0"/>
      </Structure>
    </Element>
    <Element Index="[2]">
      <Structure DataType="TIMER">
        <DataValueMember Name="PRE" DataType="DINT" Radix="Decimal"
          Value="5"/>
        <DataValueMember Name="ACC" DataType="DINT" Radix="Decimal"
          Value="9"/>
        <DataValueMember Name="EN" DataType="BOOL" Value="0"/>
        <DataValueMember Name="TT" DataType="BOOL" Value="0"/>
        <DataValueMember Name="DN" DataType="BOOL" Value="0"/>
      </Structure>
    </Element>
  </Array>
</Data>
```

Tip: If the decorated data for a tag exceeds 16 KB, the decorated data format will not be exported. In this case, the raw data format will preserve the data values of the tag.

Force Values

Force values are indicated with an additional <ForceData> XML tag element for both raw and L5K data formats. However, for decorated data, force values are indicated with ForceValue attribute in the <DataValue> XML tag element of the decorated data format.

```
<Tag Name="aDINTTag" TagType="Produced"
  DataType="DINT" Radix="Decimal">
  <ProduceInfo ProduceCount="1"
    ProgrammaticallySendEventTrigger="false"
    UnicastPermitted="false"/>
  <Data>03 00 00 00</Data>
  <ForceData>00 00 00 00 FF FF FF FF 07 00 00
    00
  </ForceData>
  <Data Format="L5K">
    <![CDATA[3 ]]>
  </Data>
  <ForceData Format="L5K">
    <![CDATA[[0,0,0,0,-1,-1,-1,-1,7,0,0,0] ]]>
  </ForceData>
  <Data Format="Decorated"><DataValue
    DataType="DINT" Radix="Decimal" Value="3"
    ForceValue="7"/>
  </Data>
</Tag>
```

.L5K file structure

The .L5K import/export file contains these components. The L5K format for each component is described in subsequent chapters of this reference manual.

Component	Description	See Chapter
CONTROLLER	The controller	Chapter 2 Define a Controller Component on page 49
DATATYPE	User-defined and I/O data structures	Chapter 3 Define a Datatype Component on page 63
MODULE	Modules in the controller organizer	Chapter 4 Define a Module Component on page 69
ADD_ON_INSTRUCTION_ DEFINITION	Add-On Instructions	Chapter 5 Define an Add-On Instruction Component on page 85
TAG	Controller-scope tags	Chapter 6 Define a Tag Component on page 105
PROGRAM	Program files	Chapter 7 Define a Program Component on page 137
ROUTINE	Ladder logic routines	Chapter 8 Define a Ladder Logic Routine on page 147
FBD_ROUTINE	Function block diagram routines	Chapter 9 Define a Function Block Diagram Routine on page 159
SFC_ROUTINE	Sequential function chart routine	Chapter 10 Define a Sequential Function Chart Routine on page 181
ST_ROUTINE	Structured text routine	Chapter 11 Define a Structured Text Routine on page 201
TASK	Controller tasks	Chapter 12 Define a Task Component on page 221
PARAMETER_CONNECTION	Program Parameter connections	Chapter 13 Define a Parameter Connection on page 225
TREND	Any trend configured for the controller project	Chapter 14 Define a Trend Component on page 229
WATCH_LIST	All quick watch lists configured in the controller project	Chapter 15 Define a Watch List Component on page 235
CONFIG	Configuration information	Chapter 16 Define Controller Configuration Objects on page 237

The CONTROLLER component is the overall structure of the import/export file. It contains the configuration information and logic of the controller project.

The header remarks (optional) and the version statement come before the CONTROLLER component.

```
Import-Export
Version  := RSLogix 5000 16.00
Owner    := User Name, Rockwell Automation
Exported := Tue May 13 08:39:40 2014
IE_VER := 2.20;
```

All components in an L5K import/export file follow this structure.

```
Component_Type <component_name> [Attributes]
   [body]
END_Component_Type
```

Item	Description
Component_Type	The component.
component_name	A specific instance of the component.
Attributes	Any attributes of the component. Component descriptions appear as an attribute of the component. Separate each attribute with a comma (,).
body	Any subcomponents (children) of this component.
END_Component_Type	End of the component information.

.L5K file conventions

The import/export feature L5K format described in this document is based on the formats specified by the IEC 1131-3 specification.

Convention	Description
< >	Items shown in angle brackets are required.
[ ]	Items shown in square brackets are optional.
user_value	Items in italics indicate user-supplied information.
LITERAL	Items in all uppercase indicate a required keyword or symbol that must be entered as shown.
"["	Items in double quotes are required characters.

White space characters include spaces, tabs, carriage returns, new line, and form feeds. These characters can occur anywhere in an import/export file, except in keywords or names. If white space characters occur outside of descriptions, they are ignored.

Internal file comments

Enter comments to document import files. The import process ignores these comments. Place comments anywhere in an import/export file, except in names and descriptions. Enter comments by starting the line (record) with REMARK and a comma.

Component descriptions

Descriptions of components are optional. Unlike internal file comments, descriptions are imported. The description of a component is added as an attribute of the component in the L5K format. Place the description within double quotes. See this example.

```
TASK Task1 (Description := "Hello World",
    Type := PERIODIC, Rate := 1000,
    Priority := 10, Watchdog := 500,
    DisableUpdateOutputs := No)
END_TASK
```

To enter control characters in the description, precede the character with a dollar sign ($). This table shows how to enter the supported control characters in a description.

Character	Required Entry
$	$$
'	$'
"	$Q
10 (line feed)	$L or $l
13,10 (carriage return, line feed)	$N or $n
12 (form feed)	$P or $p
13 (carriage return)	$R or $r
9 (tab)	$T or $t
xxxx (4-digit character code that represents a hexadecimal value)	$xxxx

Display style

Tags and data types support a radix attribute that specifies how to display the associated numerical information in the Logix Designer application.

Radix Display Option	Example (based on 15 decimal)
Binary (uses a 2# prefix)	2#0000_0000_0000_1111
Octal (uses a 8# prefix)	8#000_017
Decimal	15
Hex (uses a 16# prefix)	16#000F
Ascii	'$00$0F'
Exponential	1.5000000e+01
Float	15.0

Project documentation

Starting with version 17 of the application, you can display project documentation, such as tag descriptions and rung comments for any supported localized language. You can store project documentation for multiple languages in a single project file rather than in language-specific project files. Define all the localized languages that the project will support and set the current, default, and optional custom localized language. The software uses the default language if the content of the current language is blank for a particular component of the project. However, you can use a custom language to tailor documentation to a specific type of project file user.

Enter the localized descriptions in your Logix Designer application project when programming in that language or when using the import/export utility to translate the documentation off-line and import it back into the project. Once you enable project documentation in the Logix Designer application, you can dynamically switch between languages as you use the software.

These project documentation variables are available for any supported localized language:

- Component descriptions in tags, routines, programs, equipment phases, user-defined data types, and Add-On Instructions
- Engineering units and state identifiers added to tags, user-defined data types, or Add-On Instructions
- Trends
- Controllers
- Alarm messages (in configuration of ALARM_ANALOG and ALARM_DIGITAL tags)
- Tasks
- Property descriptions for a module in the Controller Organizer
- Rung comments, Sequential Function Chart text boxes, and Function Block Diagram text boxes

The localized comments are exported in all formats, L5K, L5X, CSV, and TXT. For more information on enabling a project to support multiple translations of project documentation, see the online help.

Define a controller component

Introduction

This chapter explains the overall structure of the controller component.

Controller component

The controller component contains the overall structure of a project to be executed on one controller. It contains the configuration information and logic that you download to one controller.

L5X controller structure

```
<Controller [controller_attributes]>
      <Description>
            <![CDATA[ text ]]>
      </Description>
      <RedundancyInfo [redundancyinfo_attributes]/>
      <Security [security_attributes]/>
            <PrimaryActionSets>
                  <PrimaryActionSet
PermissionSet=”PermissionSetName1” IsPermissionSet=”true”>
                        <![CDATA[ encoded_cached_permissions
]]>
                  </PrimaryActionSet>
                  <PrimaryActionSet
PermissionSet=”PermissionSetName2” IsPermissionSet=”false”>
                        <![CDATA[ encoded_cached_permissions
]]>
                  </PrimaryActionSet>
                  …
            </ PrimaryActionSets >
      </Security>
      <SafetyInfo [safetyinfo_attributes]>
            <SafetyTagMap>
            [comma separated safety tag map]
            </SafetyTagMap>
      </SafetyInfo>
      <DataTypes>
            [datatype]
      </DataTypes>
      <Modules>
            [module]
      </Modules>
      <AddOnInstructionDefinitions>
            [addoninstructiondefinition]
```

```
        </AddOnInstructionDefinitions>
        <Tags>
               [tag]
        </Tags>
        <Programs>
               [program]
        </Programs>
        <Tasks>
               [task]
        </Tasks>
        <ParameterConnections>
                [parameter_connection]
        </ParameterConnections>
        <CommPorts>
               [commport]
        </CommPorts>
        <CST [attribute_list] />
        <WallClockTime [attribute_list] />
        <Trends>
               [trend]
        </Trends>
        <QuickWatchLists>s
               [watch_list]
        </QuickWatchLists>
        < InternetProtocol  [Internet_Protocol_Attributes] />
<EthernetPorts>
        <EthernetPort [Ethernet_Port_Attributes] />
        <EthernetPort [Ethernet_Port_Attributes] />
</EthernetPorts>
<EthernetNetwork [Ethernet_Network_Attributes] />
</Controller>
```

Tip: The L5X controller structure must be contained within an RSLogix5000Content root element begin tag (<RSLogix5000Content>) and end tag (</RSLogix5000Content>). See the .L5X File Structure on page 37 in Chapter 1 for more information.

L5K CONTROLLER structure

```
CONTROLLER <controller_name>  [(Description := "text",
             Controller_Attributes)]
        [<DATATYPE declaration>]
        [<MODULE declaration>]
        [<ADD_ON_INSTRUCTION_DEFINITION declaration]
        TAG
               [<tag declarations>]
        END_TAG
        [<PROGRAM declaration>]
        [<TASK declaration>]
        [PARAMETER_CONNECTION declaration]
        [<TREND declaration>]
        [<QUICK_WATCH declaration>]
        PRIMARY_ACTION_SET <permission_set_name>
(IsPermissionSet := Yes) :=
               encoded_cached_permissions;
        END_PRIMARY_ACTION_SET
        [<CONFIG controller objects declaration>]
END_CONTROLLER
```

Controller elements

The table describes the elements comprising a controller.

L5X Item	L5K Item	Description
N/A	*controller_name*	The name of the controller project. In L5X, use a name attribute on the <Controller> element.
Description	Description	User information about the controller project
RedundancyInfo	N/A	For L5X format, this element contains redundancy attributes.
Security	N/A	For L5X format, this element contains security attributes.
SafetyInfo	N/A	For L5X format, this element contains safety controller attributes.
DataTypes	DATATYPE	I/O and user-defined data structures
Modules	MODULE	Devices in the controller organizer
AddOnInstructionDefinitions	ADD_ON_INSTRUCTION_ DEFINITION	Add-On instructions
Tags	TAG	Controller-scope tags
Programs	PROGRAM	Programs
Tasks	TASK	Tasks
ParameterConnections	PARAMETER_CONNECTIONS	Program parameter connections
Trends	TREND	Controller trends
QuickWatchLists	QUICK_WATCH	List of watch tags specified for a quick watch list
CommPorts, CST, WallClockTime	CONFIG	Characteristics of controller objects (status information)
PrimaryActionSet	PRIMARY_ACTION_SET	Cache of permissions for the Guest Users group that are associated with the specified logical name or permission set.

Controller attributes

Attribute	Description
Use	L5X only. Specify context or target.
Name	L5X only. Specify the name of the controller component. In L5K, the name is an element of the controller component.
ProcessorType	Specify the type of controller. (1756-L71, 1756-L71S, 1756-L72, 1756-L72S, 1756-L73, 1756-L73S, 1756-L74, 1756-L75, 1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B, 1769-L30ER, 1769-L30ERM, 1769-L30ER-NSE, 1769-L33ER, 1769-L33ERM, 1769-L36ERM, Emulator)

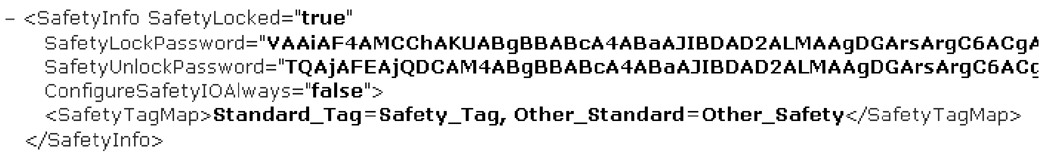
Attribute	Description
Major	L5K only. Specify the major revision number (1…127) of the controller.
MajorRev	L5X only. Specify the major revision number (1…127) of the controller.
MinorRev	L5X only. Specify the minor revision number (1…127) of the controller.
TimeSlice	Percentage of available CPU time (10…90) that is assigned to communication.
ShareUnusedTimeSlice	Specify whether to share an unused timeslice or not. Type a **0** to not share; type a **1** to share.
PowerLossProgram	Name of the program to be executed upon restart after a power loss.
MajorFaultProgram	Name of the program to be executed when a major fault occurs.
CommPath	Specify the devices in the communication path. The communication path ends with the controller (\Backplane\1). This is exported only if you select manual configuration of the communication path in RSLinx software.
CommDriver	Specify the type of communication driver. This is the name of the selected driver in RSLinx software. This is exported only if you select manual configuration of the communication driver in RSLinx software.
RedundancyEnabled	L5K only. Specify whether redundancy is used or not. Type a **0** to disable redundancy; type a **1** to enable redundancy.
Enabled	L5X only. Specify whether redundancy is used (true or false). This attribute is on the <RedundancyInfo> tag element.
KeepTestEditsOnSwitchOver	Specify whether to keep test edits on when a switchover occurs in a redundant system. Type a **0** not to keep test edits on; type a **1** to keep test edits on. For L5X, this attribute is on the <RedundancyInfo> tag element. Type **false** or **true**.
IOMemoryPadPercentage	Specify the percentage (0…100) of I/O memory that is available to the system after the download when configured for redundancy. For L5X, this attribute is on the <RedundancyInfo> tag element.
DataTablePadPercentage	Specify the percentage (0…100) of the data table to reserve. If redundancy is not enabled, type **0**. If redundancy is enabled, type **50**. For L5X, this attribute is on the <RedundancyInfo> tag element.
SecurityCode	L5K only. Specify whether the RSI Security Server is enabled for the controller. Type **0** if the controller is unsecured; type a 10-digit, non-zero value if the controller is secured.
Code	L5X only. Specify whether the RSI Security Server is enabled for the controller. Type **0** if the controller is unsecured; type a 10-digit, non-zero value if the controller is secured. This attribute is on the <Security> tag element.
SFCExecutionControl	Specify whether the SFC executes the current active steps before returning control (CurrentActive) or whether the SFC executes all threads until reaching a false transition (UntilFalse).
SFCRestartPosition	Specify whether the SFC restarts at the most recently executed step (MostRecent) or at the initial step (InitialStep).
SFCLastScan	Specify how the SFC manages its state on a last scan. Select AutomaticReset, ProgrammaticReset, or DontScan.
SerialNumber	L5K only. Specify the serial number of the controller. If a serial number is specified, it is imported into the project regardless of the MatchProjectToController setting. Type a 32-bit, hexadecimal number with the 16# prefix, such as 16#0012_E2BC.

Attribute	**Description**
ProjectSN	L5X only. Specify the serial number of the controller. If a serial number is specified, it is imported into the project regardless of the MatchProjectToController setting. Type a 32-bit, hexadecimal number with the 16# prefix, such as 16#0012_E2BC.
MatchProjectToController	Specify whether to be sure that the project matches the controller or not. Type **Yes** or **No**.
InhibitAutomaticFirmwareUpdate	Specify whether to inhibit the automatic update of controller firmware. Type a **0** to not inhibit; type a **1** to inhibit.
CurrentProjectLanguage	Specify the current project language for a project documentation project.
DefaultProjectLanguage	Specify the default project language for a project document at on project.
ControllerLanguage	Specify the controller project language for a project document at on project.
CanUseRPIFromController	Specify whether the consumed tags in the controller can connect to the producer with an RPI provided by the producer (true or false).
SecurityAuthorityID	ID of the FactoryTalk Diagnostics® to which your controller is bound. For L5X only, this attribute is on the <Security> tag element.
SecurityAuthorityURI	Network path to the FactoryTalk Diagnostics to which your controller is bound. For L5X only, this attribute is on the <Security> tag element.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object. For L5X only, this attribute is on the <Security> tag element.
IsPermissionSet	Indicates if this is associated with a permission set or a logical name.
ChangesToDetect	Mask that specifies the controller events that you wish to track. For L5X only, this attribute is on the <Security> tag element.
TrustedSlots	Mask defining the slots through which the trusted communication is permitted to the controller. For L5X only, this attribute is on the <Security> tag element
PassThroughConfiguration	For L5K and L5X. Indicates the pass through state of documentation for the project. Type **Disabled**, **Enabled**, or **EnabledWithAppend**
DownloadProjectDocumentationAndExtendedProperties	For L5K and L5X. Indicates the download project documentation configuration setting of the project.
DownloadCustomProperties	For L5K and L5X. Indicates the download custom properties configuration setting of the project. Only applies if the project is already configured to DownloadProjectDocumentation. Rockwell recommends setting this attribute to false only during startup testing to improve download speeds during commissioning testing. It should be set to true for the normal operating state of a system. For L5X, the setting is **true** or **false**. For L5K, the setting is **1** (true) or **0** (false).
EtherNetIPMode	The EtherNet/IP Mode describes the relationship between the CIP EtherNet/IP ports and the physical Ethernet ports. The CIP EtherNet/IP port can be configured as one of two modes: • Dual-IP • Linear/DLR

Controller attributes in a safety controller system

For safety controllers, specify these attributes for the Controller component, in addition to those previously described.

Attribute	Description
SafetySignature	Specifies the safety signature control as defined in the controller properties. This value is exported only; it is ignored on import. For L5X, this attribute is on the <SafetyInfo> tag element.
SafetyLocked	Displays whether the safety controller is locked or not. This value is exported only; it is ignored on import. This value will be Yes or No. For L5X, this attribute is on the <SafetyInfo> tag element. Type **true** or **false**.
SafetyLockPassword	Specifies the lock password in the controller. This value is encrypted on export. For L5X, this attribute is on the <SafetyInfo> tag element.
SafetyUnlockPassword	Specifies the unlock password in the controller. This value is encrypted on export. For L5X, this attribute is on the <SafetyInfo> tag element.

SafetyTagMap	L5K only as an attribute. Specify the tags in the safety tag map. Place double quotes around the tags. Each entry must end with a comma and carriage return. This is an example.
	"StdTag1=SafeTag1,
	StdTag2=SafTag2"
	
	For L5X, a <SafetyTagMap> element is a subelement under the <SafeyInfo> element. Specify the tags in the safety tag map in the body of the <SafetyTagMap> element Do not use quotes. Separate mappings with a comma and a space.
	
	
	- <SafetyInfo SafetyLocked="**true**"
	    SafetyLockPassword="**VAAiAF4AMCChAKUABgBBABcA4ABaAJIBDAD2ALMAAgDGArsArgC6ACgA**
	    SafetyUnlockPassword="**TQAjAFEAjQDCAM4ABgBBABcA4ABaAJIBDAD2ALMAAgDGArsArgC6ACg**
	    ConfigureSafetyIOAlways="**false**">
	    <SafetyTagMap>**Standard_Tag=Safety_Tag, Other_Standard=Other_Safety**</SafetyTagMap>
	  </SafetyInfo>

ConfigureSafetyIOAlways	Specify whether to configure safety I/O when replacing safety I/O. Type **Yes** or **No**. For L5X, this attribute is on the <SafetyInfo> tag element. Type **true** or **false**.
SignatureRunModeProtect	Indicates whether you can modify the safety signature when in Run mode. For L5X only, this attribute is on the <SafetyInfo> tag element.

Controller guidelines

Observe these guidelines when defining a controller:

- All declarations must be ordered in the prescribed syntax.
- The maximum number of tasks vary by the controller type.

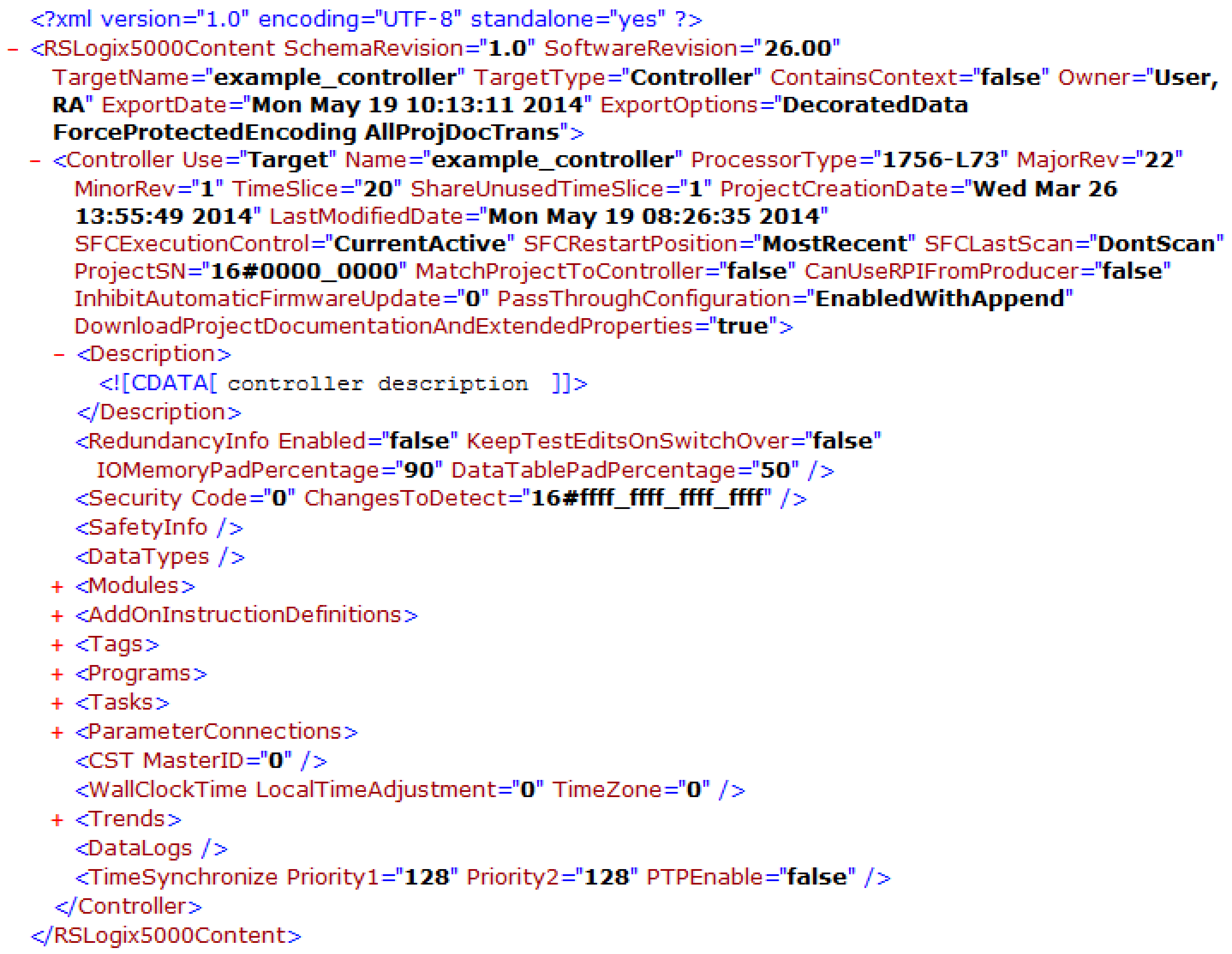
Controller	Maximum Number of Tasks
ControlLogix®	32
SoftLogix™ 5800	32

Controller	Maximum Number of Tasks
FlexLogix™	8
CompactLogix™	4
DriveLogix™	4

- There can be only one continuous task.
- Programs can be scheduled under only one task.
- There can be a maximum of 1000 programs under a task.
- Scheduled programs must be defined.

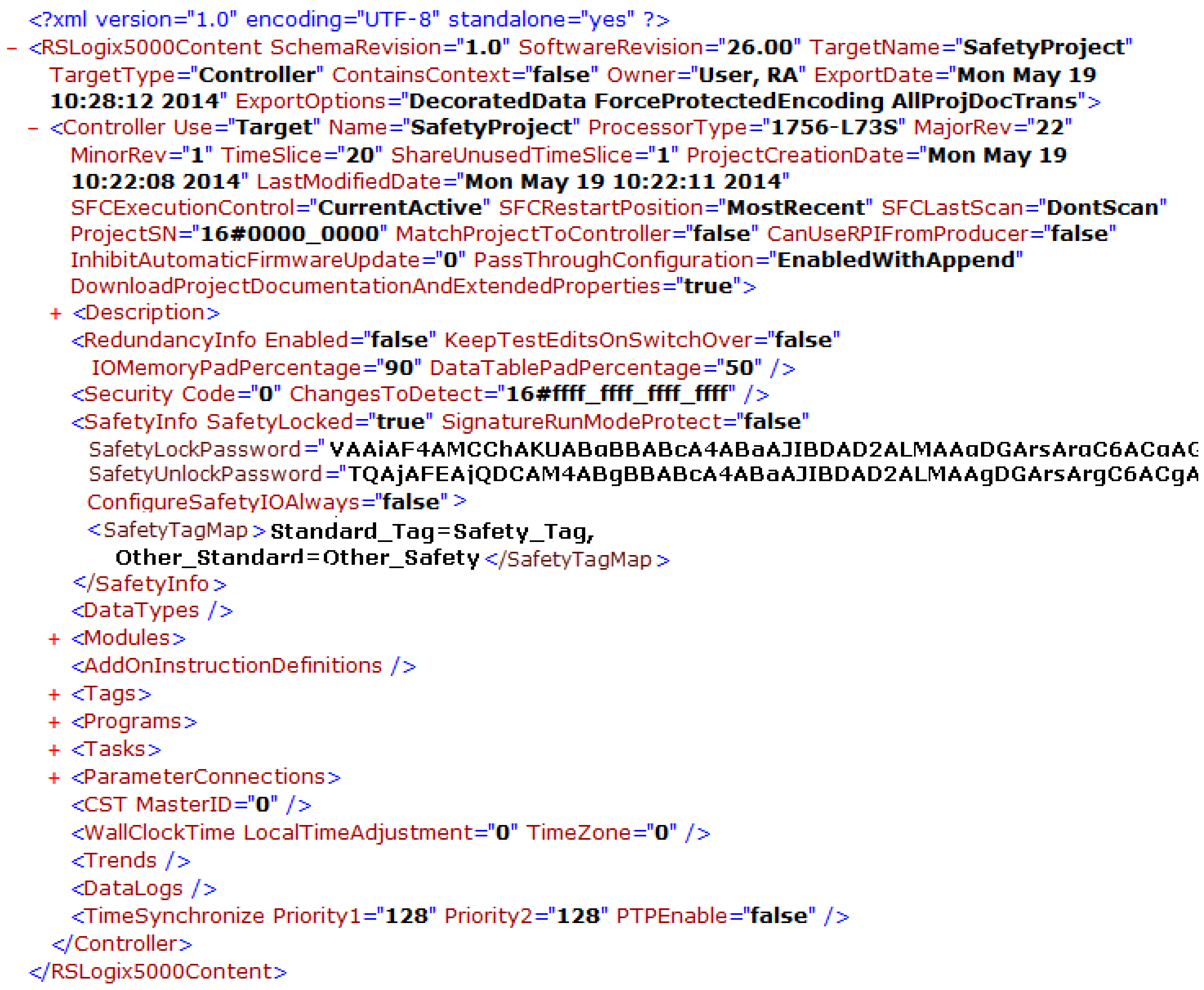
Examples

L5X Controller Example



```
 <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00"
   TargetName="example_controller" TargetType="Controller" ContainsContext="false" Owner="User,
   RA" ExportDate="Mon May 19 10:13:11 2014" ExportOptions="DecoratedData
   ForceProtectedEncoding AllProjDocTrans">
 - <Controller Use="Target" Name="example_controller" ProcessorType="1756-L73" MajorRev="22"
     MinorRev="1" TimeSlice="20" ShareUnusedTimeSlice="1" ProjectCreationDate="Wed Mar 26
     13:55:49 2014" LastModifiedDate="Mon May 19 08:26:35 2014"
     SFCExecutionControl="CurrentActive" SFCRestartPosition="MostRecent" SFCLastScan="DontScan"
     ProjectSN="16#0000_0000" MatchProjectToController="false" CanUseRPIFromProducer="false"
     InhibitAutomaticFirmwareUpdate="0" PassThroughConfiguration="EnabledWithAppend"
     DownloadProjectDocumentationAndExtendedProperties="true">
   - <Description>
       <![CDATA[ controller description  ]]>
     </Description>
     <RedundancyInfo Enabled="false" KeepTestEditsOnSwitchOver="false"
       IOMemoryPadPercentage="90" DataTablePadPercentage="50" />
     <Security Code="0" ChangesToDetect="16#ffff_ffff_ffff_ffff" />
     <SafetyInfo />
     <DataTypes />
   + <Modules>
   + <AddOnInstructionDefinitions>
   + <Tags>
   + <Programs>
   + <Tasks>
   + <ParameterConnections>
     <CST MasterID="0" />
     <WallClockTime LocalTimeAdjustment="0" TimeZone="0" />
   + <Trends>
     <DataLogs />
     <TimeSynchronize Priority1="128" Priority2="128" PTPEnable="false" />
   </Controller>
 </RSLogix5000Content>
```

L5X Safety Controller Example



```
  <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00" TargetName="SafetyProject"
   TargetType="Controller" ContainsContext="false" Owner="User, RA" ExportDate="Mon May 19
   10:28:12 2014" ExportOptions="DecoratedData ForceProtectedEncoding AllProjDocTrans">
 - <Controller Use="Target" Name="SafetyProject" ProcessorType="1756-L73S" MajorRev="22"
     MinorRev="1" TimeSlice="20" ShareUnusedTimeSlice="1" ProjectCreationDate="Mon May 19
     10:22:08 2014" LastModifiedDate="Mon May 19 10:22:11 2014"
     SFCExecutionControl="CurrentActive" SFCRestartPosition="MostRecent" SFCLastScan="DontScan"
     ProjectSN="16#0000_0000" MatchProjectToController="false" CanUseRPIFromProducer="false"
     InhibitAutomaticFirmwareUpdate="0" PassThroughConfiguration="EnabledWithAppend"
     DownloadProjectDocumentationAndExtendedProperties="true">
   + <Description>
     <RedundancyInfo Enabled="false" KeepTestEditsOnSwitchOver="false"
       IOMemoryPadPercentage="90" DataTablePadPercentage="50" />
     <Security Code="0" ChangesToDetect="16#ffff_ffff_ffff_ffff" />
     <SafetyInfo SafetyLocked="true" SignatureRunModeProtect="false"
       SafetyLockPassword="VAAiAF4AMCChAKUABqBBABcA4ABaAJIBDAD2ALMAAqDGArsArqC6ACqAC
       SafetyUnlockPassword="TQAjAFEAjQDCAM4ABgBBABcA4ABaAJIBDAD2ALMAAgDGArsArgC6ACgA
       ConfigureSafetyIOAlways="false" >
       <SafetyTagMap>Standard_Tag=Safety_Tag,
         Other_Standard=Other_Safety</SafetyTagMap>
     </SafetyInfo>
     <DataTypes />
   + <Modules>
     <AddOnInstructionDefinitions />
   + <Tags>
   + <Programs>
   + <Tasks>
   + <ParameterConnections>
     <CST MasterID="0" />
     <WallClockTime LocalTimeAdjustment="0" TimeZone="0" />
     <Trends />
     <DataLogs />
     <TimeSynchronize Priority1="128" Priority2="128" PTPEnable="false" />
   </Controller>
  </RSLogix5000Content>
```

L5K CONTROLLER Example

```
CONTROLLER example_controller (Description := "controller
description",
                  ProcessorType := "1756-L73",
                  Major := 22,
                  TimeSlice := 20,
                  ShareUnusedTimeSlice := 1,
                  RedundancyEnabled := 0,
                  KeepTestEditsOnSwitchOver := 0,
                  DataTablePadPercentage := 50,
                  SecurityCode := 0,
                  ChangesToDetect := 16#ffff_ffff_ffff_ffff,
                  SFCExecutionControl := "CurrentActive",
                  SFCRestartPosition := "MostRecent",
                  SFCLastScan := "DontScan",
                  SerialNumber := 16#0000_0000,
                  MatchProjectToController := No,
                  CanUseRPIFromProducer := No,
                  InhibitAutomaticFirmwareUpdate := 0,
                  PassThroughConfiguration := EnabledWithAppend,

DownloadProjectDocumentationAndExtendedProperties := Yes)
       MODULE Local (Parent := "Local",
              ParentModPortId := 1,
              CatalogNumber := "1756-L73",
              Vendor := 1,
              ProductType := 14,
              ProductCode := 94,
              Major := 22,
              Minor := 1,
              PortLabel := "RxBACKPLANE",
              ChassisSize := 7,
              Slot := 0,
              Mode := 2#0000_0000_0000_0001,
              CompatibleModule := 0,
              KeyMask := 2#0000_0000_0001_1111)
       END_MODULE
       TAG
       END_TAG

       PROGRAM MainProgram (MAIN := "MainRoutine",
                            MODE := 0, DisableFlag := 0)
              TAG
              END_TAG

              ROUTINE MainRoutine
              END_ROUTINE

       END_PROGRAM
       TASK MainTask (Type := CONTINUOUS,
     Rate := 10, Priority := 10, Watchdog := 500,
            DisableUpdateOutputs := No, InhibitTask := No)
              MainProgram;
       END_TASK
       PARAMETER_CONNECTION
       END_PARAMETER_CONNECTION

CONFIG ASCII(XONXOFFEnable := 0,
             DeleteMode := 0, EchoMode := 0,
             TerminationChars := 65293, AppendChars := 2573,
             BufferSize := 82)
END_CONFIG

CONFIG ControllerDevice END_CONFIG

CONFIG CST(SystemTimeMasterID := 0) END_CONFIG

CONFIG DF1(DuplicateDetection := 1,
    ErrorDetection := BCC Error, EmbeddedResponseEnable := 0,
    DF1Mode := Pt to Pt, ACKTimeout := 50,
    NAKReceiveLimit := 3, ENQTransmitLimit := 3,
    TransmitRetries := 3, StationAddress := 0,
    ReplyMessageWait := 5, PollingMode := 1,
    MasterMessageTransmit := 0, NormalPollNodeFile := "<NA>",
    NormalPollGroupSize := 0, PriorityPollNodeFile := "<NA>",
    ActiveStationFile := "<NA>", SlavePollTimeout := 3000,
    EOTSuppression := 0, MaxStationAddress := 31,
    TokenHoldFactor := 1, EnableStoreFwd := 0,
    StoreFwdFile := "<NA>")
END_CONFIG

CONFIG FileManager END_CONFIG

CONFIG SerialPort(BaudRate := 19200,
           Parity := No Parity, DataBits := 8 Bits of Data,
           StopBits := 1 Stop Bit, ComDriverId := DF1,
           PendingComDriverId := DF1, RTSOffDelay := 0,
           RTSSendDelay := 0, ControlLine := No Handshake,
           PendingControlLine := No Handshake,
           RemoteModeChangeFlag := 0,
           PendingRemoteModeChangeFlag := 0,
           ModeChangeAttentionChar := 27,
           PendingModeChangeAttentionChar := 27,
           SystemModeCharacter := 83,
           PendingSystemModeCharacter := 83,
           UserModeCharacter := 85,
           PendingUserModeCharacter := 85,
           DCDWaitDelay := 0)
END_CONFIG

CONFIG WallClockTime(LocalTimeAdjustment := 0, TimeZone := 0)
CONFIG InternetProtocol [(Internet_Protocol_Attributes)]
END_ CONFIG
CONFIG EthernetPort1 [(Internet_Protocol_Attributes)]
END_ CONFIG
CONFIG EthernetPort2 [(Internet_Protocol_Attributes)]
CONFIG EthernetNetwork [(Ethernet_Network_Attributes)]
END_CONFIG
```

```
END_CONTROLLER
```

L5K Safety CONTROLLER Example

```
CONTROLLER example_safety_controller (Description := "Safety
Project",
   ProcessorType := "1756-L73S",
   Major := 22,
   TimeSlice := 20,
   ShareUnusedTimeSlice := 1,
   RedundancyEnabled := 0,
   KeepTestEditsOnSwitchOver := 0,
   DataTablePadPercentage := 50,
   SecurityCode := 0,
   ChangesToDetect := 16#ffff_ffff_ffff_ffff,
   SFCExecutionControl := "CurrentActive",
   SFCRestartPosition := "MostRecent",
   SFCLastScan := "DontScan",
   SerialNumber := 16#0000_0000,
   MatchProjectToController := No,
   CanUseRPIFromProducer := No,
   SafetyLocked := No,
   SignatureRunModeProtect := No,
   ConfigureSafetyIOAlways := No,
   InhibitAutomaticFirmwareUpdate := 0,
   PassThroughConfiguration := EnabledWithAppend,
   DownloadProjectDocumentationAndExtendedProperties := Yes)
       MODULE Local (Parent := "Local",
                    ParentModPortId := 1,
                    CatalogNumber := "1756-L73S",
                    Vendor := 1,
                    ProductType := 14,
                    ProductCode := 148,
                    Major := 22,
                    Minor := 1,
                    PortLabel := "RxBACKPLANE",
                    ChassisSize := 7,
                    Slot := 0,
                    Mode := 2#0000_0000_0000_0001,
                    CompatibleModule := 0,
                    KeyMask := 2#0000_0000_0001_1111,
                    SafetyNetwork := 16#0000_3c77_0315_5105)
       END_MODULE

       MODULE example_safety_controller:Partner
              (Parent := "Local", ParentModPortId := 1,
               CatalogNumber := "1756-L7SP", Vendor := 1,
                ProductType := 14, ProductCode := 146,
                Major := 22, Minor := 1,
        PortLabel := "RxBACKPLANE", Slot := 1,
        Mode := 2#0000_0000_0000_0000,
        CompatibleModule := 0,
        KeyMask := 2#0000_0000_0001_1111,
        SafetyNetwork := 16#0000_0000_0000_0000)
END_MODULE

TAG
END_TAG

PROGRAM MainProgram (Class := Standard,
        MAIN := "MainRoutine", MODE := 0,
        DisableFlag := 0)
       TAG
       END_TAG

       ROUTINE MainRoutine
       END_ROUTINE

END_PROGRAM

PROGRAM SafetyProgram (Class := Safety,
        MAIN := "MainRoutine", MODE := 0,
        DisableFlag := 0)
       TAG
       END_TAG

       ROUTINE MainRoutine
       END_ROUTINE

END_PROGRAM

TASK MainTask (Type := CONTINUOUS,
        Class := Standard, Rate := 10,
        Priority := 10, Watchdog := 500,
        DisableUpdateOutputs := No, InhibitTask := No)
        MainProgram;
END_TASK

TASK SafetyTask (Type := PERIODIC,
        Class := Safety, Rate := 20,
        Priority := 10, Watchdog := 20,
        DisableUpdateOutputs := No, InhibitTask := No)
        SafetyProgram;
END_TASK

PARAMETER_CONNECTION
END_PARAMETER_CONNECTION
```

```
CONFIG ASCII(XONXOFFEnable := 0,
             DeleteMode := 0, EchoMode := 0,
             TerminationChars := 65293,
             AppendChars := 2573, BufferSize := 82)
END_CONFIG

CONFIG ControllerDevice END_CONFIG

CONFIG CST(SystemTimeMasterID := 0) END_CONFIG

CONFIG DF1(DuplicateDetection := 1,
           ErrorDetection := BCC Error,
           EmbeddedResponseEnable := 0,
           DF1Mode := Pt to Pt, ACKTimeout := 50,
           NAKReceiveLimit := 3, ENQTransmitLimit := 3,
           TransmitRetries := 3, StationAddress := 0,
           ReplyMessageWait := 5, PollingMode := 1,
           MasterMessageTransmit := 0,
           NormalPollNodeFile := "<NA>",
           NormalPollGroupSize := 0,
           PriorityPollNodeFile := "<NA>",
           ActiveStationFile := "<NA>",
           SlavePollTimeout := 3000, EOTSuppression := 0,
           MaxStationAddress := 31, TokenHoldFactor := 1,
           EnableStoreFwd := 0, StoreFwdFile := "<NA>")
END_CONFIG

CONFIG FileManager END_CONFIG

CONFIG SerialPort(BaudRate := 19200,
             Parity := No Parity, DataBits := 8 Bits of Data,
             StopBits := 1 Stop Bit, ComDriverId := DF1,
             PendingComDriverId := DF1, RTSOffDelay := 0,
             RTSSendDelay := 0, ControlLine := No Handshake,
             PendingControlLine := No Handshake,
             RemoteModeChangeFlag := 0,
             PendingRemoteModeChangeFlag := 0,
             ModeChangeAttentionChar := 27,
             PendingModeChangeAttentionChar := 27,
             SystemModeCharacter := 83,
             PendingSystemModeCharacter := 83,
             UserModeCharacter := 85,
             PendingUserModeCharacter := 85, DCDWaitDelay := 0)
END_CONFIG

CONFIG WallClockTime(LocalTimeAdjustment := 0,
                           TimeZone := 0)
CONFIG InternetProtocol [(Internet_Protocol_Attributes)]
END_ CONFIG
```

```
CONFIG EthernetPort1 [(Internet_Protocol_Attributes)]
END_ CONFIG
CONFIG EthernetPort2 [(Internet_Protocol_Attributes)]
CONFIG EthernetNetwork [(Ethernet_Network_Attributes)]
END_CONFIG

END_CONTROLLER
```

Define a Datatype component

Introduction

This chapter explains the overall structure of the datatype component.

Datatype component

Datatype components define the data types used in the logic you export.

L5X datatype structure

```
<DataTypes>
      <DataType [DataType_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <EngineeringUnit>
                  <![CDATA[ engineering_unit_text ]]>
            </EngineeringUnit>
            <Members>
                  [member_list]
            </Members>
      </Datatype
</DataTypes>
```

L5K datatype structure

```
DATATYPE <DataType_name> ([Description := "text",
      EngineeringUnit := "text",
      DataType_Attributes])
      [member_definitions]
END_DATATYPE
```

Datatype elements

L5X Item	L5K Item	Description
N/A	*DataType_name*	The name of the data type. In L5X, use a Name attribute on the <DataType> element.
Description	Description	User information about the data type.
EngineeringUnit	EngineeringUnit	(optional) User-specified description of the unit of the value, such as feet, gallons, and kilos.
Members	*member_definitions*	Defines the members of the data structure.

Datatype attributes

Attribute	Description
Name	L5X only. Specify the name of the data type. In L5K, the name is an element of the data type statement.
Family (L5X) FamilyType (L5K)	Specify StringFamily for a string data type. Specify NoFamily for all other data types.
Class	L5X only. Type **User**.

Datatype member

There are two kinds of datatype members:

- Bit member—a member in which only a single bit of information is accessed.
- Nonbit member—a member that is defined as another data type, such as SINT, INT, DINT, and COUNTER.

L5X datatype member structure

```
<Members>
      <Member [Member_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <EngineeringUnit>
                  <![CDATA[ engineeringunit_unit_text ]]>
            </EngineeringUnit>
            <State0>
                  <![CDATA[ state0_text ]]>
            </State0>
            <State1>
                  <![CDATA[ state1_text ]]>
            </State1>
      </Member>
</Members>
```

L5K datatype member structure

```
<TypeName> <MemberName> ([Description := "text",
      EngineeringUnit := "text",
      State0 := "text",
      State1 := "text",
      Member_Attributes]);
```

A bit member uses this syntax:
BIT <*BitName*> <*HostMemberName*> : <*BitPosition*> [(*Attributes)*];

Datatype member elements

L5X Item	L5K Item	Description
N/A	*TypeName*	The name of the data type of the member. In L5X, use a DataType attribute on the <Member> element.
N/A	*MemberName*	The name of the member. In L5X, use a Name attribute on the <Member> element.
Description	Description	User information about the member.
EngineeringUnit	EngineeringUnit	(optional) User-specified description of the unit of the value, such as feet, gallons, and kilos.
State0	State0	(optional) For Boolean member only. User-specified description of what the Zero state of the Boolean value is.
State1	State1	(optional) For Boolean member only. User-specified description of what the One state of the Boolean value is.
N/A	*BitName*	The name of the bit member. In L5X, use a Name attribute on the <Member> element.
N/A	*HostMemberName*	The hidden host member of bit members. In L5X, use a Target attribute on the <Member> element.
N/A	*BitPosition*	The bit position in the hidden host member. In L5X, use a BitNumber attribute on the <Member> element.

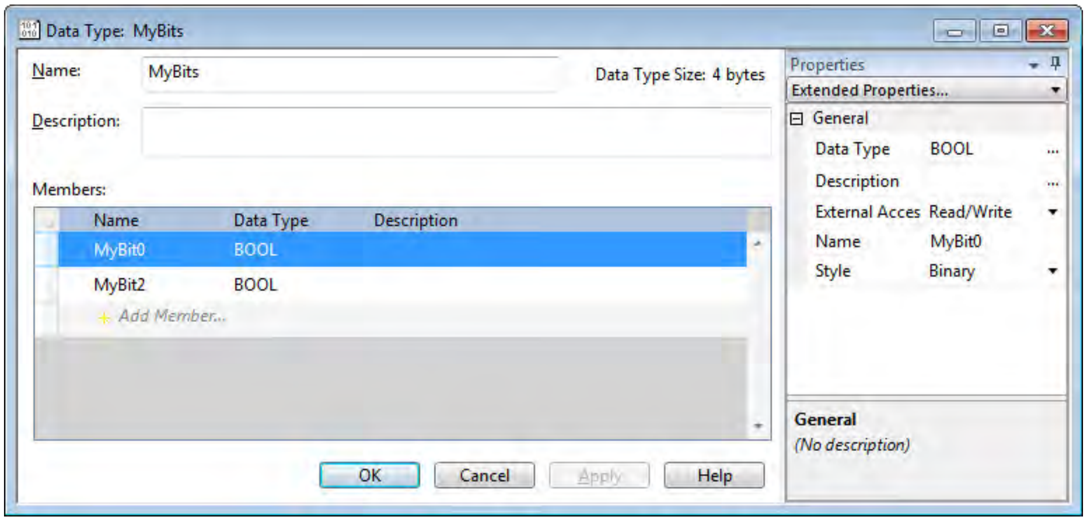
Datatype member attributes

Attribute	Description
Name	L5X only. Specify the name of the member. In L5K, the member name is an element of the member statement.
Dimension	L5X only. Specify the dimensions of the member. Type **0** if atomic or a non-zero value for an array.
Radix	Specify **decimal**, **hex**, **octal**, **binary**, **exponential**, **float**, **ASCII**, or **date/time**.
Hidden	Specify if the member is a hidden member of the structure. Type **1** or **0** (or **true** or **false** for L5X)
Target	The name of the hidden host member.
BitNumber	The bit position in the host member.
Max	(optional) User-specified maximum value for the member. Only valid for members with non-Boolean atomic datatypes.
Min	(optional) User-specified minimum value for the member. Only valid for members with non-Boolean atomic datatypes.
External Access	Specify the external access outside of the controller to the member. Specify **Read/Write**, **Read Only**, or **None**.

Bit members

All data types are allocated in 8-bit boundaries. A single bit of storage is not allowed, so a member cannot be a BOOL data type. To access a single bit, use the BIT declaration. BIT allows access to a single bit within a host member (a non-bit member).

For example, create a user-defined datatype called MyBits and a tag called MyTag of type MyBits'



Data Type: MyBits

Name: MyBits

Data Type Size: 4 bytes

Description:

Members:

Name	Data Type	Description
MyBit0	BOOL	
MyBit2	BOOL	
Add Member...		

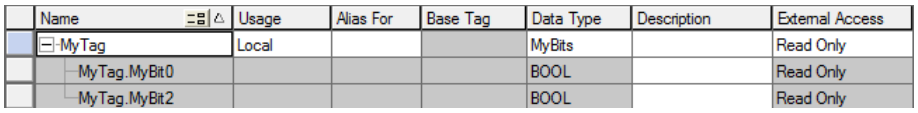
Properties

Extended Properties...

General	
Data Type	BOOL
Description	
External Acces	Read/Write
Name	MyBit0
Style	Binary

General

(No description)



Name	Usage	Alias For	Base Tag	Data Type	Description	External Access
MyTag	Local			MyBits		Read Only
MyTag.MyBit0				BOOL		Read Only
MyTag.MyBit2				BOOL		Read Only

zzzzzzzzzzMyBits0 is the host member of MyBit0 and MyBit1.

The host member is normally a hidden member because only the bit references are visible when you define a tag of the datatype.

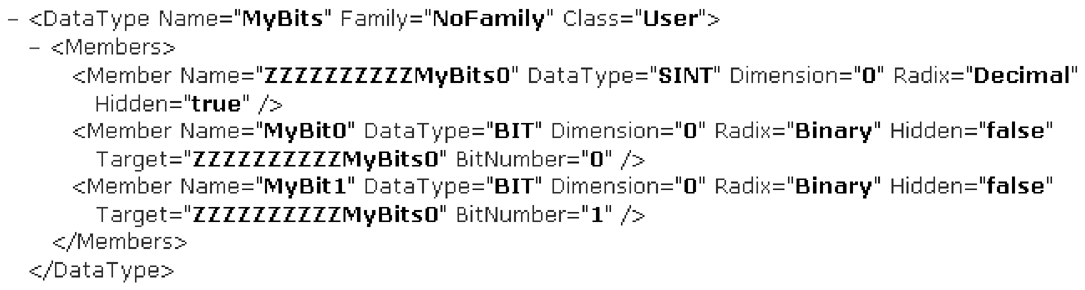
Bit members cannot be defined before their host members. Note that BitPosition zero is the least significant bit.

This is the datatype syntax for this example in the L5K format.

```
DATATYPE MyBits (FamilyType := NoFamily)
SINT ZZZZZZZZZZMyBits0 (Hidden := 1);
      BIT MyBit0 ZZZZZZZZZZMyBits0 : 0 (Radix := Binary);
      BIT MyBit1 ZZZZZZZZZZMyBits0 : 1 (Radix := Binary);
END_DATATYPE
```

Important:	There must be a space between the host member name, colon, and the bit position because type names can contain a colon (for example, I/O structures). The space indicates where the type name ends.

This is the datatype syntax for this example in the L5X format.



```
- <DataType Name="MyBits" Family="NoFamily" Class="User">
  - <Members>
      <Member Name="ZZZZZZZZZZMyBits0" DataType="SINT" Dimension="0" Radix="Decimal"
        Hidden="true" />
      <Member Name="MyBit0" DataType="BIT" Dimension="0" Radix="Binary" Hidden="false"
        Target="ZZZZZZZZZZMyBits0" BitNumber="0" />
      <Member Name="MyBit1" DataType="BIT" Dimension="0" Radix="Binary" Hidden="false"
        Target="ZZZZZZZZZZMyBits0" BitNumber="1" />
    </Members>
  </DataType>
```

Datatype guidelines

Observe these guidelines when defining a datatype:

- Datatypes must be defined first within the controller body.
- Datatypes can be defined out of order. For example, if Type1 depends on Type2, Type2 can be defined first.
- Datatypes can be unverified. For example if Type1 depends on Type2 and Type2 is never defined, then Type1 will be accessible as an unverified type. Type2 will be typeless type. Tags of Type1 may be created but not of Type2.
- Datatype members can be arrays but only one dimension is allowed.
- These datatypes cannot be used in a user-defined datatype:
  - ALARM_ANALOG
  - ALARM_DIGITAL
  - AXIS types
  - COORDINATE_SYSTEM
  - MOTION_GROUP
  - MESSAGE
  - MODULE
- If one user-defined datatype references a second user-defined data type defined in the file, the second user-defined datatype appears before the first one in the import/export file.

Examples

L5X DataType example

```
<DataType Name="SampleDT" Family="NoFamily" Class="User" UId="23e0ab2b">
  <Members>
    <Member Name="Sample_DINT_Member" DataType="DINT" Dimension="0"
      Radix="Decimal" Hidden="false">
      <Description>
        <![CDATA[ This is a DINT member of the UDT  ]]>
      </Description>
    </Member>
    <Member Name="ZZZZZZZZZZSampleDT1" DataType="SINT" Dimension="0"
      Radix="Decimal" Hidden="true" />
    <Member Name="Sample_BOOL_Member" DataType="BIT" Dimension="0"
      Radix="Decimal" Hidden="false" Target="ZZZZZZZZZZSampleDT1"
      BitNumber="0">
      <Description>
        <![CDATA[ This is a BOOL Member of the UDT  ]]>
      </Description>
    </Member>
  </Members>
</DataType>
```

L5K DATATYPE example

```
DATATYPE MyStructure (FamilyType := NoFamily)
       DINT x;
       TIMER y[3] (Radix := Decimal);
       SINT MyFlags (Hidden :=1);
       BIT aBit0 MyFlags : 0 (Radix := Binary);
       BIT aBit1 MyFlags : 1 (Radix := Binary);
END_DATATYPE
```

Define a module component

Introduction

This chapter explains the overall structure of the module component.

Module component

A module component defines any modules used by logic you export. For example, the module component can contain I/O modules referenced by I/O tags, modules accessed by GSV/SSV instructions, or controllers referenced in consumed tags.

L5X module structure

```
<Modules>
      <Module [Module_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <EKey [Ekey_Attributes]/>
            <Ports>
                  <Port [Port_Attributes]
                   <Bus [Bus_Attributes]/>
            </Port>
            </Ports>
            <Communications [Communications_Attributes]>
                  <ConfigTag [ConfigTag_Attributes]>
                          [data]
                  </ConfigTag>
                  <ConfigScript [ConfigScript_Attributes]>
                          [data]
                  </ConfigScript>
                  [connections]
            </Communications>
            <ExtendedProperties
[ExtendedProperties_Attributes]>
                          [extendedpropertiesdata]
            </ExtendedProperties>
      </Module>
</Modules>
```

L5K MODULE structure

```
MODULE <device_name> [(Description := "text",
      Module_Attributes)]
      [ConfigData := <initial_value>;]
      [ConfigScript:=<initial_value>;]
      [ExtendedProp := <text>]
      [connection_list]
END_MODULE
```

Module elements

L5X Item	L5K Item	Description
N/A	*device_name*	The name of the module. In L5X, use a Name attribute on the <Module> element.
Description	Description	User information about the module.
EKey	N/A	Keying information for the module. In L5K, this information is in the CompatibleModule and KeyMask attributes on the MODULE.
Ports	N/A	Port information for the module, which is the physical connector for the module that attaches the module to the bus. Each module has at least one port.
ConfigTag or ConfigData	ConfigData	Operating characteristics of the module. In L5X, the data for the tag is defined with <Data> elements. See Chapter 1 Data Formats on page 41 for more information.
ExtendedProperties	ExtendedProp	Additional profile data stored in the controller in an XML format.
connections	*connection_list* (zero or more CONNECTION entries)	Connection characteristics for the module.

Module attributes

Attribute	Description
Name	L5X only. Specify the name of the module. In L5K the name is an element of the statement.
Parent	L5K only. If this module is a child to another module, specify the name of the parent module. The parent module must be defined before any child module.
ParentModule	L5X only. If this module is a child to another module, specify the name of the parent module. The parent module must be defined before any child module.
ParentModPortID (L5K) ParentModPortID (L5X)	If this module is a child to another module, specify the number of the port on the parent module that connects to this child module. The parent module must be defined before any child module.
CatalogNumber	Specify the catalog number of the module.
Vendor	Specify the vendor of the module. A number **1** indicates Allen-Bradley®. For L5X, this attribute is on the <EKey> element if the State attribute has a value of *Custom*.
ProductType	Specify the product type of the module. For L5X, this attribute is on the <EKey> element if the State attribute has a value of *Custom*.
ProductCode	Specify the product code of the module. For L5X, this attribute is on the <EKey> element if the State attribute has a value of *Custom*.

Attribute	Description
Major	Specify the major revision number (1...127) of the module. For L5X, this attribute is on the <EKey> element if the State attribute has a value of *Custom*.
Minor	Specify the minor revision number (1...255) of the module. For L5X this attribute is on the <EKey> element if the State attribute has a value of *Custom*.
UserDefinedVendor	Specify the vendor of a non-Allen-Bradley module. Type a number to indicate the vendor.
UserDefinedProductType	Specify the product type of a non-Allen-Bradley module.
UserDefinedProductCode	Specify the product code of a non-Allen-Bradley module.
UserDefinedMajor	Specify the major revision number (1...127) of a non-Allen-Bradley module.
UserDefinedMinor	Specify the minor revision number (1...255) of a non-Allen-Bradley module.
PortLabel	L5K only. Specify the port used to reach this module. The port label is either RxBACKPLANE for modules in a chassis or a text string for modules on a network.
ChassisSize	L5K only. Specify the number of slots in the chassis. For L5X, use the Size attribute on the <Bus> element.
Slot	L5K only. Specify the slot number where the module is in the chassis. For L5X, use the Address attribute on the <Port> element.
NodeAddress	L5K only. Specify the node address (1...99) on the network with the Ethernet IP address or host name). For L5X, use the Address attribute on the <Port> element.
Group	L5K only. If the module is a remote I/O module, specify the starting group (0...7). For a block-transfer module, this is the module group number under the remote I/O adapter.
CommMethod	Specify the method of connecting to the module. For L5X, this attribute is on the <Communications> element.
ConfigMethod	Specify the method of configuring the module.
Mode	Select a specific mode by setting the appropriate bit. **Set:** **For:** 0 Do not inhibit the module and a fault in the module does not cause a major fault in the controller 1 Fault in the module causes a major fault in the controller 4 Inhibit the module 5 Both inhibit the module and a fault in the module causes a major fault in the controller
CompatibleModule	L5K only. Specify whether to connect to a compatible module based on the minor revision (*value* = 1) or an exact match or disabled keying of the module (*value* = 0). If you specify exact for KeyMask, set CompatibleModule to **0**. If you specify compatible for KeyMask, set CompatibleModule to **1**.

Attribute	**Description**
KeyMask	L5K only. Specify whether to connect to the exact module that matches the electronic keying information of vendor, product code, product type, major revision, and minor revision. No keying will connect to any module. **Specify :** — **To:** 2#0000_0000_0000_0000 — Disable keying 2#0000_0000_0001_1111 — Require a replacement module to be compatible 2#0000_0000_0001_1111 — Require a replacement module to be an exact match The values for compatible module and for exact match are the same because this attribute is used in conjunction with CompatibleModule to distinguish between compatible module or exact match.
State	L5X only. This attribute is on the <EKey> element. Type **CompatibleModule**, **ExactMatch**, **Disabled**, or **Custom**.
PrimCxnInputSize	Specify the size of the input data associated with the primary connection (0…500 bytes). For L5X, this attribute is on the <Communications> element.
PrimCxnOutputSize	Specify the size of the output data associated with the primary connection (0…496 bytes). For L5X, this attribute is on the <Communications> element.
SecCxnInputSize	Specify the size of the input data associated with the secondary connection (0…500 bytes). Typically, there is one I/O connection on a module (primary connection). If there are two, the second connection is the secondary connection. For L5X, this attribute is on the <Communications> element.
SecCxnOutputSize	Specify the size of the output data associated with the secondary connection (0…496 bytes). Typically, there is one I/O connection on a module that is the primary connection. If there are two, the second connection is the secondary connection. For L5X, this attribute is on the <Communications> element.
ChABaud	L5K only. For a 1756-DHRIO module, specify the baud rate for channel A. Type **57.6**, **115.2**, or **230.4**. For L5X, use the Baud attribute on the <Bus> element.
ChBBaud	L5K only. For a 1756-DHRIO module, specify the baud rate for channel B. Type **57.6**, **115.2**, or **230.4**. For L5X, use the Baud attribute on the <BusControlNet> elemEtherNet/IPent.
DtlsFileName	Specify the file name associated with a DriveExecutive™ project. DriveExecutive configures drives on ControlNet™ and EtherNet/IP™ networks.
ConfigCode	Specify the value that represents the drive rating of the drive. Select this rating on the **Power** tab in a DriveExecutive project for drives on ControlNet and EtherNet/IPnetworks.
ControlNetSignature	This value (hexadecimal) is exported only for the purpose of doing a file compare. This value is ignored on import.
SafetyNetwork	If the module is in a safety controller system, specify the 6-byte hexadecimal number of the safety network.
SafetyEnabled	A flag only in modules that can be configured as safety or standard. Type **true** if the module is a safety module.
RSNetWorxFileName	L5K only. Specify the file name of an associated RSNetWorx project file.
Inhibited	L5X only. If the module is inhibited, type **true**. If the module is not inhibited, type **false**.
MajorFault	L5X only. Specify if the controller generates a major fault if the connection to the module is lost in run mode (**true** or **false**).
ConfigSize	L5X only. This attribute is on the <ConfigTag> or <ConfigData> element. Specify the size of the Config Tag or Config Data.
Id	L5X only. This attribute is on the <Port> element. It uniquely identifies the port.
Address	L5X only. This attribute is on the <Port> element. Specify the node number, slot number, or IP address/host name.

Attribute	Description
Type	L5X only. This attribute is on the <Port> element. Defines the type of the module
Upstream	L5X only. This attribute is on the <Port> element. It is determined by the I/O topology of the module. Specify **true** for Upstream or **false** for downstream.
NATActualAddress	The IP address of a safety I/O module or controller specified by the user as the actual address on the network of the module. For L5X, this attribute is on the <Port> element.
ConnectorOffset	L5X only. This attribute is on the <Port> element.
Width	L5X only. This attribute is on the <Port> element.
Size	L5X only. This attribute is on the <Bus> element. For a sizable chassis, specify the chassis size. In L5K, this attribute is the ChassisSize attribute on the MODULE.
Baud	L5X only. This attribute is on the <Bus> element. Specify the baud rate (57.6, 115.2, or 230.4). In L5K, this attribute is the ChABaud or ChBBaud attribute on the MODULE.
ShutdownParentOnFault	Indicates the parent device is shut down when this module faults.
DrivesADCMode	Sets or clears the Drives ADC mode bit. Setting to true on a non-ADC causes the drive to fail.
DrivesADCEnabled	Indicates that Automatic Device Configuration is enabled for this device. Can be set true only when the DrivesADCMode is set true.
UserDefinedCatalogNumber	Used to persist the Catalog Number for drive peripherals. You do not have to modify this value.
Constant	Specify whether the value is a constant value or a dynamic value. For L5K, specify **yes** for a constant value or **no** for a dynamic value. For L5X, specify **true** or **false**.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.

Module attributes in a safety controller system

In a safety controller system, the module component for the safety partner follows the module component for the primary safety controller. All of the attributes of the safety partner are determined based on those of the primary safety controller.

The module component for the primary safety controller follows the structure previously described. The safety partner module uses these attributes:

- Parent
- ParentModPortID
- CatalogNumber (1756-LSP)
- Vendor
- ProductType
- ProductCode
- Major
- Minor
- Mode
- PortLabel
- Slot
- CompatibleModule
- Key
- Mask
- SafetyNetwork
- SafetyEnabled
- NATActualAddress

Module connection

L5X connection structure

```
<Connections>
      <Connection [Connection_Attributes]>
            <InputTag>
                  data
            </InputTag>
            <OutputTag>
                  data
            </OututTag>
      </Connection>
      <RackConnection [RackConnection_Attributes]>
            <InAliasTag>
                  data
            </InAliasTag>
            <OutAliasTag>
                  data
            </OutAliasTag>
      </RackConnection>
</Connections>
```

L5K CONNECTION structure

```
CONNECTION <connection_name> [(Connection_Attributes)]
      [InputData := <value_list>;]
      [InputForceData := <value_list>;]
      [OutputData := <value_list>;]
      [OutputForceData := <value_list>;]
END_CONNECTION
```

Connection elements

L5X Item	L5K Item	Description
N/A	connection_name	The name of the connection. In L5X, use a Name attribute on the <Connection> element.
InputTag or InputData	InputData	Input channel data. In L5X, the data for the input tag is defined with <Data> elements. See Chapter 1 Data Formats on page 41 for more information.
InputTag or InputData	InputForceData	Forcing information for the input channel. In L5X, the force data for the input tag is defined with <ForceData> elements. See Chapter 1 Data Formats on page 41 for more information.
OutputTag or OutputData	OutputData	Output channel data. In L5X, the data for the output tag is defined with <Data> elements. See Chapter 1, Data Formats on page 41 for more information.
OutputTag or OutputData	OutputForceData	Forcing information for the output channel. In L5X, the force data for the output tag is defined with <ForceData> elements. See Chapter 1 Data Formats on page 41 for more information.

For details on the data in the connection list, see the user manual for the I/O module. The connection list data depends on the I/O module and the configuration for that module.

In L5K format, forces appear as arrays of bytes under the InputForceData and OutputForceData attributes of the connection list. In L5X format, forces appear as arrays of bytes under the <ForceData> elements in the <InputTag> and <OutputTag> elements.

Important:	Do not modify forces in the import/export file. Use the programming software to enter and enable forces.

Module connection attributes

Attribute	Description
Name	L5X only. Specify the name of the connection. In L5K, the name is an element of the statement.
Rate	L5K only. Specify the requested packet interval (RPI) rate in microseconds.
RPI	L5X only. Specify the requested packet interval rate in microseconds.
InputCxnPoint	Specify the input connection point for the primary connection (0...255).
InputSize	Specify the input size (0...255).
OutputCxnPoint	Specify the output connection point for the primary connection (0...255).

Attribute	Description
OutputSize	Specify the output size (0…255).
Unicast	Specify if the EtherNet/IP connection is unicast. For L5K, specify **yes** for unicast or **no** to remain multicast. For L5X, specify **true** or **false**. On export, only appears if the path to the unicast supported I/O module crosses an EtherNet/IP network.
EventID	Specify the event ID if used in conjunction with an event task.
ControlNetScheduled	Specify how the connection is scheduled. Specify **yes** to schedule over ControlNet or **no** to connect unscheduled. This attribute is only used if the path from the module to the controller uses ControlNet. For L5X format specify **true** or **false**.
Type	L5X only. Specify the type of connection: **Input**, **Output**, **MotionSync**, **MotionAsync**, **MotionEvent**, **SafetyInput**, or **SafetyOutput**.
Priority	Indicates the rank of the input production. Valid values = **Scheduled** (default) or **High**.
InputConnectionType	Indicates the type of input production. Valid values = **Multicast** (default) or **Unicast**.
OutputRedundantOwner	Indicates if the output production is a redundant owner.
InputProductionTrigger	Indicates the input production trigger. Valid values = **Cyclic**, **COS**, or **Application**.
ConnectionPath	Indicates the target connection path.
InputTagSuffix	Identifies the suffix for the Input Tag.
OutputTagSuffix	Identifies the suffix for the Output Tag
Constant	Specify whether the value for an Input or an Output parameter is a constant value or it can change. For L5K, specify **yes** for a constant value or **no** for a dynamic value. For L5X, specify **true** or **false**.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this Input/Output Tag.

Module connection attributes in a safety controller system

A module connection in a safety controller system has these attributes, in addition to the module connection attributes previously described.

Attribute	Description
TimeoutMultiplier	Specify the timeout multiplier (default = 2) for a safety controller system. This value determines the RPIs of time to wait for a packet before declaring a time out. This translates into the number of messages that may be lost before declaring a connection error. A Timeout Multiplier of 1 indicates that no messages may be lost; that is, there must be a packet every RPI. A Timeout Multiplier of 2 indicates that 1 message may be lost; that is, as long as a packet is seen in 2 times the RPI, no time-out will occur. Type a number from 1…4.
NetworkDelayMultiplier	Specify the network delay multiplier (default = 100%) for a safety controller control system. This value lets you reduce or increase the connection reaction time limit in cases where the transport time of the message is significantly less or more than the RPI. This may be the case when the RPI of an output connection is the same as a lengthy task period. Type a percentage from 10…600.
ReactionTimeLimit	Specify the connection reaction time limit (0…5500032) for a safety controller system. The Logix Designer application calculates the connection reaction time limit as a function of the RPI, timeout multiplier, and network delay multiplier. The connection reaction time limit is automatically recalculated if any of the values change.

Attribute	Description
MaxObservedNetworkDelay	L5X only. The MaxObservedNetworkDelay is a measure of the longest time data for a safety connection is delayed from transporting the safety packets over the network. This attribute is exported for informational purposes only and is ignored on import.

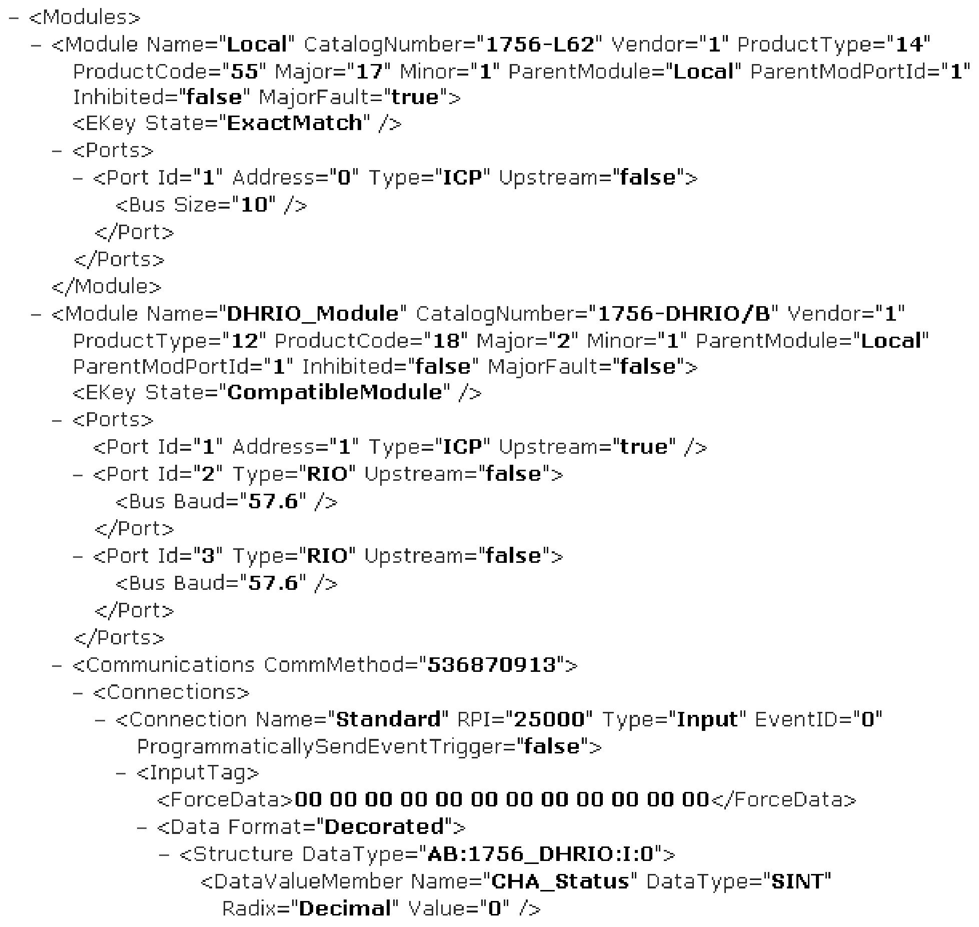
Module guidelines

Observe these guidelines when defining a module.

- Attributes can be in any order. They export in the order defined.
- A parent module must be defined before any definitions of its child modules.

Examples

L5X module example



```
- <Modules>
  - <Module Name="Local" CatalogNumber="1756-L62" Vendor="1" ProductType="14"
      ProductCode="55" Major="17" Minor="1" ParentModule="Local" ParentModPortId="1"
      Inhibited="false" MajorFault="true">
      <EKey State="ExactMatch" />
    - <Ports>
      - <Port Id="1" Address="0" Type="ICP" Upstream="false">
          <Bus Size="10" />
        </Port>
      </Ports>
    </Module>
  - <Module Name="DHRIO_Module" CatalogNumber="1756-DHRIO/B" Vendor="1"
      ProductType="12" ProductCode="18" Major="2" Minor="1" ParentModule="Local"
      ParentModPortId="1" Inhibited="false" MajorFault="false">
      <EKey State="CompatibleModule" />
    - <Ports>
        <Port Id="1" Address="1" Type="ICP" Upstream="true" />
      - <Port Id="2" Type="RIO" Upstream="false">
          <Bus Baud="57.6" />
        </Port>
      - <Port Id="3" Type="RIO" Upstream="false">
          <Bus Baud="57.6" />
        </Port>
      </Ports>
    - <Communications CommMethod="536870913">
      - <Connections>
        - <Connection Name="Standard" RPI="25000" Type="Input" EventID="0"
            ProgrammaticallySendEventTrigger="false">
          - <InputTag>
              <ForceData>00 00 00 00 00 00 00 00 00 00 00 00</ForceData>
            - <Data Format="Decorated">
              - <Structure DataType="AB:1756_DHRIO:I:0">
                  <DataValueMember Name="CHA_Status" DataType="SINT"
                    Radix="Decimal" Value="0" />
              <DataValueMember Name="CHB_Status" DataType="SINT"
                Radix="Decimal" Value="0" />
            </Structure>
          </Data>
        </InputTag>
      </Connection>
    </Connections>
  </Communications>
</Module>
- <Module Name="Output_Module" CatalogNumber="1756-OB16D" Vendor="1"
  ProductType="7" ProductCode="4" Major="3" Minor="1" ParentModule="Local"
  ParentModPortId="1" Inhibited="false" MajorFault="false">
  <EKey State="CompatibleModule" />
- <Ports>
    <Port Id="1" Address="2" Type="ICP" Upstream="true" />
  </Ports>
- <Communications CommMethod="536870914">
  - <ConfigTag ConfigSize="40">
      <Data>2C 00 00 00 13 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00 00 00 00
        00</Data>
    - <Data Format="Decorated">
      - <Structure DataType="AB:1756_DO_DC_Diag:C:0">
          <DataValueMember Name="ProgToFaultEn" DataType="BOOL"
            Value="0" />
          <DataValueMember Name="FaultMode" DataType="DINT" Radix="Binary"
            Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
          <DataValueMember Name="FaultValue" DataType="DINT" Radix="Binary"
```

```
               Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
             <DataValueMember Name="ProgMode" DataType="DINT" Radix="Binary"
               Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
             <DataValueMember Name="ProgValue" DataType="DINT" Radix="Binary"
               Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
             <DataValueMember Name="FaultLatchEn" DataType="DINT"
               Radix="Binary"
               Value="2#0000_0000_0000_0000_1111_1111_1111_1111" />
             <DataValueMember Name="NoLoadEn" DataType="DINT" Radix="Binary"
               Value="2#0000_0000_0000_0000_1111_1111_1111_1111" />
             <DataValueMember Name="OutputVerifyEn" DataType="DINT"
               Radix="Binary"
               Value="2#0000_0000_0000_0000_1111_1111_1111_1111" />
           </Structure>
         </Data>
       </ConfigTag>
     - <Connections>
       - <Connection Name="Diagnostic" RPI="20000" Type="Output" EventID="0"
           ProgrammaticallySendEventTrigger="false">
         - <InputTag>
             <ForceData>00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00</ForceData>
           - <Data Format="Decorated">
             - <Structure DataType="AB:1756_DO_DC_Diag:I:0">
                 <DataValueMember Name="Fault" DataType="DINT"
                   Radix="Binary"
                   Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
                 <DataValueMember Name="Data" DataType="DINT" Radix="Binary"
                   Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
               - <ArrayMember Name="CSTTimestamp" DataType="DINT"
                   Dimensions="2" Radix="Decimal">
                   <Element Index="[0]" Value="0" />
                   <Element Index="[1]" Value="0" />
                 </ArrayMember>
                 <DataValueMember Name="FuseBlown" DataType="DINT"

                  Radix="Binary"
                  Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
                <DataValueMember Name="NoLoad" DataType="DINT"
                  Radix="Binary"
                  Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
                <DataValueMember Name="OutputVerifyFault" DataType="DINT"
                  Radix="Binary"
                  Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
              </Structure>
            </Data>
          </InputTag>
        - <OutputTag>
            <Data>00 00 00 00</Data>
            <ForceData>00 00 00 00 00 00 00 00 00 00 00 00</ForceData>
          - <Data Format="Decorated">
            - <Structure DataType="AB:1756_DO:O:0">
                <DataValueMember Name="Data" DataType="DINT" Radix="Binary"
                  Value="2#0000_0000_0000_0000_0000_0000_0000_0000" />
              </Structure>
            </Data>
          </OutputTag>
        </Connection>
      </Connections>
    </Communications>
  </Module>
</Modules>
```

L5X Safety Partner Module Example

```
– <Module Name="SafetyProject:Partner" CatalogNumber="1756-LSP" Vendor="1"
    ProductType="14" ProductCode="69" Major="17" Minor="1" ParentModule="Local"
    ParentModPortId="1" Inhibited="false" MajorFault="false"
    SafetyNetwork="16#0000_0000_0000_0000">
  – <Description>
      <![CDATA[ My Safety Project!  ]]>
    </Description>
    <EKey State="ExactMatch" />
  – <Ports>
      <Port Id="1" Address="4" Type="ICP" Upstream="true" Width="0" />
    </Ports>
  </Module>
```

L5K MODULE example

```
        MODULE Local (Parent := "Local",
                      ParentModPortId := 1,
                      CatalogNumber := "1756-L62",
                      Vendor := 1,
                      ProductType := 14,
                      ProductCode := 55,
                      Major := 17,
                      Minor := 1,
                      PortLabel := "RxBACKPLANE",
                      ChassisSize := 10,
                      Slot := 0,
                      Mode := 2#0000_0000_0000_0001,
                      CompatibleModule := 0,
                      KeyMask := 2#0000_0000_0001_1111)
        END_MODULE

        MODULE DHRIO_Module (Parent := "Local",
                             ParentModPortId := 1,
                             CatalogNumber := "1756-DHRIO/B",
                             Vendor := 1,
                             ProductType := 12,
                             ProductCode := 18,
                             Major := 2,
                             Minor := 1,
                             PortLabel := "RxBACKPLANE",
                             Slot := 1,
                             CommMethod := 536870913,
                             ConfigMethod := 8388609,
                             Mode := 2#0000_0000_0000_0000,
                             CompatibleModule := 1,
                             KeyMask := 2#0000_0000_0001_1111,
                             ChABaud := 57.6,
                             ChBBaud := 57.6)
                        CONNECTION Standard (Rate := 25000,
                                             EventID := 0)
                                        InputData  := [0,0];
                                        InputForceData := [0,0,0,0,0,0,0,0,0,0,0,0];
                        END_CONNECTION

        END_MODULE

        MODULE Output_Module (Parent := "Local",
                              ParentModPortId := 1,
                              CatalogNumber := "1756-OB16D",
                              Vendor := 1,
                              ProductType := 7,
                              ProductCode := 4,
                              Major := 3,
                              Minor := 1,
                              PortLabel := "RxBACKPLANE",
                              Slot := 2,
                              CommMethod := 536870914,
                              ConfigMethod := 8388612,
                              Mode := 2#0000_0000_0000_0000,
                              CompatibleModule := 1,
                              KeyMask := 2#0000_0000_0001_1111)
                        ConfigData  := [44,19,1,0,0,0,0,0,0,0,65535,65535,65535,0];
                        CONNECTION Diagnostic (Rate := 20000,
                                               EventID := 0)
                                        InputData  := [0,0,[0,0],0,0,0,0];
                                        InputForceData :=
[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0];
                                        OutputData  := [0];
                                        OutputForceData := [0,0,0,0,0,0,0,0,0,0,0,0];
                        END_CONNECTION

        END_MODULE
```

L5K Safety Partner MODULE example

```
MODULE SafetyProject:Partner (Description := "My Safety Project!",
                              Parent := "Local",
                              ParentModPortId := 1,
                              CatalogNumber := "1756-LSP",
                              Vendor := 1,
                              ProductType := 14,
                              ProductCode := 69,
                              Major := 17,
                              Minor := 1,
                              PortLabel := "RxBACKPLANE",
                              Slot := 4,
                              Mode := 2#0000_0000_0000_0000,
                              CompatibleModule := 0,
                              KeyMask := 2#0000_0000_0001_1111,
                              SafetyNetwork := 16#0000_0000_0000_0000)
END_MODULE
```

Define an Add-On Instruction component

Introduction

This chapter explains the overall structure of the Add-On Instruction component.

Add-On Instruction component

An Add-On Instruction component defines an Add-On Instruction.

Important:	The EditedDate attribute of an Add-On Instruction must be updated if the Add-On Instruction is modified by editing an .L5K or .L5X file. When you change an Add-On Instruction by manually editing an .L5X file using a text editor and you do not change the EditedDate attribute, the application does not overwrite the Add-On Instruction when you import the file.

L5X AddOnInstructionDefinition Structure

```
<AddOnInstructionDefinitions>
      <AddOnInstructionDefinition
[AddOnInstructionDefinition_Attributes]>
             <Description>
             <![CDATA[ text ]]>
             </Description>
             <AdditionalHelpText>
             <![CDATA[ text ]]>
             </AdditionalHelpText>
             <SignatureHistory>
             [history]
             </SignatureHistory>
             <Parameters>
             [parameter]
             </Parameters>
             <LocalTags>
             [local_tag]
             </LocalTags>
             <Routines>
             [routine]
             </Routine>
             <ScanModeRoutine>
             [routine]
             </ScanModeRoutine>
      </AddOnInstructionDefintion>
</AddOnInstructionDefinitions>
```

L5K ADD_ON_INSTRUCTION_ DEFINITION structure

```
ADD_ON_INSTRUCTION_DEFINITION <name>
      [(Description := "text", Attributes)]
      [<HISTORY_ENTRY declaration>]
      [<PARAMETERS declaration>]
      [<LOCAL_TAGS declaration>]
      [<add_on_instruction_routines]
      [<scan_mode_routine>]
END_ADD_ON_INSTRUCTION_DEFINITION
```

Add-On Instruction elements

L5X Item	L5K Item	Description
N/A	name	In L5K, the name of the Add-On Instruction. In L5X, use a Name attribute on the <AddOnInstructionDefinition> element.
Description	Description	User information about the Add-On Instruction (128 characters maximum).
SignatureHistory	HISTORY_ENTRY	Optional element for a sealed Add-On Instruction.
AdditionalHelpText	N/A	In L5K, use the AdditonalHelpText attribute. For L5X, specify help text for the user help on the Add-On Instruction.
Parameters	PARAMETERS	Parameters of the Add-On Instruction.
LocalTags	LOCAL_TAGS	Local tags of the Add-On Instruction.
Routines	add_on_instruction_ routines	Logic that comprises the Add-On Instruction. Logic can be relay ladder, function block, or structured text.
ScanModeRoutine	SCAN_MODE_ROUTINE	Optional element that has the logic for a Prescan routine, Postscan routine, or EnableInFalse routine.
EncryptionInfo	ENCRYPTION_INFO	Details of the license based source protection for the lockable object. Only exists for protected Add-On Instructions exported in plain text.
EncryptedAOIContent	N/A	Source-protected and locked Add-On Instruction content. Only exists for locked Add-On Instructions exported in plain text.

Add-On Instruction attributes

Attribute	Description
Name	L5X only. Specify the name of the Add-On Instruction component. In L5K, the name is an element of the statement.
Class	Specify the class of the Add-On Instruction. This attribute applies only to safety projects. Type **Standard** or **Safety**.
Revision	Specify the revision of the Add-On Instruction, in the form of MajorRevision.MinorRevision. Each revision number can be 1…65,535. If there is no period, the number is treated as a major revision only.
RevisionExtension	Provide additional information about the revision (40 characters maximum).
RevisionNote	Provide information about the revision (128 characters maximum).
Vendor	Specify the name of the vendor (40 characters maximum) of the Add-On Instruction.

Attribute	Description
ExecutePrescan	Specify whether to execute the Prescan routine after the Logic is prescanned. Type **1** for yes; type **0** for no. The default is 1 if a Prescan routine exists.
ExecutePostscan	Specify whether to execute the Postscan routine after the Logic is postscanned. Type **1** for yes; type **0** for no. The default is 1 if a Postscan routine exists.
ExecuteEnableInFalse	Specify whether to execute the EnableInFalse routine when enable is false. Type **1** for yes; type **0** for no. The default is 1 if an EnableInFalse routine exists.
CreatedDate	Specify the date the Add-On Instruction was created.
CreatedBy	Specify the developer that created the Add-On Instruction.
EditedDate	Specify the date the Add-On Instruction was last edited.
EditedBy	Specify the developer that edited the Add-On Instruction.
SoftwareRevision	Specify the revision of the application last used to edit the Add-On Instruction. The default is the currently open version of the application.
AdditionalHelpText	Specify help text specific to the Add-On Instruction.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
IsEncrypted	Indicates whether the Add-On Instruction is protected with license-based Source Protection and locked.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Routines in Add-On Instructions

Enter routines in an Add-On Instruction the same as logic routines. The logic in a single routine must all be in the same programming language, but each routine can be in a different programming language. Program the routines in ladder logic (ROUTINE), function block (FBD_ROUTINE), or structured text (ST_ROUTINE) languages. The Add-On Instruction has predefined routine names that you must use and cannot change.

Routine Name	Description
Logic	Defines the logic for the Add-On Instruction. At the minimum, every Add-On Instruction must have a Logic routine.
Prescan	Defines logic to execute during prescan.
Postscan	Defines logic to execute during postscan.
EnableInFalse	Defines logic to execute when EnableIn is false.

For example, this structure for an Add-On Instruction uses all four routines.

```
ADD_ON_INSTRUCTION_DEFINITION Example (attributes)
      PARAMETERS
            add_on_instruction_parameters
      END_PARAMETERS

      LOCAL_TAGS
            add_on_instruction_local_tags
      END_LOCAL_TAGS

      FBD_ROUTINE Logic (attributes)
```

```
            function_block_routine_logic
      END_FBD_ROUTINE

      ST_ROUTINE Prescan (attributes)
            structured_text_routine_logic
      END_ST_ROUTINE

      ROUTINE Postscan (attributes)
            ladder_logic_routine_logic
      END_ROUTINE

      FBD_ROUTINE EnableInFalse (attributes)
            function_block_routine_logic
      END_FBD_ROUTINE
END_ADD_ON_INSTRUCTION_DEFINITION
```

If a tag in an Add-On Instruction references a second Add-On Instruction whose definition is also present in the file, the referenced Add-On Instruction definition must appear before the first one in the import/export file.

Parameters

The parameter component defines Input, Output, and InOut type parameters in the Add-On Instruction. For L5X format, the default data for the local tag is defined with a <DefaultData>. The <DefaultData> element is defined the same as a <Data> element. See Chapter 1 Data Formats on page 41 for more information on the <Data> element format.

The system defined EnableIn input parameter and EnableOut output parameter are defined in the export format so the description may be modified in a .L5K or .L5X format file. The rest of the attributes for the EnableIn and EnableOut parameters that are system defined will be ignored by import even though they are present in the import file.

L5X parameters structure

```
<Parameters>
      <Parameter [Parameter_Attributes]>
            <Description>
            <![CDATA[ text ]] >
            </Description>
            <Comments>
            <Comment Operand="specifier">
            <![CDATA[ comment_text ]]>
            </Comment>
            </Comments>
            <EngineeringUnits>
            <EngineeringUnit Operand="specifier">
            <![CDATA[ engineering_unit_text ]]>
            </EngineeringUnit>
            </EngineeringUnits>
            <Mins>
            <Min Operand="specifier"> min_value </Min>
```

```
                    </Mins>
                    <Maxes>
                    <Max Operand="specifier"> max_value </Max>
                    </Maxes>
                    <State0s>
                    <State0 Operand="specifier">
                    <![CDATA[ state0_text ]]>
                    </State0>
                    </State0s>
                    <State1s>
                    <State1 Operand="specifier">
                    <![CDATA[ state1_text ]]>
                    </State1>
                    </State1s>
                    <DefaultData [DefaultData_Attributes]>
                    data
                    </DefaultData>
            </Parameter>
    </Parameters>
```

L5K parameters structure

```
PARAMETERS
      <name> : <datatype[array_specification]>[(Description :=
"text",
              Comment := "text",
              EngineeringUnit := "text",
              Max := value,
              Min := value,
              State0 := "text",
              State1 := "text",
              Parameter_Attributes)];
END_PARAMETERS
```

Parameter elements

L5X Item	L5K Item	Description
N/A	*name*	The name of the parameter. In L5X, use a Name attribute on the <Parameter> element.
N/A	*datatype*	Data type of the parameter. InOut parameters can be atomic (SINT, INT, DINT, and REAL) and compound (user-defined and array) data types. Input and Output parameters can be only atomic (SINT, INT, DINT, and REAL) data types. In L5X, use a DataType attribute on the <Parameter> element.
N/A	*array_specification*	Dimensional boundaries for an InOut parameter array. In L5X, use a Dimensions attribute on the <Parameter> element.
Description	Description	User information about the parameter with a 128-character maximum.

L5X Item	**L5K Item**	**Description**
DefaultData	N/A	The default data values for Input parameters or Output parameters. In L5K, use a DefaultData attribute.
Comment	Comment	(optional) User information about specified sub-regions of the parameter. Can specify Comment<*specifier*> Where the specifier is: .*bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter .*membername* - for a structure member of the parameter There can be multiple comment elements.
EngineeringUnit	EngineeringUnit	(optional) User specified description of what the unit of the value is (that is, feet, gallons, kilos). Can specify EngineeringUnit <*specifier*> Where the specifier is: .*bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter .*membername* - for a structure member of the parameter There can be multiple engineering unit elements.
Max	Max	(optional) User specified maximum value about qualified sub-regions of the parameter. Only valid for a parameter's sub-regions, which is a non-Boolean atomic datatypes. Can specify Max <*specifier*> Where the specifier is: .*bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter .*membername* - for a structure member of the parameter There can be multiple max elements.
Min	Min	(optional) User specified minimum value about qualified sub-regions of the parameter. Only valid for a parameter's sub-regions, which is a non-Boolean atomic datatypes. Can specify Min <*specifier*> Where the specifier is: .*bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter .*membername* - for a structure member of the parameter There can be multiple min elements.

L5X Item	L5K Item	Description
State0	State0	(optional) for Boolean parameters or sub-regions only. User specified description of what the Zero state of the Boolean value is. Can specify State0 <*specifier*> Where the specifier is: *.bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter *.membername* - for a structure member of the parameter There can be multiple state0 elements.
State1	State1	(optional) for Boolean parameters or sub-regions only. User specified description of what the One state of the Boolean value is. Can specify State1 <*specifier*> Where the specifier is: *.bitnumber* - for a bit in the parameter *[element]* - for an array element of the parameter *.membername* - for a structure member of the parameter There can be multiple state1 elements.

Parameters attributes

Attribute	Description
Name	L5X only. Specify the name of the parameter. In L5K, the name is an element of the statement.
DataType	L5X only. Specify the datatype of the parameter. InOut parameters can be atomic (SINT, INT, DINT, and REAL) , compound (user-defined and array) data types object backed (MESSAGE, ALARM, etc.). Input and Output parameters can be only atomic (SINT, INT, DINT, and REAL) data types. In L5K, the datatype is an element of the statement.
TagType	L5X only. Specify **Base** or **Alias**.
AliasFor	L5X only. Name of the base tag that the alias parameter references. Specify LocaTag<specifier> Where the *specifier* is a bit (*.bitnumber*), array element ([*element*]), or structure member (*.membername*) of the tag, or any combination such as *[7].Input.0*.
Dimensions	L5X only. Specify the dimensions of the datatype. In L5K, the dimensions are an element of the statement.
Usage	Specify the type of parameter. Type **Input**, **Output**, or **InOut**.
Radix	Specify **decimal**, **hex**, **octal**, **binary**, **exponential**, **float**, **ASCII**.
Required	Specify whether the parameter is required. Type **1** if the parameter is required; type **0** if the parameter is optional.

Attribute	Description
Constant	Specify whether the value for an Input or an Output parameter is a constant value or it can change. For L5K, specify **yes** for a constant value or **no** for a dynamic value. For L5X, specify **true** or **false**.
ExternalAccess	Specify the external access, outside of the controller, to the parameter. Specify **Read/Write**, **Read Only**, or **None**.
Max	(optional) User specified maximum value for the parameter. Only valid for parameter with non-Boolean atomic datatype.
Min	(optional) User specified minimum value for the parameter. Only valid for parameter with non-Boolean atomic datatype.
Visible	Specify whether the parameter is visible on the display for the instructions. Type **1** if the parameter is visible; type **0** if the parameter is not visible.
DefaultData	L5K only. Specify a default value for the parameter. This attribute is not available if you specify Usage as InOut. In L5X, the parameter default data is an element of the L5X structure.

Signature history

The Signature History stores history entries for an Add-On Instruction. There can be 0…6 entries that are exported in the order they are created. The order in the file is used during import to store them. If you edit the file manually, that order is maintained.

- L5K file—The Signature History is stored in the HISTORY_ENTRY structure.
- L5X file—The Signature History is stored in the <SignatureHistory> structure.

When an Add-On Instruction is sealed, the Signature History is protected and hidden in the ENCODED_DATA section. See Encoded/UnencodedAdd-On Instructions on page 94.

- L5K file—The ENCODED_DATA section is a separate section.
- L5X file—The <EncodedData> section is an element of <AddOnInstructionDefinitions>.

L5X SignatureHistory structure

```
<SignatureHistory>
      <HistoryEntry [HistoryEntry_Attributes]>
            <Description>
            <![CDATA[ text ]] >
            </Description>
      </HistoryEntry>
</SignatureHistory>
```

L5K HISTORY_ENTRY structure

```
HISTORY_ENTRY [History_Entry_Attributes)]
END_HISTORY_ENTRY
```

History entry attributes

Attribute	Description
User	Specifies the identity of the user that created the entry.
Timestamp	Specifies the timestamp when the entry was created. The value is a UTC date time, such as 2009-04-01T12:08:00.000Z.
SignatureID	Specifies the signature ID for the Add-On Instruction when the entry was created. The value is an 8-digit uppercase hex number, such as 8F44EBA3.
Description	User information about the parameter (128 characters maximum).

Local tags

The local tags component defines local tags in the Add-On Instruction. The L5K format for defining a local tag is the same format for defining a tag in a program or at controller scope For more details on defining a tag, see Chapter 6 Defining a Tag Component on page 105. For L5X format, you specify the default data for the local tag with a <DefaultData> element. Define the <DefaultData> element the same as a <Data> element. See Chapter 1 Data Formats on page 41 for more information on the <Data> element format.

L5X LocalTags structure

```
<LocalTags>
      <LocalTag [LocalTag_Attributes]>
            <Description>
            <![CDATA[ text ]] >
            </Description>
            <Comments>
            <Comment Operand="specifier">
            <![CDATA[ comment_text ]]>
            </Comment>
            </Comments>
            <EngineeringUnits>
            <EngineeringUnit Operand="specifier">
            <![CDATA[ engineering_unit_text ]]>
            </EngineeringUnit>
            </EngineeringUnits>
            <Mins>
            <Min Operand="specifier"> min_value </Min>
            </Mins>
            <Maxes>
            <Max Operand="specifier"> max_value </Max>
            </Maxes>
            <State0s>
            <State0 Operand="specifier">
            <![CDATA[ state0_text ]]>
            </State0>
            </State0s>
            <State1s>
            <State1 Operand="specifier">
            <![CDATA[ state1_text ]]>
            </State1>
```

```
                    </State1s>
                    <DefaultData [DefaultData_Attributes]>
                    data
                    </DefaultData>
            </LocalTag>
    </LocalTags>
```

L5K LOCAL_TAGS structure

```
LOCAL_TAGS
        tag_declaration
END_LOCAL_TAGS
```

Local tag attributes

Specify these attributes for local tags in L5X format. See Chapter 6 Defining a Tag Component on page 105 for attributes for local tags in L5K format.

Attribute	Description
Name	L5X only. Specify the name of the local tag. In L5K, the name is an element of the statement.
DataType	L5X only. Specify the datatype of the local tag. Local tags can be atomic (SINT, INT, DINT, and REAL) and compound (for example, user-defined, add-on instruction defined, array) data types. Local tags cannot be object backed data types (for example, MESSAGE, ALARM). In L5K, the datatype is an element of the statement.
Dimensions	L5X only. Specify the dimensions of the datatype. In L5K, the dimensions are an element of the statement.
Radix	Specify **decimal**, **hex**, **octal**, **binary**, **exponential**, **float**, **ASCII**.
ExternalAccess	Specify the external access, outside of the controller, to the local tag. Specify **Read/Write**, **Read Only**, or **None**.
Max	(optional) User specified maximum value for the local tag. Only valid for local tag with non-Boolean atomic datatype.
Min	(optional) User specified minimum value for the local tag. Only valid for local tag with non-Boolean atomic datatype.
DefaultData	L5K only. Specify a default value for the local tag. In L5X, the parameter default data is an element of the L5X structure.

Encoded/Unencoded Add-On Instructions

These examples are for protected (encoded) and unprotected (clear text) codes for Add-On Instructions.

If the project contains high-integrity Add-On Instructions, those Add-On Instructions always appear as encoded data components when you export the project.

See Exporting Source-protected Logic on page 28 on page 32 for procedures.

L5X EncodedData Structure

```
<EncodedData EncodedType= "type", Name="name",
Type="routinetype"
             [,other_attributes]>
      <Description>
             <![CDATA[ text ]] >
      </Description>
      encoded_data
</EncodedData>
```

L5K ENCODED_DATA Structure

```
ENCODED_DATA [( EncodedType: type, Name:= name,
               Type:= routinetype,
               other_attributes)]
      encoded_data
END_ENCODED_DATA
```

Encoded data attributes

L5X Item	L5K Item	Description
type	*type*	The type of data encoded. In L5K, specify **ADD_ON_INSTRUCTION_DEFINITION** In L5X, specify **AddOnInstructionDefinition**
name	*name*	The name of the protected Add-On Instruction.
SignatureID	*SignatureID*	32-bit value based upon the current configuration of the Add-On-Instruction.
SignatureTimestamp	*SignatureTimestamp*	The time and date that the Add-On-Instruction was sealed.
SafetySignatureID	*SafetySignatureID*	Only applies to Safety Add-On-Instructions. Additional safety ID calculated online in the safety system.
N/A	*other_attributes*	Attributes of the Add-On Instruction that are not protected during export.
N/A	*encoded_data*	The protected portion of the Add-On Instruction.
IsEncrypted	*IsEncrypted*	Indicates whether the Add-On Instruction is protected with license-based Source Protection and locked.

Important: When the Add-On Instruction is source-protected, the *encoded_data* information is encrypted. If you modify this encrypted information, you cannot re-import the Add-On Instruction.

Encoded Information elements

L5X Item	L5K Item	Identifies
EncryptionKey	ENCRYPTION_KEY	Identifies the options the user has chosen for protecting and locking their content.

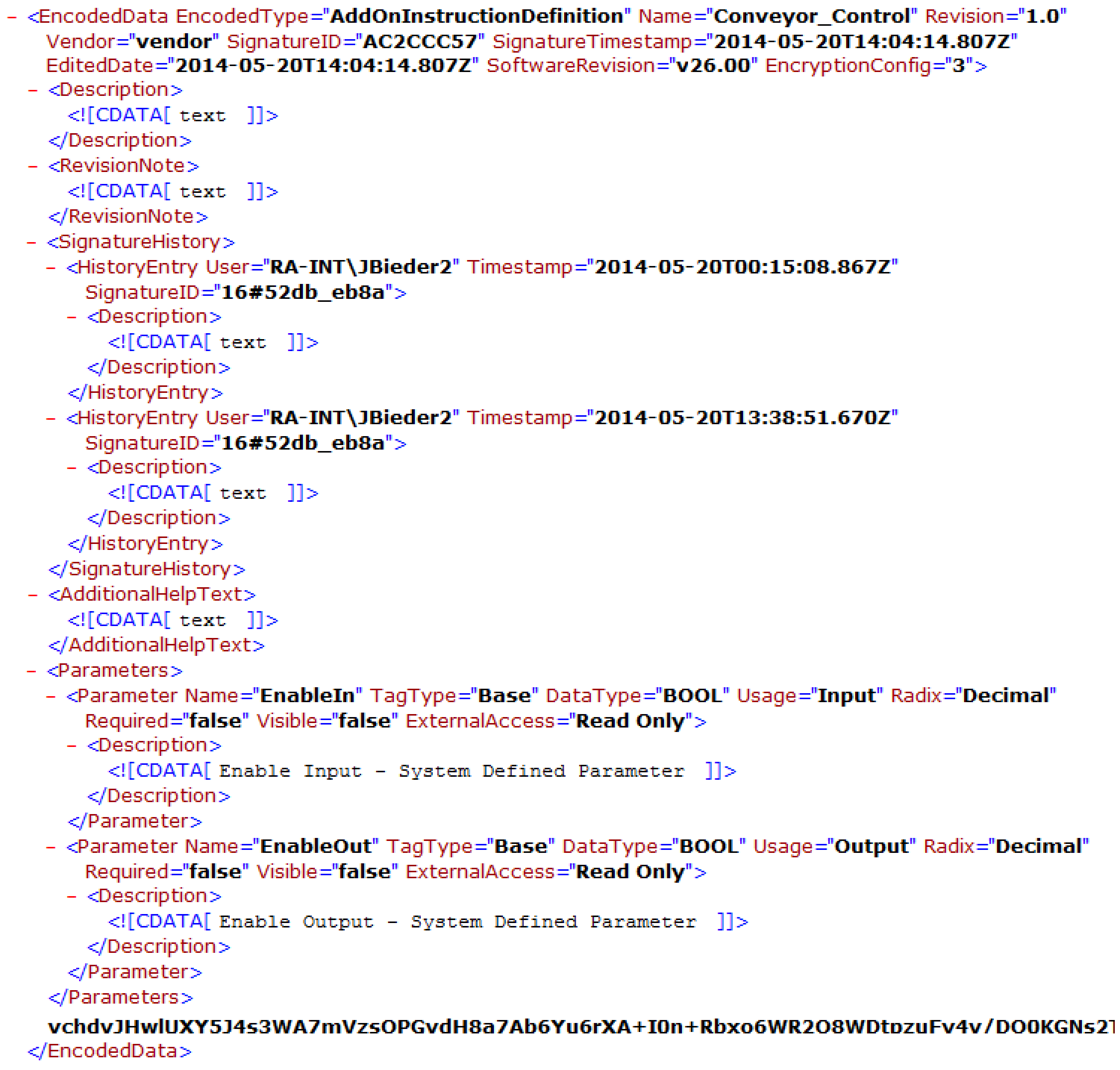
Encoded key attributes

Attribute	**Description**
Name	Identifies the type of protection.
ID	Identifier for the key (Firm code, product code).
Description	Description of what the key is associated with (license name).
Vendor	Indicates the vendor who supplied the key.
PublicKey	Stores the public key that will be used for the locking of the associated object.

Encoded content attributes

Attribute	**Description**
EncryptedType	Indicates the underlying language of the routine for this encoded content (for example, RLL or Structured text).
OnlineEditType	L5X only. Specify the online edit logic type (**Original**, **PendingEdits**, or **TestEdits**). This attribute is not specified if there are no edits.

L5X Encoded Add-On Instruction example



```
- <EncodedData EncodedType="AddOnInstructionDefinition" Name="Conveyor_Control" Revision="1.0"
    Vendor="vendor" SignatureID="AC2CCC57" SignatureTimestamp="2014-05-20T14:04:14.807Z"
    EditedDate="2014-05-20T14:04:14.807Z" SoftwareRevision="v26.00" EncryptionConfig="3">
  - <Description>
      <![CDATA[ text  ]]>
    </Description>
  - <RevisionNote>
      <![CDATA[ text  ]]>
    </RevisionNote>
  - <SignatureHistory>
    - <HistoryEntry User="RA-INT\JBieder2" Timestamp="2014-05-20T00:15:08.867Z"
        SignatureID="16#52db_eb8a">
      - <Description>
          <![CDATA[ text  ]]>
        </Description>
      </HistoryEntry>
    - <HistoryEntry User="RA-INT\JBieder2" Timestamp="2014-05-20T13:38:51.670Z"
        SignatureID="16#52db_eb8a">
      - <Description>
          <![CDATA[ text  ]]>
        </Description>
      </HistoryEntry>
    </SignatureHistory>
  - <AdditionalHelpText>
      <![CDATA[ text  ]]>
    </AdditionalHelpText>
  - <Parameters>
    - <Parameter Name="EnableIn" TagType="Base" DataType="BOOL" Usage="Input" Radix="Decimal"
        Required="false" Visible="false" ExternalAccess="Read Only">
      - <Description>
          <![CDATA[ Enable Input - System Defined Parameter  ]]>
        </Description>
      </Parameter>
    - <Parameter Name="EnableOut" TagType="Base" DataType="BOOL" Usage="Output" Radix="Decimal"
        Required="false" Visible="false" ExternalAccess="Read Only">
      - <Description>
          <![CDATA[ Enable Output - System Defined Parameter  ]]>
        </Description>
      </Parameter>
    </Parameters>
    vchdvJHwlUXY5J4s3WA7mVzsOPGvdH8a7Ab6Yu6rXA+I0n+Rbxo6WR2O8WDtpzuFv4v/DO0KGNs2T
  </EncodedData>
```

L5K Encoded Add-On instruction example

```
ENCODED_DATA (EncodedType := ADD_ON_INSTRUCTION_DEFINITION,
              Name := "Conveyor_Control",
              Description := "This is the description",
              Revision := "1.0",
              RevisionNote := "This is a Revision Note",
              Vendor := "vendor",
              SignatureID := AC2CCC57,
              SignatureTimestamp := "2014-05-20T14:04:14.807Z",
              EditedDate := "2014-05-20T14:04:14.807Z",
              AdditionalHelpText := "This is help text",
              EncryptionConfig := 3)
       HISTORY_ENTRY  (User := RA-INT\JBieder2,
                       Timestamp := "2014-05-20T00:15:08.867Z",
                       SignatureID := 16#52db_eb8a,
                       Description := "History description")
       END_HISTORY_ENTRY
       PARAMETERS
              EnableIn : BOOL (Description := "Enable Input -
System Defined Parameter",
                                    Usage := Input,
                                    RADIX := Decimal
                                    Required := No,
                                    Visible := No,
                                    ExternalAccess := Read Only);
              EnableOut : BOOL (Description := "Enable Output -
System Defined Parameter",
                                     Usage := Output,
                                     RADIX := Decimal,
                                     Required := No,
                                     Visible := No,
                                     ExternalAccess := Read
Only);
       END_PARAMETERS
       5PC4UUeSPrD8+QMe30neT5/97J+VmK95qgOApHiZ7VpmkuGyeYVmzDm3
ceYND35YMmzC4xyFQfJYld…
END_ENCODED_DATA
```

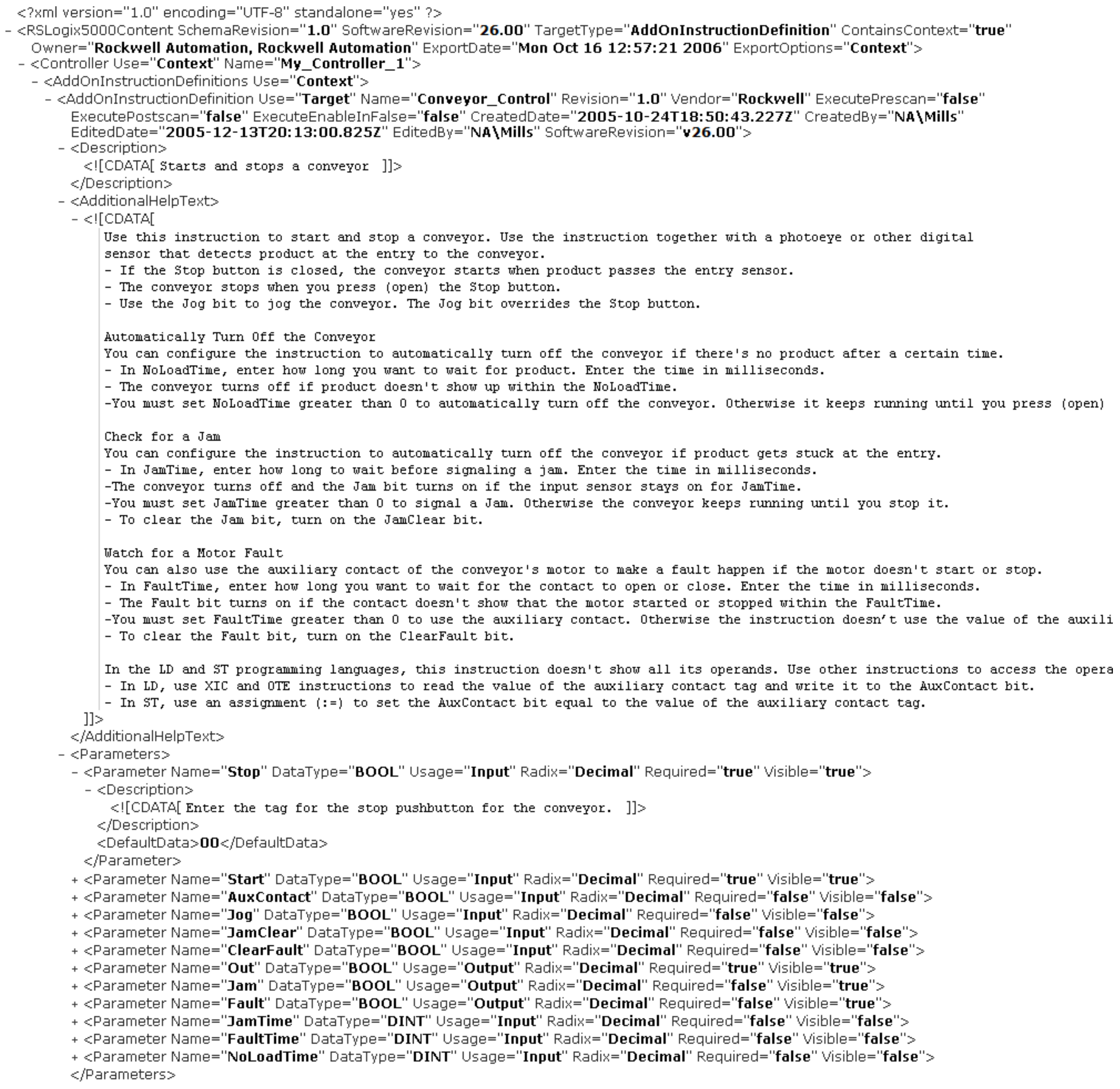
Add-On Instruction Guidelines

Use these Add-On Instruction guidelines with function blocks:

- If the operand is not a qualified tag or literal value, the Add-On Instruction is not verified.
- The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

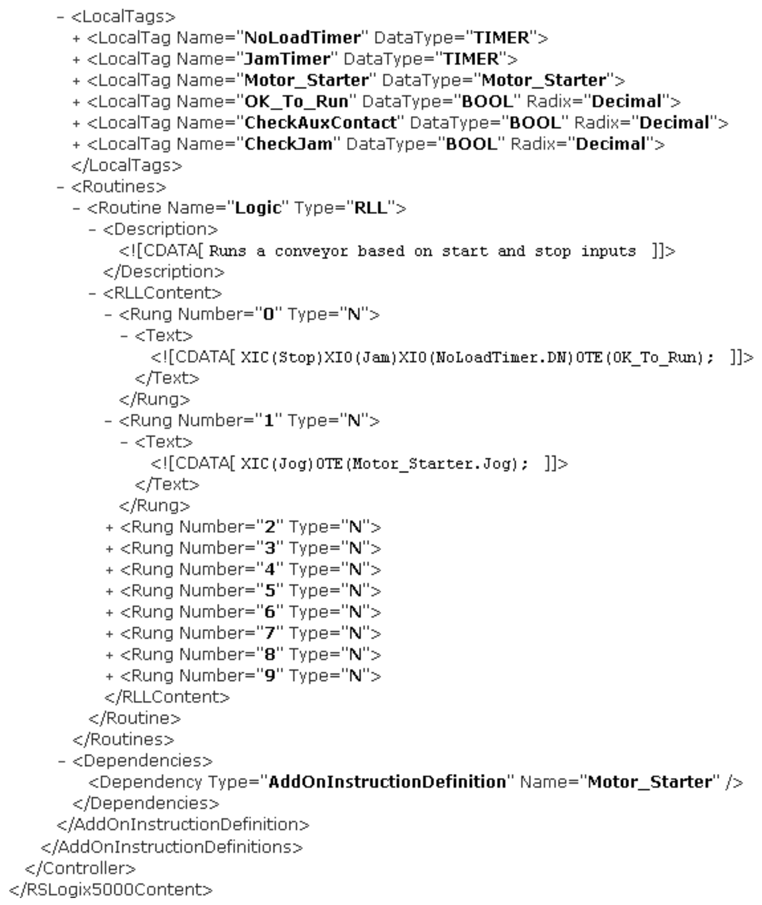
L5X unencoded AddOnInstruction definition example

This L5X file shows a definition partial export example for an L5X Add-On Instruction.



```
  <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <RSLogix5000Content SchemaRevision="1.0" SoftwareRevision="26.00" TargetType="AddOnInstructionDefinition" ContainsContext="true"
    Owner="Rockwell Automation, Rockwell Automation" ExportDate="Mon Oct 16 12:57:21 2006" ExportOptions="Context">
  - <Controller Use="Context" Name="My_Controller_1">
    - <AddOnInstructionDefinitions Use="Context">
      - <AddOnInstructionDefinition Use="Target" Name="Conveyor_Control" Revision="1.0" Vendor="Rockwell" ExecutePrescan="false"
          ExecutePostscan="false" ExecuteEnableInFalse="false" CreatedDate="2005-10-24T18:50:43.227Z" CreatedBy="NA\Mills"
          EditedDate="2005-12-13T20:13:00.825Z" EditedBy="NA\Mills" SoftwareRevision="v26.00">
        - <Description>
            <![CDATA[ Starts and stops a conveyor  ]]>
          </Description>
        - <AdditionalHelpText>
          - <![CDATA[
              Use this instruction to start and stop a conveyor. Use the instruction together with a photoeye or other digital
              sensor that detects product at the entry to the conveyor.
              - If the Stop button is closed, the conveyor starts when product passes the entry sensor.
              - The conveyor stops when you press (open) the Stop button.
              - Use the Jog bit to jog the conveyor. The Jog bit overrides the Stop button.

              Automatically Turn Off the Conveyor
              You can configure the instruction to automatically turn off the conveyor if there's no product after a certain time.
              - In NoLoadTime, enter how long you want to wait for product. Enter the time in milliseconds.
              - The conveyor turns off if product doesn't show up within the NoLoadTime.
              -You must set NoLoadTime greater than 0 to automatically turn off the conveyor. Otherwise it keeps running until you press (open)

              Check for a Jam
              You can configure the instruction to automatically turn off the conveyor if product gets stuck at the entry.
              - In JamTime, enter how long to wait before signaling a jam. Enter the time in milliseconds.
              -The conveyor turns off and the Jam bit turns on if the input sensor stays on for JamTime.
              -You must set JamTime greater than 0 to signal a Jam. Otherwise the conveyor keeps running until you stop it.
              - To clear the Jam bit, turn on the JamClear bit.

              Watch for a Motor Fault
              You can also use the auxiliary contact of the conveyor's motor to make a fault happen if the motor doesn't start or stop.
              - In FaultTime, enter how long you want to wait for the contact to open or close. Enter the time in milliseconds.
              - The Fault bit turns on if the contact doesn't show that the motor started or stopped within the FaultTime.
              -You must set FaultTime greater than 0 to use the auxiliary contact. Otherwise the instruction doesn't use the value of the auxili
              - To clear the Fault bit, turn on the ClearFault bit.

              In the LD and ST programming languages, this instruction doesn't show all its operands. Use other instructions to access the opera
              - In LD, use XIC and OTE instructions to read the value of the auxiliary contact tag and write it to the AuxContact bit.
              - In ST, use an assignment (:=) to set the AuxContact bit equal to the value of the auxiliary contact tag.
            ]]>
          </AdditionalHelpText>
        - <Parameters>
          - <Parameter Name="Stop" DataType="BOOL" Usage="Input" Radix="Decimal" Required="true" Visible="true">
            - <Description>
                <![CDATA[ Enter the tag for the stop pushbutton for the conveyor.  ]]>
              </Description>
              <DefaultData>00</DefaultData>
            </Parameter>
          + <Parameter Name="Start" DataType="BOOL" Usage="Input" Radix="Decimal" Required="true" Visible="true">
          + <Parameter Name="AuxContact" DataType="BOOL" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="Jog" DataType="BOOL" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="JamClear" DataType="BOOL" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="ClearFault" DataType="BOOL" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="Out" DataType="BOOL" Usage="Output" Radix="Decimal" Required="true" Visible="true">
          + <Parameter Name="Jam" DataType="BOOL" Usage="Output" Radix="Decimal" Required="false" Visible="true">
          + <Parameter Name="Fault" DataType="BOOL" Usage="Output" Radix="Decimal" Required="false" Visible="true">
          + <Parameter Name="JamTime" DataType="DINT" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="FaultTime" DataType="DINT" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          + <Parameter Name="NoLoadTime" DataType="DINT" Usage="Input" Radix="Decimal" Required="false" Visible="false">
          </Parameters>
```

Add-On Instruction Example, Continued



```
- <LocalTags>
  + <LocalTag Name="NoLoadTimer" DataType="TIMER">
  + <LocalTag Name="JamTimer" DataType="TIMER">
  + <LocalTag Name="Motor_Starter" DataType="Motor_Starter">
  + <LocalTag Name="OK_To_Run" DataType="BOOL" Radix="Decimal">
  + <LocalTag Name="CheckAuxContact" DataType="BOOL" Radix="Decimal">
  + <LocalTag Name="CheckJam" DataType="BOOL" Radix="Decimal">
  </LocalTags>
- <Routines>
  - <Routine Name="Logic" Type="RLL">
    - <Description>
        <![CDATA[ Runs a conveyor based on start and stop inputs  ]]>
      </Description>
    - <RLLContent>
      - <Rung Number="0" Type="N">
        - <Text>
            <![CDATA[ XIC(Stop)XIO(Jam)XIO(NoLoadTimer.DN)OTE(OK_To_Run);  ]]>
          </Text>
        </Rung>
      - <Rung Number="1" Type="N">
        - <Text>
            <![CDATA[ XIC(Jog)OTE(Motor_Starter.Jog);  ]]>
          </Text>
        </Rung>
      + <Rung Number="2" Type="N">
      + <Rung Number="3" Type="N">
      + <Rung Number="4" Type="N">
      + <Rung Number="5" Type="N">
      + <Rung Number="6" Type="N">
      + <Rung Number="7" Type="N">
      + <Rung Number="8" Type="N">
      + <Rung Number="9" Type="N">
      </RLLContent>
    </Routine>
  </Routines>
- <Dependencies>
    <Dependency Type="AddOnInstructionDefinition" Name="Motor_Starter" />
  </Dependencies>
</AddOnInstructionDefinition>
</AddOnInstructionDefinitions>
</Controller>
</RSLogix5000Content>
```

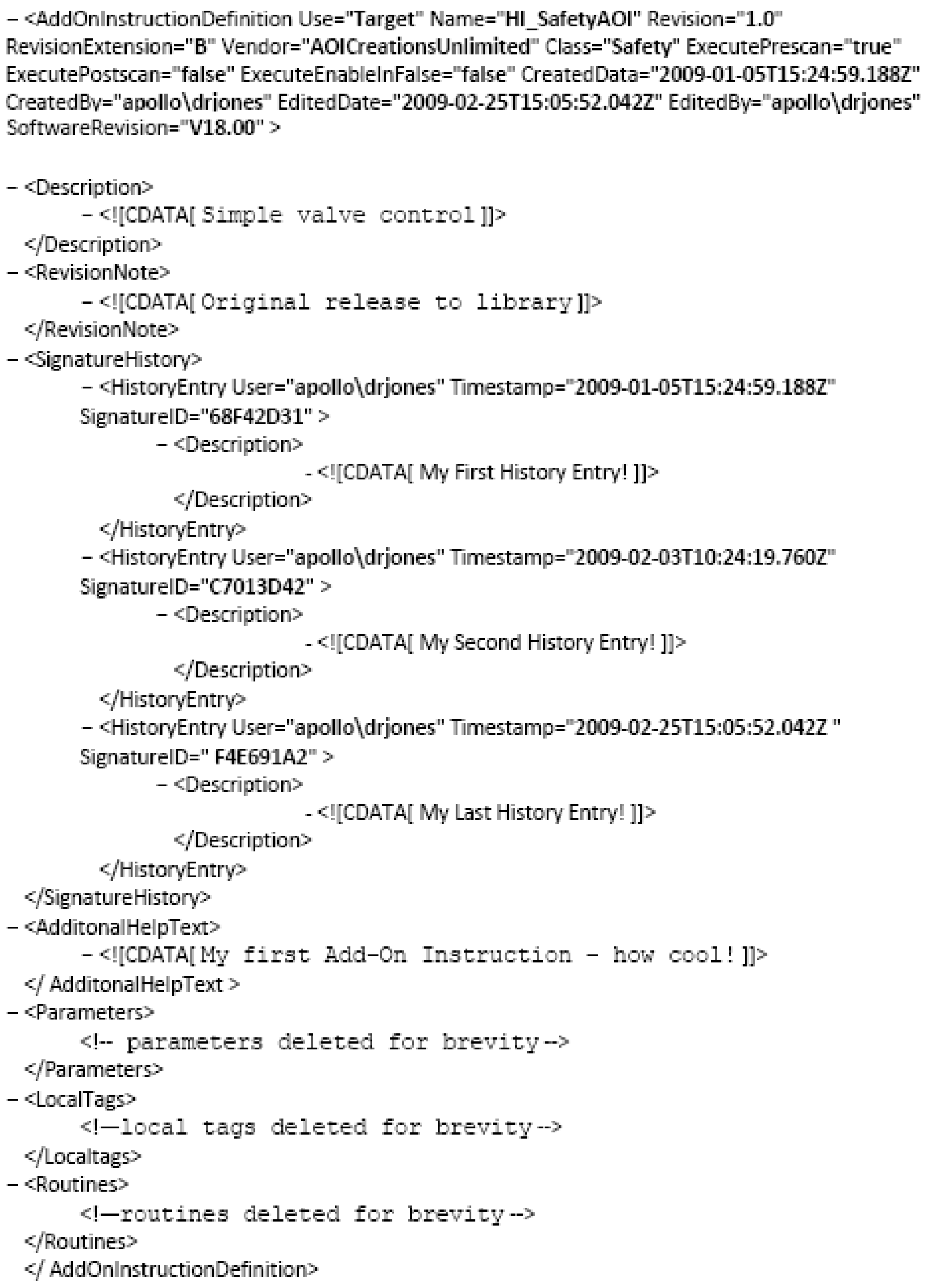
L5K unencoded ADD_ON_INSTRUCTION _DEFINITION example

```
ADD_ON_INSTRUCTION_DEFINITION Valve (Description := "Simple
valve control",
             Revision := “1.0”, RevisionExtension := “B”,
             Vendor := “RaesUDICreationsUnlimited”,
ExecutePrescan := Yes,
             ExecutePostscan := No, ExecuteEnableInFalse :=
No,
             CreatedBy := “apollo\drjones”, EditedDate :=
“2005-01-05T15:24:59.188Z”,
             EditedBy := “apollo\drjones”,
             AdditionalHelpText := “My first Add-On
Instruction – how cool!”)

      PARAMETERS
             Valve_Command : BOOL (Description := “0 - Close
valve$N1 - Open valve”,
             Radix := Decimal, Required := Yes, Visible :=
Yes, DefaultData := “1”);
```

```
            Array_Parameter : REAL[5] (Type := InOut, Radix
:= Float, Required := Yes,
            Visible := Yes); Valve_Out : DINT (Type :=
Output, Radix := Decimal,
            Required := No, Visible := Yes, DefaultData :=
“0”);
            Reset : BOOL (Description := “Used by Prescan
routine to run Reset code”,
            Type := Input, Radix := Decimal, Required := No,
Visible := No,
            DefaultData := “1”);
        END_PARAMETERS

        LOCAL_TAGS
            Valve_Type : DISCRETE_2STATE (Description := “The
valve is a 2 state valve”,
            DefaultData :=
“[49,0.00000000e+000,0,0,0.00000000e+000,0.00000000e+000,

        0.00000000e+000,0.00000000e+000,0.00000000e+000,0.000000
00e+000]”);
        END_LOCAL_TAGS

        FBD_ROUTINE Logic (Description := "This UDI Logic
routine is nonsense but shows the
        format sufficiently. In fact, it does not even use the
InOut Parameter",
            SheetSize := "Letter (8.5x11in)",
SheetOrientation := Landscape)
            SHEET (Name := "")
                D2SD_BLOCK (ID := 0, X := 200, Y := 160,
Operand := Valve_Type,
                    VisiblePins := "ProgCommand,
State0Perm, State1Perm, FB0, FB1,
                    HandFB, ProgProgReq, ProgOperReq,
ProgOverrideReq, ProgHandReq,
                    Out, Device0State, Device1State,
CommandStatus, FaultAlarm,
                    ModeAlarm, ProgOper, Override,
Hand")
                END_D2SD_BLOCK
                IREF (ID := 1, X := 120, Y := 100, Operand
:= Valve_Command)
                END_IREF
                OREF (ID := 2, X := 460, Y := 140, Operand
:= Valve_Out)
                END_OREF
            END_SHEET
        END_FBD_ROUTINE
        ST_ROUTINE Prescan (Description := "This should run
before the Instruction does")
            '//If Reset is True - do something
            'IF (Reset) THEN
            ' //do something
```

```
                    'END_IF;
                    '
            END_ST_ROUTINE

    END_ADD_ON_INSTRUCTION_DEFINITION
```

L5X unencoded safety AddOnInstruction definition example



```
– <AddOnInstructionDefinition Use="Target" Name="HI_SafetyAOI" Revision="1.0"
RevisionExtension="B" Vendor="AOICreationsUnlimited" Class="Safety" ExecutePrescan="true"
ExecutePostscan="false" ExecuteEnableInFalse="false" CreatedData="2009-01-05T15:24:59.188Z"
CreatedBy="apollo\drjones" EditedDate="2009-02-25T15:05:52.042Z" EditedBy="apollo\drjones"
SoftwareRevision="V18.00" >

– <Description>
      – <![CDATA[ Simple valve control ]]>
  </Description>
– <RevisionNote>
      – <![CDATA[ Original release to library ]]>
  </RevisionNote>
– <SignatureHistory>
      – <HistoryEntry User="apollo\drjones" Timestamp="2009-01-05T15:24:59.188Z"
      SignatureID="68F42D31" >
            – <Description>
                        - <![CDATA[ My First History Entry! ]]>
              </Description>
        </HistoryEntry>
      – <HistoryEntry User="apollo\drjones" Timestamp="2009-02-03T10:24:19.760Z"
      SignatureID="C7013D42" >
            – <Description>
                        - <![CDATA[ My Second History Entry! ]]>
              </Description>
        </HistoryEntry>
      – <HistoryEntry User="apollo\drjones" Timestamp="2009-02-25T15:05:52.042Z "
      SignatureID=" F4E691A2" >
            – <Description>
                        - <![CDATA[ My Last History Entry! ]]>
              </Description>
        </HistoryEntry>
  </SignatureHistory>
– <AdditonalHelpText>
      – <![CDATA[ My first Add-On Instruction – how cool! ]]>
  </ AdditonalHelpText >
– <Parameters>
      <!-- parameters deleted for brevity -->
  </Parameters>
– <LocalTags>
      <!—local tags deleted for brevity -->
  </Localtags>
– <Routines>
      <!—routines deleted for brevity -->
  </Routines>
  </ AddOnInstructionDefinition>
```

L5K unencoded safety ADD_ON_INSTRUCTION _DEFINITION example

```
ADD_ON_INSTRUCTION_DEFINITION HI_SafetyAOI (Description :=
"sealed safety AOI",
      Revision := “1.0”, RevisionExtension := “B”,
      RevisionNote := “Original release to library”,
      Vendor := “AOICreationsUnlimited”, Class := Safety,
ExecutePrescan := Yes,
      ExecutePostscan := No, ExecuteEnableInFalse := No,
      CreatedDate := “2009-01-05T15:24:59.188Z”, CreatedBy :=
“apollo\drjones”,
      EditedDate := “2009-02-25T15:05:52.042Z”, EditedBy :=
“apollo\drjones”,
      AdditionalHelpText := “My first HI Safety Add-On
Instruction”)

HISTORY_ENTRY (User := “apollo\drjones”,
      Timestamp := “2009-01-05T15:24:59.188Z”, SignatureID :=
68F42D31,
      Description := “My First History Entry!”)
END_ HISTORY_ENTRY

HISTORY_ENTRY (User := “apollo\drjones”,
      Timestamp := “2009-02-03T10:24:19.760Z”, SignatureID :=
C7013D42,
      Description := “My Second History Entry!”)
END_ HISTORY_ENTRY

HISTORY_ENTRY (User := “apollo\drjones”,
      Timestamp := “2009-02-25T15:05:52.042Z”, SignatureID :=
F4E691A2,
      Description := “My Last History Entry!”)
END_ HISTORY_ENTRY
(* PARAMETERS, LOCAL_TAGS, and ROUTINE blocks deleted for
brevity *)
END_ADD_ON_INSTRUCTION_DEFINITION
```

Define a tag component

Introduction

This chapter explains the overall structure of the tag component.

Tag component

The tag component defines the tags associated with the logic you selected or within the program you selected. Within a tag list in the L5K format, message and motion tags must follow all non-motion tags, and axis tags must follow motion group tag. Tags may appear in any order in the L5X format.

Important:	For detailed information about atomic and structure tags and their supported attributes and ranges, see the Logix5000 Controller Common Procedures Programming Manual, publication 1756-PM001.

L5X tag structure

```
<Tag [Tag_Attributes]>
      <ConsumeInfo [Consume_Attributes]/>
      <ProduceInfo [Produce_Attributes]/>
      <Description>
            <![CDATA[ text ]]>
      </Description>
      <Comments>
            <Comment Operand="specifier">
                  <![CDATA[ comment_text ]]>
            </Comment>
      </Comments>
      <EngineeringUnits>
            <EngineeringUnit Operand="specifier">
                  <![CDATA[ engineering_unit_text ]]>
            </EngineeringUnit>
      </EngineeringUnits>
      <Mins>
            <Min Operand="specifier"> min_value </Min>
      </Mins>
      <Maxes>
            <Max Operand="specifier"> max_value </Max>
      </Maxes>
      <State0s>
            <State0 Operand="specifier">
                  <![CDATA[ state0_text ]]>
            </State0>
      </State0s>
```

```
            <State1s>
                  <State1 Operand="specifier">
                        <![CDATA[ state1_text ]]>
                  </State1>
            </State1s>
            <Data>
                  value
            </Data>
            <ForceData>
                  value
            </ForceData
      </Tag>
```

L5K TAG structure

```
<tag_name> [OF alias] : <type["x,y,z"]>
      [(Description := "text",
      Comment := "text",
      Comment := "text",
      EngineeringUnit := "text",
      Max := value,
      Min := value,
      State0 := "text",
      State1 := "text",
      Tag_Attributes,
      Produce_Attributes,
      Consume_Attributes)]
      [, <tag_force_data>] := value;
```

Tag elements

L5X Item	L5K Item	Description
N/A	*tag_name*	The name of the tag. In L5X, use a Name attribute on the <Tag> element.
N/A	*alias*	Name of the base tag that the alias tag references. Specify *tag<specifier>* Where the *specifier* is a bit (*.bitnumber*), array element ([*element*]), or structure member (*.membername*) of the tag. In L5X, use an AliasFor attribute on the <Tag> element.
N/A	*x, y, z*	The number of elements within the array dimension. For example [5, 10, 2]. In an L5K array tag, there cannot be any white space between the type and array definition. There must be a space between the tag name and the colon and another space between that same colon and the type name. In L5X, use a Dimension attribute on the <Tag> element.

L5X Item	L5K Item	Description
ConsumeInfo	N/A	Identifies a consumed tag and provides the tag attributes. In L5K, specify Consume_Attributes attributes .
ProduceInfo	N/A	Identifies a produced tag and provides the tag attributes. In L5K, specify Produce_Attributes attributes.
Description	Description	User information about the tag.
Comment	Comment	Provide information about a tag component. Can specify Comment<*specifier*> Where the *specifier* is: *.bitnumber* for a bit in the tag. [*element*] for an array element of the tag. *.membername* for a structure member of the tag. There can be multiple comment elements.
Data	*value*	Tag data. In L5X, this element can also contain additional attributes for other tag types.
EngineeringUnit	EngineeringUnit	(optional) User-specified description of what the unit of the value is, in feet, gallons, or kilos. Can specify EngineeringUnit <*specifier*> Where the *specifier* is: *.bitnumber* - for a bit in the tag *[element]* - for an array element of the tag *.membername* - for a structure member of the tag There can be multiple engineering unit elements.
Max	Max	(optional) User-specified maximum value about qualified sub-regions of the parameter. Only valid for the sub-regions of the parameter, which is a non-Boolean atomic datatypes. Can specify EngineeringUnit <*specifier*> Where the *specifier* is: *.bitnumber* - for a bit in the tag *[element]* - for an array element of the tag *.membername* - for a structure member of the tag There can be multiple max elements.

L5X Item	**L5K Item**	**Description**
Min	Min	(optional) User-specified minimum value about qualified sub-regions of the parameter. Only valid for the sub-regions of the parameter, which is a non-Boolean atomic datatypes. Can specify EngineeringUnit <*specifier*> Where the *specifier* is: *.bitnumber* - for a bit in the tag *[element]* - for an array element of the tag *.membername* - for a structure member of the tag There can be multiple min elements.
State0	State0	(optional) For Boolean parameters or sub-regions only. User-specified description of what the Zero state of the Boolean value is. Can specify EngineeringUnit <*specifier*> Where the *specifier* is: *.bitnumber* - for a bit in the tag *[element]* - for an array element of the tag *.membername* - for a structure member of the tag There can be multiple stat0 elements.
State1	State1	(optional) For Boolean parameters (or sub-regions) only. User-specified description of what the One state of the Boolean value is. Can specify EngineeringUnit <*specifier*> Where the *specifier* is: *.bitnumber* - for a bit in the tag *[element]* - for an array element of the tag *.membername* - for a structure member of the tag There can be multiple state1 elements.
ForceData	*tag_force_data*	Tag force data.

Tag attributes

Attribute	**Description**
Name	The name of the tag. In L5K, the name is an element of the statement.
TagType	L5X only. Type **Base**, **Alias**, **Produce**, or **Consumed**.

Attribute	**Description**
DataType	Type of tag. Atomic types: BOOL, SINT, INT, DINT, LINT, REAL String types: STRING Predefined types such as: AXIS_CONSUMED, AXIS_GENERIC_DRIVE, AXIS_SERVO, AXIS_SERVO_DRIVE, AXIS_VIRTUAL, CAM, CAM_PROFILE, CONTROL, COORDINATE_SYSTEM, COUNTER, MESSAGE, MOTION_GROUP Equipment phase types: PHASE, PHASE_INSTRUCTION Safety types: CONNECTION_STATUS and unique types for each safety instruction Function block types: unique type for each function block Sequential function chart: SFC_ACTION, SFC_STEP, SFC_STOP User-defined data types. Add-On Instruction defined data types. Module-defined data types.
AliasFor	L5X only. Name of the base tag that the alias tag references. Specify *tag<specifier>* Where the *specifier* is a bit (*.bitnumber*), array element ([*element*]), or structure member (*.membername*) of the tag, or any combination such as *[7].Input.0*.
Dimensions	L5X only. The number of elements within the array dimension. For example [5, 10, 2].
Class	Specify the class of the tag. This attribute applies only to safety controller projects. Type **Standard** or **Safety**.
Radix	Specify the display style as **decimal**, **hex**, **octal**, **binary**, **exponential**, **float**, **ASCII**, or **date/time**. (LINT only).
PLCMappingFile	If this tag is mapped to a PLC controller, specify the file number, which can be any positive number. For L5X, this attribute is on the <ProduceInfo> element.
PLC2Mapping	If this tag is mapped to a PLC-2 file, set this attribute to 1. If this tag is not mapped to a PLC-2 file, set this attribute to 0. For L5X, this attribute is on the <ProduceInfo> element.
ProgrammaticallySend EventTrigger	If the project programmatically sends an event trigger, set this attribute to **1**. Otherwise, set this attribute to **0**. For L5X, this attribute is on the <ProduceInfo> or <ConsumeInfo> element.
Unicast	Allow connections to be unidirectional, rather than bidirectional. Type **Yes** or **No**.
UnicastPermitted	Specify when unicast connections can be received. Type **Yes** or **No**. For L5X, this attribute is on the <ProduceInfo> element.
Usage	• Specify how an Equipment Phase program uses a tag. This attribute applies only to tags that are program-scoped to an Equipment Phase program. Type **Input**, **Output**, or **Normal**. • Specify how a parameter is used. Type **Input**, **Output**, **InOut**, or **Public**.
Sequencing	Specify if the parameter can be seen by the FactoryTalk Batch Server. Only Input and Output parameters can be used by a sequence. Usage is **Input** or **Output**.
ExternalAccess	Specify the external access, outside of the controller, to the tag. Specify **Read/Write**, **Read Only**, or **None**.
Max	(optional) User specified maximum value for the tag. Only valid for tag with non-Boolean atomic datatype.
Min	(optional) User specified minimum value for the tag. Only valid for tag with non-Boolean atomic datatype.
Constant	Specify whether the tag value is a constant value or it can change. For L5K, specify **yes** for a constant value or **no** for a dynamic value. For L5X, specify **true** or **false**.

Attribute	Description
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Produced tag attributes

A produced tag has these attributes, and those for a standard tag.

Attribute	Description
ProduceCount	Specify the number of consumers allowed with any positive number. In L5X, this attribute is on the <ProduceInfo> element.
MinimumRPI	Specify the smallest and fastest packet interval at which consumers may consume data from the tag (0.196...536870.911 and 1...536870.911 for CompactLogix).
MaximumRPI	Specify the largest and slowest packet interval at which consumers may consume data from the tag (0.196...536870.911).
DefaultRPI	Specify a default RPI that the produced tag provides value to consumers that attempt to connect with an out-of-range RPI (0.196...536870.911).

Consumed tag attributes

A consumed tag also has these attributes, in addition to those for a standard tag.

Important: If consumed information is provided on an alias tag, the alias tag is converted to a base tag before it can consume data.

Attribute	Description
Producer	If the controller consumes this tag, specify the name of the remote controller that produces this tag. You must also specify RemoteTag and RPI attributes. In L5X, this attribute is on the <ConsumeInfo> element.
RemoteTag	If the controller consumes this tag from a controller that supports tag names, specify the name of the tag on the remote controller. You must also specify Producer and RPI attributes. In L5X, this attribute is on the <ConsumeInfo> element.
RemoteFile	If the controller consumes this tag from a PLC-5 controller, specify the PLC-5 file number, as any positive number, on the PLC-5 controller. You must also specify Producer and RPI attributes. In L5X, this attribute is on the <ConsumeInfo> element.
RPI	If the controller consumes this tag, specify the RPI value in milliseconds, as any positive number. You must also specify Producer and RemoteTag attributes. In L5X, this attribute is on the <ConsumeInfo> element.

ALARM_ANALOG tag

L5X tag structure for ALARM_ANALOG tag

In an .L5X file, tag attributes for an ALARM_ANALOG tag are in the Data element.

```
<Data Format="Alarm">
      <AlarmAnalogParameters [Alarm_Analog_Attributes]/>
      <AlarmConfig>
            messages
            alarm_class
            HMI_command
      </AlarmConfig>
</Data>
```

L5K tag structure for ALARM_ANALOG tag

In an .L5K file, tag attributes for an ALARM_ANALOG tag are in the tag statement.

```
<tag_name> : <type>
      [(Alarm_Analog_Attributes)]
```

ALARM_ANALOG tag attributes

Attribute	Description
EnableIn	Specify whether to enable the alarm tag. Type **0** to disable the tag; type **1** to enable the tag.
InFault	Specify the quality of the input fault data. Type **1** for bad quality; type **0** for good quality.
HHEnabled	Specify the whether the alarm monitors for a high-high limit. Type **1** to enable; type **0** to disable.
HEnabled	Specify the whether the alarms monitors for a high limit. Type **1** to enable; type **0** to disable.
LEnabled	Specify the whether the alarm monitors for a low limit. Type **1** to enable; type **0** to disable.
LLEnabled	Specify the whether the alarms monitors for a low-low limit. Type **1** to enable; type **0** to disable.
AckRequired	Specify whether the alarms requires acknowledgment. Type **1** to enable; type **0** to disable.
ProgAckAll	Specify whether the program acknowledges all alarm conditions. Type **1** to enable; type **0** to disable.
OperAckAll	Specify whether an operator acknowledges all alarm conditions. Type **1** to enable; type **0** to disable.
HHProgAck	Specify whether the program acknowledges a high-high condition. Type **1** to enable; type **0** to disable.
HHOperAck	Specify whether an operator acknowledges a high-high condition. Type **1** to enable; type **0** to disable.
HProgAck	Specify whether the program acknowledges a high condition. Type **1** to enable; type **0** to disable.
HOperAck	Specify whether an operator acknowledges a high condition. Type **1** to enable; type **0** to disable.
LProgAck	Specify whether the program acknowledges a low condition. Type **1** to enable; type **0** to disable.
LOperAck	Specify whether an operator acknowledges a low condition. Type **1** to enable; type **0** to disable.
LLProgAck	Specify whether the program acknowledges a low-low condition. Type **1** to enable; type **0** to disable.
LLOperAck	Specify whether an operator acknowledges a low-low condition. Type **1** for enabled; type **0** for disabled.
HHOperShelve	Set by the operator to shelve a high-high condition.
HOperShelve	Set by the operator to shelve a high condition.
LOperShelve	Set by the operator to shelve a low condition.
LLOperShelve	Set by the operator to shelve a low-low condition.
ROCPosProgAck	Specify whether the program acknowledges a positive (increasing), rate-of-change condition. Type **1** to enable; type **0** to disable.
ROCPosOperAck	Specify whether an operator acknowledges a positive (increasing), rate-of-change condition. Type **1** to enable; type **0** to disable.

Attribute	**Description**
ROCPNegProgAck	Specify whether the program acknowledges a negative (decreasing), rate-of-change condition. Type **1** to enable; type **0** to disable.
ROCPNegOperAck	Specify whether an operator acknowledges a negative (decreasing), rate-of-change condition. Type **1** to enable; type **0** to disable.
ROCPosOperShelve	Set by the operator to shelve a positive rate-of-change condition.
ROCNegOperShelve	Set by the operator to shelve a negative rate-of-change condition.
ProgSuppress	Specify whether the program can suppress an alarm. Type **1** to enable; type **0** to disable.
OperSuppress	Specify whether an operator can suppress an alarm. Type **1** to enable; type **0** to disable.
ProgUnsuppress	Specify whether the program can unsuppress an alarm. Type **1** to enable; type **0** to disable.
OperUnsuppress	Specify whether an operator can unsuppress an alarm. Type **1** to enable; type **0** to disable.
ProgDisable	Specify whether the program disables an alarm. Type **1** to enable; type **0** to disable.
OperDisable	Specify whether an operator disables an alarm. Type **1** to enable; type **0** to disable.
ProgEnable	Specify whether the program enables an alarm. Type **1** to enable; Type **0** to disable.
OperEnable	Specify whether an operator enables an alarm. Type **1** to enable; type **0** to disable.
ProgUnshelveAll	Set by the user program to unshelve all conditions on this alarm.
AlarmCountReset	Specify whether to reset the alarm count. Type **1** to reset; type **0** to not reset.
In	Specify the analog input (REAL) to the alarm.
HHLimit	Specify the high-high limit (REAL) for the alarm condition.
HHSeverity	Specify the severity (1...500) of a high-high alarm condition.
HLimit	Specify the high limit (REAL) for the alarm condition.
HSeverity	Specify the severity (1...500) of a high alarm condition.
LLimit	Specify the low limit (REAL) for the alarm condition.
LSeverity	Specify the severity (1...500) of a low alarm condition.
LLLimit	Specify the low-low limit (REAL) for the alarm condition.
LLSeverity	Specify the severity (1...500) of a low-low alarm condition.
HHOperUnshelve	Set by the operator to unshelve a high-high condition.
HOperUnshelve	Set by the operator to unshelve a high condition.
LOperUnshelve	Set by the operator to unshelve a low condition.
LLOperUnshelve	Set by the operator to unshelve a low-low condition.
MinDurationPRE	Specify the minimum time (DINT) an alarm condition to remain true for the alarm to be considered active.
HHMinDurationEnable	Set to enable minimum duration timer when detecting the high-high condition.
HMinDurationEnable	Set to enable minimum duration timer when detecting the high condition.
LMinDurationEnable	Set to enable minimum duration timer when detecting the low condition.
LLMinDurationEnable	Set to enable minimum duration timer when detecting the low-low condition.
Deadband	Specify the deadband (REAL) for the high-high, high, low, and low-low levels.
ROCPosLimit	Specify the positive rate-of-change limit (REAL) for the alarm condition.
ROCPosSeverity	Specify the severity (1...500) of a positive rate-of-change alarm condition.
ROCNegLimit	Specify the negative rate-of-change limit (REAL) for the alarm condition.
ROCNegSeverity	Specify the severity (1...500) of a negative rate-of-change alarm condition.
ROCPeriod	Specify the time period (seconds) to evaluate rate-of-change conditions.
ROCPosOperUnshelve	Set by the operator to unshelve a positive rate-of-change condition.
ROCNegOperUnshelve	Set by the operator to unshelve a negative rate-of-change condition.

Attribute	Description
ShelveDuration	Time duration for which a shelved alarm will be shelved, between 1 and *MaxShelveDuration*.
MaxShelveDuration	Maximum time duration for which an alarm can be shelved.
AssocTag1	Specify a tag associated with the alarm.
AssocTag2	Specify a tag associated with the alarm.
AssocTag3	Specify a tag associated with the alarm.
AssocTag4	Specify a tag associated with the alarm.
AlarmClass	Specify an alarm class for the alarm. In L5X, use an AlarmClass element in the Data Element.
HMICmd	Specify a command string for the HMI. In L5X, use an HMICommand element in the Data Element.

ALARM_DIGITAL tag

L5X tag structure for ALARM_DIGITAL tag

In an .L5X file, tag attributes for an ALARM_DIGITAL tag are in the Data element.

```
<Data Format="Alarm">
      <AlarmDigitalParameters [Alarm_Digital_Attributes]/>
      <AlarmConfig>
            message
            alarm_class
            HMI_command
      </AlarmConfig>
</Data>
```

L5K tag structure for an ALARM_DIGITAL tag

In an .L5K file, tag attributes for an ALARM_DIGITAL tag are in the tag statement.

```
<tag_name> : <type>
      [(Alarm_Digital_Attributes)] := value;
```

ALARM_DIGITAL tag attributes

Attribute	Description
EnableIn	Specify whether to enable the alarm tag. Type **1** to enable the tag; type **0** to disable the tag
In	Specify the analog input to the alarm.
InFault	Specify the quality of the input fault data. Type **1** for bad quality; type **0** for good quality.
Condition	Specify whether the alarm condition exists. Type **1** for yes; type **0** for no.
AckRequired	Specify whether the alarms require acknowledgment. Type **1** to enable; type 0 to disable.
Latched	Specify whether the alarm output is latched. Type **1** for yes; type **0** for no.
ProgAck	Specify whether the program acknowledges the alarm condition. Type **1** to enable; type **0** to disable.
OperAck	Specify whether an operator acknowledges the alarm condition. Type **1** to enable; type **0** to disable.

Attribute	Description
ProgReset	Specify whether the program resets the alarm condition. Type **1** to enable; type **0** to disable.
OperReset	Specify whether an operator resets the alarm condition. Type **1** to enable; type **0** to disable.
ProgSuppress	Specify whether the program can suppress an alarm. Type **1** to enable; type **0** to disable.
OperSuppress	Specify whether an operator can suppress an alarm. Type **1** to enable; type **0** to disable.
ProgUnsuppress	Specify whether the program can unsuppress an alarm. Type **1** to enable; type **0** to disable.
OperUnsuppress	Specify whether an operator can unsuppress an alarm. Type **1** to enable; type **0** to disable.
ProgDisable	Specify whether the program disables an alarm. Type **1** to enable; type **0** to disable.
OperDisable	Specify whether an operator disables an alarm. Type **1** to enable; type **0** to disable.
ProgEnable	Specify whether the program enables an alarm. Type **1** to enable; type **0** to disable.
OperEnable	Specify whether an operator enables an alarm. Type **1** to enable; type **0** to disable.
AlarmCountReset	Specify whether to reset the alarm count. Type **1** to reset; type **0** to not reset.
UseProgTime	Specify how to timestamp alarm events. Type **1** for programmatic timestamp; type **0** for controller timestamp.
ProgTime	Specify the programmatic timestamp (LINT).
Severity	Specify the severity (1…500) of the alarm condition.
MinDurationPRE	Specify the minimum time (DINT) an alarm condition remains true for the alarm to be considered active.
OperShelve	Set by the operator interface to shelve the alarm.
ProgUnshelve	Set by the user program to unshelve the alarm.
OperUnshelve	Set by the operator interface to unshelve the alarm.
ShelveDuration	Time duration for which a shelved alarm is shelved, between 1 and *MaxShelveDuration*.
MaxShelveDuration	Maximum time duration that an alarm is shelved.
AssocTag1	Specify a tag associated with the alarm.
AssocTag2	Specify a tag associated with the alarm.
AssocTag3	Specify a tag associated with the alarm.
AssocTag4	Specify a tag associated with the alarm.
AlarmClass	Specify an alarm class for the alarm. In L5X, use an AlarmClass element in the Data Element.
HMICmd	Specify a command string for the HMI. In L5X, use an HMICommand element in the Data Element.

L5X AlarmConfig structure

In an .L5X file, the AlarmConfig element contains the alarm message text alarm class, and HMI command.

```
<AlarmConfig>
```

```
            <Messages>
                  <Message Type="type">
                        <Text Lang="language">
                              <![CDATA[ message_text ]]>
                        </Text>
                  </Message>
            /Messages>
            <AlarmClass>
                  <![CDATA[ class_text ]]>
            </AlarmClass>
            <HMICommand>
                  <![CDATA[ command_text ]]>
            </HMICommand>
      </AlarmConfig>
```

AlarmConfig elements

L5X Item	Description
Message	Each message element contains a separate message. Specify a Type attribute for the analog alarm type. **Specify** — **For** HH — high-high alarm H — high alarm L — low alarm LL — low-low alarm POS — rate-of-change positive alarm NEG — rate-of change negative alarm
Text	The text of the message. Specify a Lang attribute for the language: **EN-US** (United States English), **DE** (Germany German), **ES** (Spain Spanish), **FR** (France French), **IT** (Italian), **PT** (Brazil Portuguese), **JA** (Japanese), **KO** (Korean), **ZH** (Chinese).
AlarmClass	Specify an alarm class for the alarm.
HMICommand	Specify a command string for the HMI.

L5K ANALOG_ALARM message structure

In an .L5K file, the ALMMSG statement contains the alarm message text.

ALMMSG elements

```
ALMMSG.<alarm_type>:<language>:=<"message_text">
```

L5K Item	Description
alarm_type	For an analog alarm type. **Specify** **For** HH high-high alarm H high alarm L low alarm LL low-low alarm POS rate-of-change positive alarm NEG rate-of change negative alarm Specify AM for a digital alarm.
language	Languages: **EN-US** (United States English), **DE** (Germany German), **ES** (Spain Spanish), **FR** (France French), **IT** (Italian), **PT** (Brazil Portuguese), **JA** (Japanese), **KO** (Korean), **ZH** (Chinese).
message_text	Alarm message. Enclose the message in double quotes (" "). This is a unicode string.

MESSAGE tag

Message tag structure is explained in these pages.

L5X message structure

In an .L5X file, message attributes are in the Data element.

```
<Data Format="Message">
      <MessageParameters [Message_Attributes]/>
</Data>
```

L5K MESSAGE structure

In an .L5K file, message attributes are in the tag statement.

```
<tag_name> : <type>
      [(Message_Attributes)];
```

Message tag attributes

Attribute	Description
MessageType	Type **Block Transfer Read**, **Block Transfer Write**, **CIP Data Table Read**, **CIP Data Table Write**, **CIP Generic**, **PLC2 Unprotected Read**, **PLC2 Unprotected Write**, **PLC3 Typed Read**, **PLC3 Typed Write**, **PLC3 Word Range Read**, **PLC3 Word Range Write**, **PLC5 Typed Read**, **PLC5 Typed Write**, **PLC5 Word Range Read**, **PLC5 Word Range Write**, **SERCOS IDN Read**, **SERCOS IDN Write**, **SLC Typed Read**, **SLC Typed Write**, **Unconfigured**, or **Module Reconfigure**.
RemoteElement	Specify the address or tag name of the element in the remote device. This is the source element of a read instruction or the destination element of a write instruction.
RequestedLength	Specify the number of elements to be transferred (0...32,767).
ConnectedFlag	Specify whether the CIP generic message requires a connection or not. Type **1** for connected, or **0** for not connected.
ConnectionPath	Specify the connection path to the other device.

Attribute	Description
CommTypeCode	Specify the type of communication method. **Type:** — **For this communication method:** 0 — CIP (most messages use CIP communications) 1 — DH+ 2 — CIP with source ID 3 — block transfer via universal remote I/O 4 — block transfer via ControlNet
ServiceCode	If the message type is CIP Generic, specify the service code (0...32,767 hexadecimal).
ObjectType	If the message type is CIP Generic, specify the object type (0...32,767 hexadecimal). The ObjectType attribute is the same as the Class field on the MSG configuration dialog box.
TargetObject	If the message type is CIP Generic, specify the target object (0...32,767 decimal). The TargetObject attribute is the same as the Instance field on the MSG configuration dialog box.
AttributeNumber	If the message type is CIP Generic, specify the attribute number (0...65,535 hexadecimal).
Channel	For a DH+ or block transfer message, specify the channel. Type **A** or **B**.
SourceLink	If the communication method uses DH+, specify the source link (0...199).
DestinationLink	If the communication method uses DH+, specify the destination link (0...199).
DestinationNode	If the communication method uses DH+, specify the destination node number (0...77 octal).
Rack	For a DH+ or block transfer message, type the rack number (0...77 octal) of the target device.
Group	For a DH+ or block transfer message, type the group number (0...7) of the target device.
Slot	For a DH+ or block transfer message, type the slot number (0...15) of the target device.
LocalIndex	Specify the index into the local element, typically 0.
RemoteIndex	Specify the index into the remote element, typically 0.
LocalElement	Specify the tag name of the element in the local controller. This is the destination element of a read instruction or the source element of a write instruction.
DestinationTag	Specify the tag name of the destination element.
CacheConnections	If the message is to cache connections, type **TRUE**. If the message is not to cache connections, type **FALSE**.
LargePacketUsage	CIP Generic type messages with a cached connection can be configured to use either a standard or large size packet. **True** makes use of the large packet size.

AXIS_CIP_DRIVE, AXIS_CONSUMED, AXIS_GENERIC_DRIVE, AXIS_SERVO, AXIS_SERVO_DRIVE, or AXIS_VIRTUAL Tag

Each of the axis tags has this structure.

L5X axis structure

In an .L5X file, axis attributes are in the Data element.

```
<Data Format="Axis">
      <AxisParameters [Axis_Attributes]/>
```

```
</Data>
```

L5K AXIS TAG structure

In an .L5K file, axis attributes are in the tag statement.

```
<tag_name> : <type>
       [(Axis_Attributes)];
```

Axis tag attributes

These attributes are for the AXIS_CONSUMED, AXIS_GENERIC_DRIVE, AXIS_SERVO, AXIS_SERVO_DRIVE, and AXIS_VIRTUAL tags. For information about attributes for AXIS_CIP_DRIVE tags, see the *Integrated Motion on the Ethernet/IP Network Configuration and Startup User Manual* publication MOTION-UM003.

Attribute	Description
MotionGroup	Type the name of the associated motion group, or type **NA**. For L5X, if there is no Motion group, then the attribute is not present.
MotionModule	Type the name of the associated motion module, or type **NA**. For L5X, if there is no Motion module, then the attribute is not present.
MotorCatalogNumber	Specify the catalog number of the motor that this axis is connected or type **NONE**.
RotationalPosResolution	Specify the number of counts per motor revolution (1...[232-1]).
ConversionConstant	Specify the number of feedback counts per position unit. Type a real number from 1.0...1.0e9.
OutputCamExecutionTargets	Specify the number of output cam execution targets (any positive number).
AxisState	Type **Axis-Ready**, **Direct Drive Control**, **Servo Control**, **Axis Faulted**, or **Axis Shutdown**.
PositionUnits	Specify user-defined engineering units, rather than feedback units.
AverageVelocityTimebase	Specify the time in seconds for calculating the average velocity of the axis (any positive number).
RotaryAxis	Specify the positioning mode for an axis. Type **Rotary** or **Linear**.
PositionUnwind	For a rotary axis, specify the distance, in feedback counts, used to perform electronic unwind (any positive number).
HomeMode	Specify the homing mode. Type **Passive**, **Active**, or **Absolute**.
HomeDirection	For active homing sequences, except for the immediate sequence type, specify the desired homing direction. Type **Uni-directional Forward**, **Bi-directional Forward**, **Uni-directional Reverse**, or **Bi-directional Reverse**.
HomeSequence	Specify the event that will cause the home position to be set. Type **Immediate**, **Switch**, **Marker**, **Switch-Marker**, **Torque Level**, or **Torque Level-Marker**.
HomeConfigurationBits	Specify the home configuration bits. Type a hexadecimal number.
HomePosition	Specify the desired absolute position, in positioning units, for the axis after the homing sequence is complete (any positive number).
HomeOffset	Specify the desired offset (any positive number) in position units the axis is to move, upon completion of the homing sequence, to reach the home position. In most cases, this value will be zero.
HomeSpeed	Specify the speed of the jog profile used in the first leg of the homing sequence (any positive number). The homing speed should be less than the maximum speed, and greater than zero.
HomeReturnSpeed	Specify speed of the jog profile used in the return leg(s) of an active homing sequence (any positive number). The return speed should be less than the maximum speed, and greater than zero.
MaximumSpeed	Specify the maximum speed (any positive number).
MaximumAcceleration	Specify the maximum acceleration rate of the axis in position units/second (any positive number).
MaximumDeceleration	Specify the maximum deceleration rate of the axis in position units/second (any positive number).

Attribute	Description
ProgrammedStopMode	Specify how a specific axis stops when the controller changes mode, or a motion group stop (MGS) instruction is executed. Type **Fast Disable**, **Fast Stop**, **Fast Shutdown**, **Hard Disable**, or **Hard Shutdown**.
MasterInputConfigurationBits	Specify the master input configuration bits. Type a hexadecimal number.
MasterPositionFilterBandwidth	Specify the bandwidth in Hertz of the master position filter.
AxisType	Specify the intended use of the axis. Type **Servo** or **Feedback Only**.
ServoLoopConfiguration	Specify the configuration of the loop. Type **Custom**, **Position Servo**, **Aux Position Servo**, **Dual Position Servo**, **Aux Command Servo, Dual Command Servo, Velocity Servo**, or **Torque Servo**.
ExternalDriveType	Specify the type of external drive. **Specify:** **To:** 0 Torque servo 1 Velocity servo 2 Hydraulic servo
FaultConfigurationBits	Specify the fault configuration bits. Type a hexadecimal number.

Attribute	Description
AxisInfoSelect1	Specify an axis attribute to transmit, and the actual position data, to the controller. The options include: • <none> • Position Command • Position Feedback • Aux Position Feedback • Position Error • Position Int. • Error • Velocity Command • Velocity Feedback • Velocity Error • Velocity Int. Error • Accel. Command • Accel. Feedback • Servo Output Level • Marker Distance • Torque Command • Torque Feedback • Positive Dynamic Torque Limit • Negative Dynamic Torque Limit • Motor Capacity, Drive Capacity • Power Capacity • Bus Regulator Capacity • Motor Electrical Angle • Torque Limit Source • DC Bus Voltage • Absolute Offset • Analog Input 1 • Analog Input 2 • Guard Status • Guard Faults

Attribute	Description
AxisInfoSelect2	Specify a second axis attribute to transmit, and the actual position data, to the controller. The options include: • <none> • Position Command • Position Feedback • Aux Position Feedback • Position Error • Position Int. Error • Velocity Command • Velocity Feedback • Velocity Error • Velocity Int. Error • Accel. Command • Accel. Feedback • Servo Output Level • Marker Distance • Torque Command • Torque Feedback • Positive Dynamic Torque Limit • Negative Dynamic Torque Limit • Motor Capacity • Drive Capacity • Power Capacity • Bus Regulator Capacity • Motor Electrical Angle • Torque Limit Source • DC Bus Voltage • Absolute Offset • Analog Input 1 or Analog Input 2 • Absolute Offset • Analog Input 1 • Analog Input 2 • Guard Status • Guard Faults.
LDTType	Specify the LDT device type. Type **PWM**, **Start/Stop Rising**, or **Start/Stop Falling**.
LDTRecirculations	Only use this field if you specified PWM for LDTType. Specify the number of recirculations that the transducer is configured for so the 1756-HYD02 module knows how the LDT is configured.
LDTCalibrationConstant	Specify the calibration constant (also called gradient on some LDTs). This number is engraved on each LDT by the manufacturer. It specifies the characteristics of that individual transducer.
LDTCalibrationConstantUnits	Specify the units of the calibration constant. Type **us/in** or **m/s**.
LDTScaling	Define the relationship between the unit of measurement of the transducer and the system. This is necessary for calculating the conversion constant. The LDT length is used with the number of recirculations to calculate the minimum servo update period.
LDTScalingUnits	Specify the units of scaling. Type **us/in** or **m/s**.

Attribute	**Description**
LDTLength	Specify the length of the LDT.
LDTLengthUnits	Specify the units of length. Type **us/in** or **m/s**.
SSICodeType	Specify the encoding on the data sent from an SSI transducer. Type **Binary** or **Grey**.
SSIDataLength	Specify the data length (8...32 bits) of the SSI transducer. The default value is 13.
SSIClockFrequency	Specify the SSI clock frequency (in kHz). Valid values are 208 (default) or 650.
AbsoluteFeedbackEnable	Specify whether to enable absolute feedback. Type **1** to enable absolute feedback. Otherwise, type **0**. Absolute feedback is always enabled for LDT.
AbsoluteFeedbackOffset	Specify the absolute offset that is used to place the machine zero point at the desired location relative to the zero point of the LDT.
ServoFeedbackType	Specify the type of feedback device. Type **LDT** (linear displacement transducer), **AQB** (A quadrature B), or **SSI** (synchronous serial interface)
ServoPolarityBits	Specify the servo polarity bits. Type a hexadecimal number.
VelocityFeedforwardGain	Specify the velocity feedforward gain (any positive number).
AccelerationFeedforwardGain	Specify the acceleration feedforward gain (any positive number).
PositionProportionalGain	Specify the position proportional gain (any positive number).
PositionIntegralGain	Specify the position integral gain (any positive number).
VelocityProportionalGain	Specify the velocity proportional gain (any positive number).
VelocityIntegralGain	Specify the velocity integral gain (any positive number).
VelocityScaling	Specify the velocity scaling attribute that is used to convert the output of the servo loop into equivalent voltage to an external velocity servo drive.
TorqueScaling	Specify the torque scaling attribute that is used to convert the acceleration of the servo loop into equivalent % rated torque to the motor.
OutputLPFilterBandwidth	Specify the bandwidth in Hertz of the servo low-pass digital output filter.
IntegratorHoldEnable	Type **Disabled** or **Enabled**.
PositionDifferentialGain	Specify a position differential gain (PosD) to help predict a large overshoot ahead of time and attempt to correct before the overshoot actually occurs.
DirectionalScalingRatio	Specify the ratio between the extend direction gain and the retract direction gain.
MaximumPositiveTravel	Specify the maximum positive position (any positive number) to be used for software overtravel checking in position units.
MaximumNegativeTravel	Specify the maximum negative position (any positive number) to be used for software overtravel checking, in position units.
PositionErrorTolerance	Specify the how position error the servo module tolerates (any positive number) before it issues a position error fault.
PositionLockTolerance	Specify the maximum position error the servo module accepts (any positive number) to indicate that the position lock status bit is set.
OutputLimit	Specify the maximum servo output voltage of a physical axis (any positive number).
DirectDriveRampRate	Specify the rate at which the analog output changes from the current value to the requested value when an MDO command is given (if ramp control is enabled). The ramp rate is specified in Volts per second.
OutputOffset	Specify a fixed voltage value (-10...10V) to add to the servo output value to correct axis drift.
VelocityOffset	Specify a dynamic velocity correction to the output of the position servo loop, in position units/second (any positive number).
TorqueOffset	Specify a dynamic torque command correction to the output of the velocity servo loop as a percentage of the velocity servo loop output (-100...100).
FrictionCompensation	Specify the percentage (0...100) of output level added to a positive current servo output value, or subtracted from a negative current servo output value to move an axis stuck in place from static friction.

Attribute	Description
FrictionCompensationWindow	This window is defined as: command position - window attribute to command position + window attribute While the command velocity is zero and the actual position is within this window, the friction compensation, or deadband compensation, for hydraulics, is applied proportionally to the position error. While the command velocity is non-zero, the full friction compensation is applied.
BacklashStabilizationWindow	The window controls the backlash stabilization feature in the servo control loop. Mechanical backlash is a common problem in applications that use mechanical gearboxes.
BacklashReversalOffset	Specify the backlash reversal error to compensate for positional inaccuracy introduced by mechanical backlash.
HardOvertravelFaultAction	Specify the fault action taken when a hardware overtravel error occurs. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
SoftOvertravelFaultAction	Specify the fault action taken when a software overtravel error occurs. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
PositionErrorFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
FeedbackFaultAction	Specify the fault action to be taken when a feedback loss condition is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
FeedbackNoiseFaultAction	Specify the fault action to be taken when excessive feedback noise is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
DriveFaultAction	Specify the fault action to be taken when a drive fault condition is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
TestIncrement	Specify the amount of distance traversed by the axis when executing the output and feedback test (any positive number).
TuningTravelLimit	Specify the tuning travel limit in revolutions (any positive number).
TuningSpeed	Specify the tuning speed in revolutions per second (any positive number).
TuningTorque	Specify the tuning torque % rated (0...300).
DampingFactor	Specify the damping factor (0.5...2).
DriveModelTimeConstant	Specify the drive model time constant (1.0e-6f...1).
PositionServoBandwidth	Specify the maximum allowable value for position bandwidth (0.001F...1000), given the damping factor. This parameter is disabled if the loop configuration is set to velocity.
VelocityServoBandwidth	Specify the unity gain bandwidth that is to be used to calculate the subsequent gains for a motion apply axis tuning (MAAT) instruction (0.001F...1000).
TuningConfigurationBits	Specify the tuning configuration bits. Type a hexadecimal number.
TorqueLimitSource	Type **Not Limited**, **Negative Limit**, **Positive Limit**, **Bridge Limit**, **I(t) Limit**, or **Motor Limit**.
DriveUnit	Specify the units of the drive. Type **us/in** or **m/s**.
PositionDataScaling	Specify the scaling method used on position values (0...255).
PositionDataScalingFactor	Specify the scaling factor for all position data in a drive (1...65535).
PositionDataScalingExp	Specify the scaling exponent for all position data in a drive (-32768...32767).
VelocityDataScaling	Specify the scaling method to use for all velocity values (0...127).
VelocityDataScalingFactor	Specify the scaling factor for all velocity data (1...65535).
VelocityDataScalingExp	Specify the scaling exponent for all velocity data (-32768...32767).
AccelerationDataScaling	Specify the scaling method for all acceleration values (0...127).
AccelerationData ScalingFactor	Specify the scaling factor for all acceleration data (1...65535).
AccelerationDataScalingExp	Specify the scaling exponent for all acceleration data (-32768...32767).
TorqueDataScaling	Specify the scaling method for all torque values (0...127).

Attribute	**Description**
TorqueDataScalingFactor	Specify the scaling factor for all torque values (1...65535).
TorqueDataScalingExp	Specify the scaling exponent for all torque values (-32768...32767).
DrivePolarity	Specify the polarity of the servo loop of the drive. Type **Custom**, **Positive**, or **Negative**.
MotorFeedbackType	Specify the type of motor associated with the selected motor (MotorCatalogNumber). If you specify **NONE** for the motor, you must specify a feedback type.
MotorFeedbackResolution	Specify the resolution of the motor (1...2147483647).
AuxFeedbackType	Specify the type of auxiliary feedback device.
AuxFeedbackResolution	Specify the resolution of the auxiliary feedback device (1...2147483647).
MotorFeedbackUnit	Specify the units for motor feedback. Type **Rev**, **Inch**, or **Millimeter**.
AuxFeedbackUnit	Specify the units for auxiliary feedback. Type **Rev**, **Inch**, or **Millimeter**.
OutputNotchFilterFrequency	Specify the frequency of the digital notch filer of the drive (0...10,000.0).
VelocityDroop	Specify the velocity droop (any positive number).
VelocityLimitBipolar	Specify the velocity limit symmetrically in both directions (any positive number).
AccelerationLimitBipolar	Specify the acceleration and deceleration limits for the drive (any positive number).
TorqueLimitBipolar	Specify the torque limit symmetrically in both directions (0...1000.0).
VelocityLimitPositive	Specify the maximum allowable velocity in the positive direction (any positive number).
VelocityLimitNegative	Specify the maximum allowable velocity in the negative direction (any positive number).
VelocityThreshold	Specify the velocity threshold limit (any positive number).
VelocityWindow	Specify the limits of the velocity window (any positive number).
VelocityStandstillWindow	Specify the velocity limit for the standstill window (any positive number).
AccelerationLimitPositive	Specify the maximum acceleration ability of the drive (any positive number).
AccelerationLimitNegative	Specify the maximum acceleration ability of the drive (any negative number).
TorqueLimitPositive	Specify the maximum torque in the positive direction (0...1000.0).
TorqueLimitNegative	Specify the maximum torque in the negative direction (-1000.0...0).
TorqueThreshold	Specify the torque threshold (0...1000.0).
DriveThermalFaultAction	Specify the fault action to be taken when a drive thermal fault is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
MotorThermalFaultAction	Specify the fault action to be taken when a motor thermal fault is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
DriveEnableInputFaultAction	Specify the fault action to be taken when a drive enable input fault is detected. Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**.
StoppingTorque	Specify the amount of torque available to stop the motor (0...1000).
StoppingTimeLimit	Specify the maximum amount of time that the drive amplifier will remain enabled while trying to stop (0...6553.5).
BrakeEngageDelayTime	Specify the amount of time that the drive maintains torque when the servo axis is disabled, and the drive decelerates to a minimum speed (0...6.5535).
BrakeReleaseDelayTime	Specify amount of time that the drive ignores command values from the controller when the servo axis is enabled, and the drive activates the torque (0...6.5535).
PowerSupplyID	Specify the power supply ID (any positive number).
BusRegulatorID	Specify the bus regulator ID (any positive number).
PWMFrequencySelect	Specify High Frequency or Low Frequency.
LoadInertiaRatio	Specify the load inertia ratio (any positive number).
AmplifierCatalogNumber	Specify the catalog number of the amplifier to which this axis is connected.

Attribute	Description
AuxFeedbackRatio	Specify the auxiliary feedback ratio (any positive number).
ContinuousTorqueLimit	Specify the maximum torque limit (0...200).
ResistiveBrakeContactDelay	Specify amount of time to delay resistive brake contact.
ConfigurationProfile	Specify the minimum set of attributes the drive can support. **Specify:** **To:** 0 Rockwell classic (identifies past systems for backward compatibility) 1 Packaging (identifies packaging applications)
RegistrationInputs	Specify the number of drive-resident (probe) inputs. Up to two registration inputs per axis.
MaximumAccelerationJerk	Specify the value motion instructions used to determine the maximum acceleration jerk rate to apply to the axis when acceleration jerk is specified as a percent of the maximum. This value is only used by a S-curve profile.
MaximumDecelerationJerk	Specify the value motion instructions used to determine the maximum deceleration jerk rate to apply to the axis when deceleration jerk is specified as a percent of the maximum. This value is only used by a S-curve profile.
DynamicsConfigurationBits	Specify the S-curve profile. **Specify:** **To:** 0 Reduce S-curve stop delay 1 Prevent S-curve velocity reversals
PhaseLossFaultAction	Specify how the axis responds to a drive fault. The default is 1 (disable drive). **Specify:** **To:** 0 Shutdown 1 Disable drive 2 Stop command 3 Status only
HomeTorqueLevel	Specify the torque limit when using one of the torque homing modes. Type the percent (0...TorqueLimitPositive) of continuous torque. The default is 0%.
InputPowerPhase	Specify the power phase operation of a Kinetix 2000 drive. Type **0** for three-phase power; type **1** for single-phase power.
MotorRatedContinuousCurrent	The nameplate AC continuous current rating of the motor (any positive number). This is a database number and should not be changed.
MotorRatedPeakCurrent	The peak or intermittent current rating of the motor (any positive number). This is a database number and should not be changed.
RotaryMotorInertia	The unloaded inertia of a rotary motor.
RotaryMotorRatedSpeed	The nameplate rated speed of a rotary motor (any positive number). This is a database number and should not be changed.
LinearMotorRatedSpeed	The nameplate rated speed of a linear motor (any positive number). This is a database number and should not be changed.
LinearMotorMass	The unloaded moving mass of a linear motor (any positive number). This is a database number and should not be changed.
MotorData	The motor data associated with the currently selected catalog number. This should not be changed.
AdditionalBusCapacitance	Specify the Additional Bus Capacitance. Valid values are in the range of 0...65535
InterpolatedPositionConfiguration	Specify the Interpolated Position Configuration. Type a hexadecimal number.
AxisUpdateSchedule	Specify an enumeration that indicates which update rate, the Base, Alternate 1 or Alternate 2 update period, to use to update the Axis.

COORDINATE_SYSTEM tag

L5X CoordinateSystem structure

In an .L5X file, coordinate system attributes are in the Data element.

```
<Data Format="CoordinateSystem">
      <CoordinateSystemParameters
            [Coordinate_System_Attributes]/>
</Data>
```

L5K COORDINATE_SYSTEM structure

In an .L5K file, coordinate system attributes are in the tag statement.

```
<tag_name> : <type>
      [(Coordinate_System_Attributes)]
```

Coordinate system tag attributes

Attribute	Description
MotionGroupInstance	Type the name of the associated motion group or type **NA**.
SystemType	Specify the coordinate system type. Type **Cartesian**, **Articulated Dependent**, **Articulated Independent**, **Delta**, **SCARA Delta**, or **SCARA Independent**.
Dimension	Specify the number of axes that this coordinated system supports. Type **1**, **2**, or **3**.
Axes	Specify the name of the axes in this coordinated system.
CoordinationMode	Specify coordination mode. Type **Primary** or **Ancillary**.
CoordinationUnits	Specify units to be used for measuring and calculating motion related values such as position, velocity. Type units that are relevant to your application.
ConversionRatioNumerator	The conversion ratio defines the relationship of axis position units to coordination units for each axis. Type the numerator as a float or an integer.
ConversionRatioDenominator	The conversion ratio defines the relationship of axis position units to coordination units for each axis. Type the denominator as an integer.
CoordinateSystemAutoTagUpdate	Specify whether or not the actual position values of the current coordinated system are automatically updated during operation. To enable auto tag update, type **1**. Otherwise, type **0**.
MaximumSpeed	Specify the maximum speed to be used by the coordinated motion instructions in calculating vector speed when speed is expressed as a percent of maximum.
MaximumAcceleration	Specify the value for maximum acceleration to be used by the coordinated motion instructions to determine the acceleration rate to apply to the coordinate system vector when acceleration is expressed as a percent of maximum.
MaximumDeceleration	Specify the value for maximum deceleration to be used by the coordinated motion instructions to determine the deceleration rate to apply to the coordinate system vector when deceleration is expressed as a percent of maximum.
ActualPositionTolerance	Specify the value in coordination units, for actual position to be used by coordinated motion instructions when they have a termination type of actual tolerance.
CommandPositionTolerance	Specify the value in coordination units, for command position to be used by coordinated motion instructions when they have a termination type of command tolerance.
TransformDimension	Specify the transform dimension.
JointRatioNumerator	Specify numerator of the joint ratio.
JointRatioDenominator	Specify denominator of the joint ratio.
LinkLength1	Specify the length of Robotic Arm 1.
LinkLength2	Specify the length of Robotic Arm 2.
ZeroAngleOffset1	Specify the rotational angular offset of joint axes 1 in degrees. This is used to shift the 0 degree position of the joint.

Attribute	Description
ZeroAngleOffset2	Specify the rotational angular offset of joint axes 2 in degrees. This is used to shift the 0 degree position of the joint.
ZeroAngleOffset3	Specify the rotational angular offset of joint axes 3 in degrees. This is used to shift the 0 degree position of the joint.
BaseOffset1	Specify the difference for the first axis between the origin of the robot at the first joint of the robotic arm, as determined by the application's Kinematics internal equations, and the origin defined by the robot manufacturer.
BaseOffset2	Specify the difference for the second axis between the origin of the robot at the first joint of the robotic arm, as determined by the application's Kinematics internal equations, and the origin defined by the robot manufacturer.
BaseOffset3	Specify the difference for the third axis between the origin of the robot at the first joint of the robotic arm, as determined by the application's Kinematics internal equations, and the origin defined by the robot manufacturer.
EndEffectorOffset1	Specify the end effector offset value, which is the distance between the end of the robot arm L2 and the end of the end effector in the x1 dimension.
EndEffectorOffset2	Specify the end effector offset value, which is the distance between the end of the robot arm L2 and the end of the end effector in the x2 dimension.
EndEffectorOffset3	Specify the end effector offset value, which is the distance between the end of the robot arm L2 and the end of the end effector in the x3 dimension.
MaximumAccelerationJerk	Specify the value for maximum acceleration jerk to be used by the coordinated motion instructions to determine the acceleration jerk rate to apply to the coordinate system vector when acceleration jerk is expressed as a percent of maximum.
MaximumDecelerationJerk	Specify the value for maximum deceleration jerk to be used by the coordinated motion instructions to determine the deceleration jerk rate to apply to the coordinate system vector when deceleration jerk is expressed as a percent of maximum
MasterInputConfigurationBits	Specify the master input configuration bits. Type a hexadecimal number.
MasterPositionFilterBandwidth	Specify the Master Position Filter Bandwidth.

MOTION_GROUP Tag

L5X MotionGroup structure

In an .L5X file, motion group attributes are in the Data element.

```
<Data Format="MotionGroup">
      <MotionGroupParameters [Motion_Group_Attributes]/>
</Data>
```

L5K MOTION_GROUP structure

In an .L5K file, motion group attributes are in the tag statement.

```
<tag_name> : <type>
      [(Motion_Group_Attributes)];
```

Motion Group Tag attributes

Attribute	Description
GroupType	Specify the type of motion group. Type **Warning Enabled** or **Warning Disabled**.
CourseUpdatePeriod	Specify the coarse update period in milliseconds (500...3200ms).
PhaseShift	Specify the phase shift (0...65,535).
GeneralFaultType	Specify whether an error generates a major fault or a non-major fault. Type **Major Fault** or **Non Major Fault**.
AutoTagUpdate	Type **Disabled** or **Enabled**.

Attribute	Description
Alternate1UpdateMultiplier	Specify the value that is multiplied by the Base Update Period, which was previously called the Coarse Update Period. The result is displayed as the **Alternate 1 Update Period**.
Alternate2UpdateMultiplier	Specify the value that is multiplied by the **Base Update Period**, which was previously called the Coarse Update Period. The result is displayed as the **Alternate 2 Update Period**.

HMIBC tag

In an .L5X file, HMIBC attributes are in the Data element.

L5X HMIBC structure

```
<Tag Name="MyHMIBC" TagType="Base" DataType="HMIBC"
ExternalAccess="Read/Write">
      <Data Format="HMIBC">
       <HMIBCParameters EnableIn="false" ProgFB="false"
BitIndex="0" TerminalCount="0"/>
      </Data>
</Tag>
```

L5K HMIBC structure

```
TAG
       myHMIBC : HMIBC (EnableIn := "false",
                         ProgFB := "false");
END_TAG
```

HMIBC attributes

L5X Item	L5K Item	Description
EnableIn	EnableIn	Relay Ladder: Corresponds to the rung state. Does not affect processing. Function Block: If cleared, the instruction does not execute and outputs are not updated. If set, the instruction executes. Default is set. Structured Text: No effect. The instruction always executes. Value: **true** or **false**
ProgFB	ProgFB	Program Feedback. For use by the user program. Not used by the instruction. Value: **true** or **false**
BitIndex		L5X Only: Export only, ignored on import Value: 0 - 65535
TerminalCount		L5X Only: Export only, ignored on import Value: 0 - 65535

SAFETY tag

In an .L5X file, safety attributes are in the Data element.

L5X safety structure

```
<Data Foamt="Safety">
       <SafetyParameters [Safety_Attributes]/>
</Data>
```

L5K SAFETY structure

In an .L5K file, safety attributes are in the tag statement.

```
<tag_name> : <type>
       [(Safety_Attributes)] := value;
```

Safety tag attributes

A safety produced or safety consumed tag (Class = Safety) has these attributes, and the attributes for a standard tag.

Attribute	Description
TimeoutMultiplier	Specify the timeout multiplier (default = 2) for a safety controller system. This value determines the RPIs of time to wait for a packet before declaring a time out. This translates into the number of messages that may be lost before declaring a connection error. A Timeout Multiplier of 1 indicates that no messages may be lost, which means there must be a packet every RPI interval. A Timeout Multiplier of 2 indicates that 1 message may be lost, which means as long as a packet is seen in 2 times the RPI, no time-out will occur. Type a number from 1…4, inclusive. This attribute applies only to safety consumed tags. For L5X, this attribute is on the <ConsumeInfo> element.
NetworkDelayMultiplier	Specify the network delay multiplier (default = 100%) for a safety controller system. This value lets you reduce or increase the connection reaction time limit in cases where the transport time of the message is significantly less or more than the RPI. This may be the case when the RPI of an output connection is the same as that of a lengthy task period. Type a percentage from 10…300, inclusive. This attribute applies only to safety consumed tags. For L5X, this attribute is on the <ConsumeInfo> element.
ReactionTimeLimit	Specify the connection reaction time limit for a safety controller system. The Logix Designer application calculates the connection reaction time limit as a function of the RPI, timeout multiplier, and network delay multiplier. The connection reaction time limit is automatically recalculated if any of the above values change. This attribute applies only to safety consumed tags. For L5X, this attribute is on the <ConsumeInfo> element.
MaxObservedNetworkDelay	L5X only. MaxObservedNetworkDelay is a measure of the longest time the data of a safety connection is delayed from transporting the safety packets over the network. This attribute is exported for informational purposes only and is ignored on import. This attribute is on the <ConsumeInfo> element.
Unicast	For a safety consumed tag, specify if the EtherNet/IP connection is unicast. Specify **yes** for unicast or **no** to remain multicast. For L5X format, specify **true** or **false**. On export, only appears if the path to the producing module crosses an EtherNet/IP network and the producing module supports unicast.
UnicastPermitted	For a safety produced tag, specify whether let the EtherNet/IP connection be unicast. Specify **yes** for unicast or **no** to remain multicast. For L5X format, specify **true** or **false**.

Tag initial values

L5X initial tag value

In an .L5X file, place the initial value of the tag in the Data element. See Chapter 1 Data Formats on page 41 for more information on Data elements.

```
<Data>
      initial_value
</Data>
```

If the tag is a string tag, specify a Format attribute.

```
<Data Format="String" Length="value">
      <[CDATA['string text']]>
</Data>
```

In L5X format, the string is padded with zeros (00) to fill its maximum of 82 characters.

L5K initial TAG value

In an .L5K file, place the initial value of the tag in the tag statement.

```
<tag_name> : <type> [(Attributes)][:= <initial_value>];
```

If the tag is a string tag, specify a STRING type.

<*tag_name*> : STRING := [<*length*>, '*string_text*$00 ... $00'];

The string is padded with zeros ($00) to fill its maximum of 82 characters.

Add-On Instruction tag values

The Logix Designer application optimizes user memory usage by minimizing unused space in tags whose type is an Add-On Instruction data type.

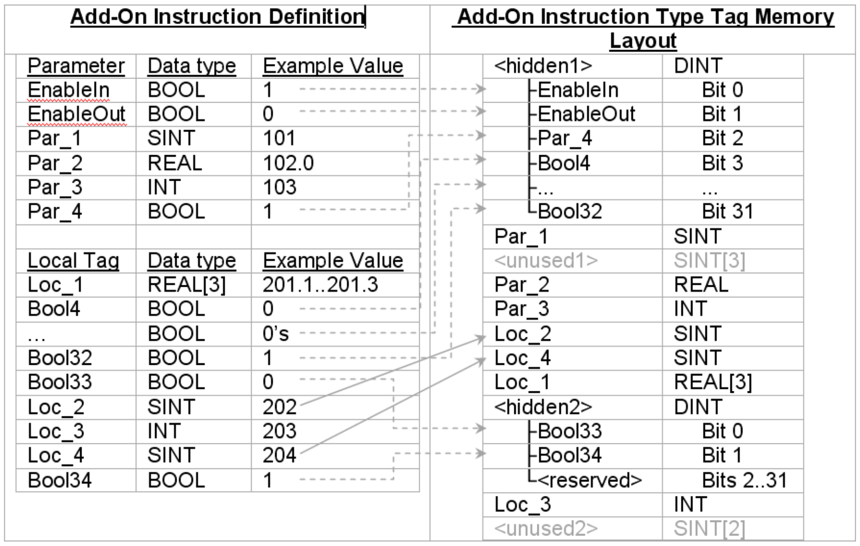
The values for the Input & Output parameters are represented in the order as they are listed in the Add-On Instruction definition. This rule applies to all parameter data types except for BOOL. In order to reduce the data size of a tag of Add-On Instruction type, BOOL parameters and BOOL local tags are collected and packed in one or more hidden DINT members. Up to 32 BOOLs are packed into each hidden DINT member. That is, the first BOOL is at bit 0, the second BOOL is at bit 1. The hidden DINT members are located at the position where the 1st, 33rd, 65th, (n*32+1) BOOL is located. See the example.

The values for the local tags are represented in the order listed in the Add-On Instruction definition except as noted here. BOOL local tags are packed with BOOL parameters. In order to reduce the data size of an Add-On Instruction type tag, SINT and INT tags may be repositioned.

This is done because all types except SINT and INT must be aligned on a four-byte boundary. When a SINT precedes a DINT, there are three unused bytes between the two members. To optimize memory usage, the unused space is filled with other SINTs and/or INTs when possible. Note that the free space optimization begins immediately after the last parameter. See the example.

Add-On Instruction tag values example

This example demonstrates the tag memory layout of an Add-On Instruction definition. The dashed lines show where the BOOL members are located in memory. The solid lines indicate where a local member is repositioned to minimize unused space.



Add-On Instruction Definition		
Parameter	Data type	Example Value
EnableIn	BOOL	1
EnableOut	BOOL	0
Par_1	SINT	101
Par_2	REAL	102.0
Par_3	INT	103
Par_4	BOOL	1
Local Tag	Data type	Example Value
Loc_1	REAL[3]	201.1..201.3
Bool4	BOOL	0
…	BOOL	0's
Bool32	BOOL	1
Bool33	BOOL	0
Loc_2	SINT	202
Loc_3	INT	203
Loc_4	SINT	204
Bool34	BOOL	1

Add-On Instruction Type Tag Memory Layout	
<hidden1>	DINT
├EnableIn	Bit 0
├EnableOut	Bit 1
├Par_4	Bit 2
├Bool4	Bit 3
├…	…
└Bool32	Bit 31
Par_1	SINT
<unused1>	SINT[3]
Par_2	REAL
Par_3	INT
Loc_2	SINT
Loc_4	SINT
Loc_1	REAL[3]
<hidden2>	DINT
├Bool33	Bit 0
├Bool34	Bit 1
└<reserved>	Bits 2..31
Loc_3	INT
<unused2>	SINT[2]

The L5K representation of an Add-On Instruction type tag containing the example values is: [-2147483643, 101, 102.0, 103, 202, 204, [201.1, 201.2, 201.3], 2, 203].

- The <unused1> memory area aligns the member, Par_2, on a 4-byte boundary. All types except for SINT and INT must be aligned on a 4-byte boundary. INTs must be aligned on a 2-byte boundary.
- The <unused2> memory area pads the Add-On Instruction type tag such that the byte length is a multiple of 4.
- Unused data is not included in the L5K format. Unused data is included in the L5X format.
- The simplest way to guarantee that the order of the parameters and local tags in the L5K Add-On Instruction definition matches the order of data values in the L5K Add-On Instruction type tag is to order the tags in the LOCAL_TAGS section such that all SINTs are first, followed by all INTs, and everything else.

Tag guidelines

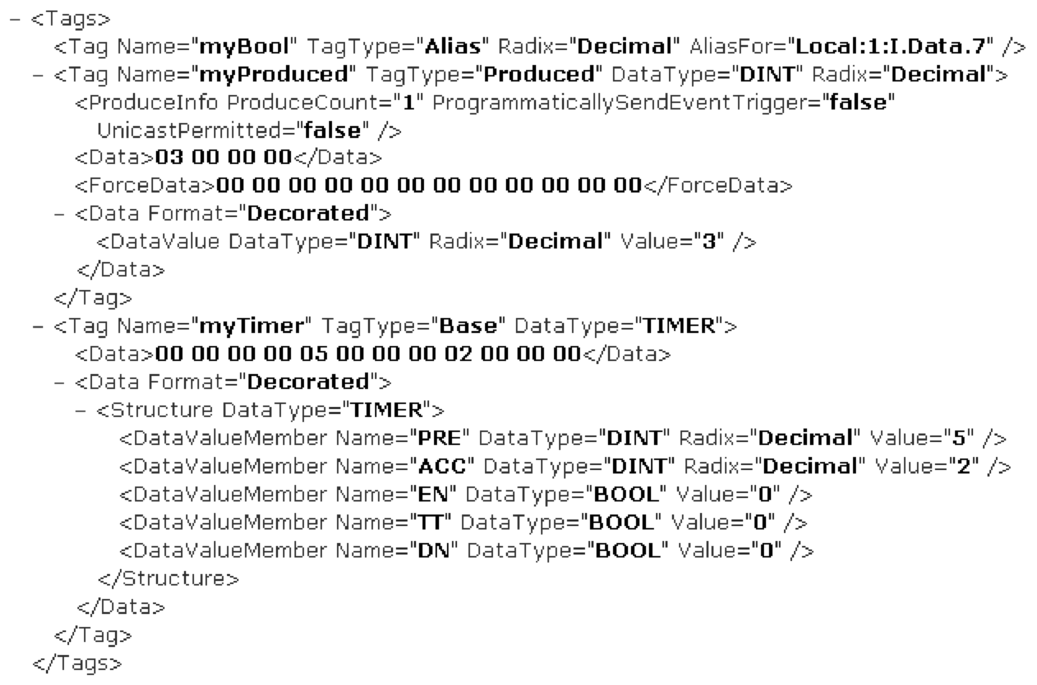
Observe these guidelines when defining a tag.

- Tags must be defined after modules and add-on instructions. If there are no modules or add-on instructions, then the tags must be defined after the data types within the controller body.
- Base tags and aliases can be defined out of order within a tag block.

- You cannot define a second dimension without a first dimension or a third dimension without a second dimension.
- The initial values must comply with the tag type and dimensions.
- Whitespace cannot occur within the initial values in L5K format or within the type/dimension specifier.

Examples

L5X tag example



```
- <Tags>
    <Tag Name="myBool" TagType="Alias" Radix="Decimal" AliasFor="Local:1:I.Data.7" />
  - <Tag Name="myProduced" TagType="Produced" DataType="DINT" Radix="Decimal">
      <ProduceInfo ProduceCount="1" ProgrammaticallySendEventTrigger="false"
        UnicastPermitted="false" />
      <Data>03 00 00 00</Data>
      <ForceData>00 00 00 00 00 00 00 00 00 00 00 00</ForceData>
    - <Data Format="Decorated">
        <DataValue DataType="DINT" Radix="Decimal" Value="3" />
      </Data>
    </Tag>
  - <Tag Name="myTimer" TagType="Base" DataType="TIMER">
      <Data>00 00 00 00 05 00 00 00 02 00 00 00</Data>
    - <Data Format="Decorated">
      - <Structure DataType="TIMER">
          <DataValueMember Name="PRE" DataType="DINT" Radix="Decimal" Value="5" />
          <DataValueMember Name="ACC" DataType="DINT" Radix="Decimal" Value="2" />
          <DataValueMember Name="EN" DataType="BOOL" Value="0" />
          <DataValueMember Name="TT" DataType="BOOL" Value="0" />
          <DataValueMember Name="DN" DataType="BOOL" Value="0" />
        </Structure>
      </Data>
    </Tag>
  </Tags>
```

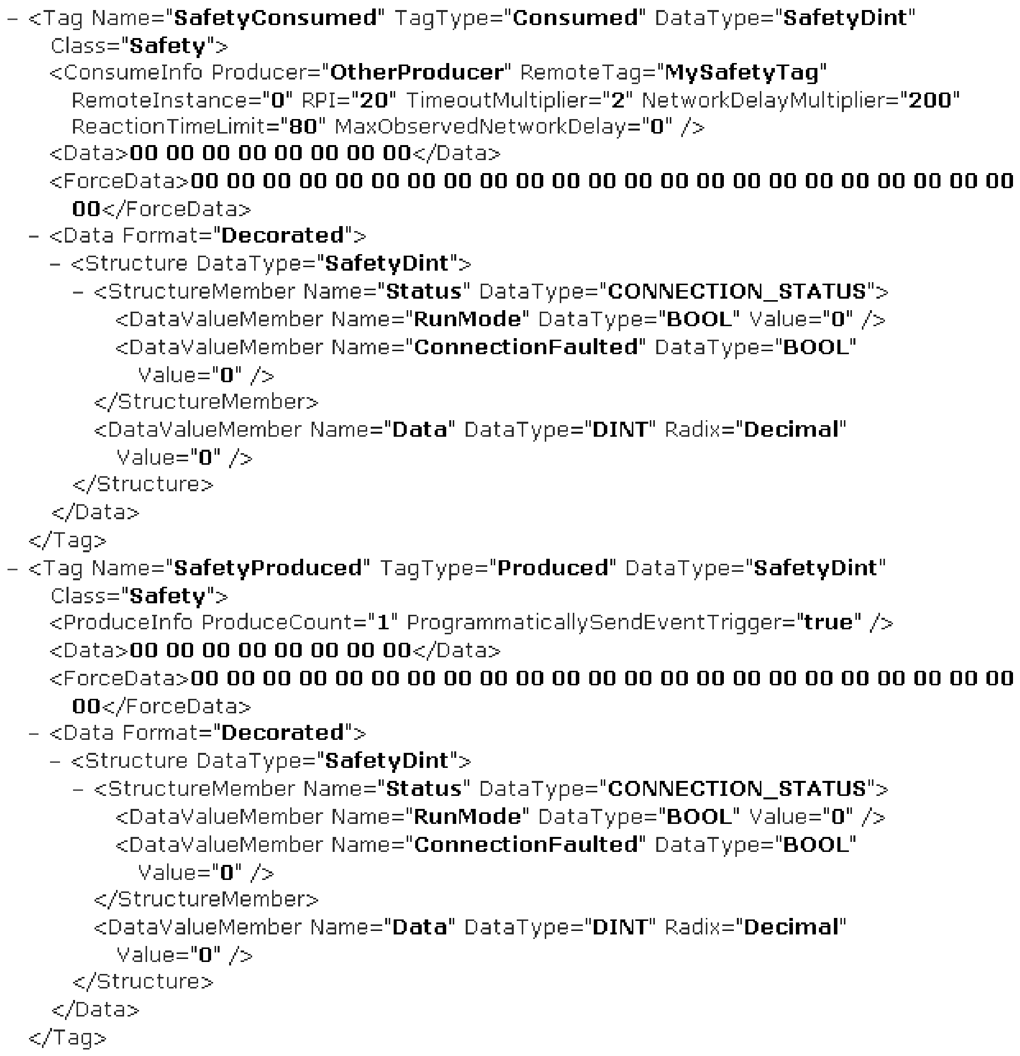
L5K TAG examples

```
TAG
      bits : MySint := [0];
      dest : INT (RADIX := Decimal) := 0;
      overflow OF bits.MyBit0 (RADIX := Binary);
      source : REAL (RADIX := Exponential) := 0.0;
      timer : TIMER[3] := [[0,0,100],[0,10,100],[0,0,50]];
END_TAG
```

This example shows forced tag data.

```
TAG
      dint_a : DINT (RADIX := Decimal) := 0;
      int_a : INT (RADIX := Decimal) := 0;
      tag_a : UDT_A (ProduceCount := 2) := [0,0],
      TagForceData := [0,0,0,0,1,0,-1,-1,1,0,-72,34];
END_TAG
```

L5X safety tag example



```
- <Tag Name="SafetyConsumed" TagType="Consumed" DataType="SafetyDint"
    Class="Safety">
    <ConsumeInfo Producer="OtherProducer" RemoteTag="MySafetyTag"
      RemoteInstance="0" RPI="20" TimeoutMultiplier="2" NetworkDelayMultiplier="200"
      ReactionTimeLimit="80" MaxObservedNetworkDelay="0" />
    <Data>00 00 00 00 00 00 00 00</Data>
    <ForceData>00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
      00</ForceData>
  - <Data Format="Decorated">
    - <Structure DataType="SafetyDint">
      - <StructureMember Name="Status" DataType="CONNECTION_STATUS">
          <DataValueMember Name="RunMode" DataType="BOOL" Value="0" />
          <DataValueMember Name="ConnectionFaulted" DataType="BOOL"
            Value="0" />
        </StructureMember>
        <DataValueMember Name="Data" DataType="DINT" Radix="Decimal"
          Value="0" />
      </Structure>
    </Data>
  </Tag>
- <Tag Name="SafetyProduced" TagType="Produced" DataType="SafetyDint"
    Class="Safety">
    <ProduceInfo ProduceCount="1" ProgrammaticallySendEventTrigger="true" />
    <Data>00 00 00 00 00 00 00 00</Data>
    <ForceData>00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
      00</ForceData>
  - <Data Format="Decorated">
    - <Structure DataType="SafetyDint">
      - <StructureMember Name="Status" DataType="CONNECTION_STATUS">
          <DataValueMember Name="RunMode" DataType="BOOL" Value="0" />
          <DataValueMember Name="ConnectionFaulted" DataType="BOOL"
            Value="0" />
        </StructureMember>
        <DataValueMember Name="Data" DataType="DINT" Radix="Decimal"
          Value="0" />
      </Structure>
    </Data>
  </Tag>
```

L5K safety TAG examples

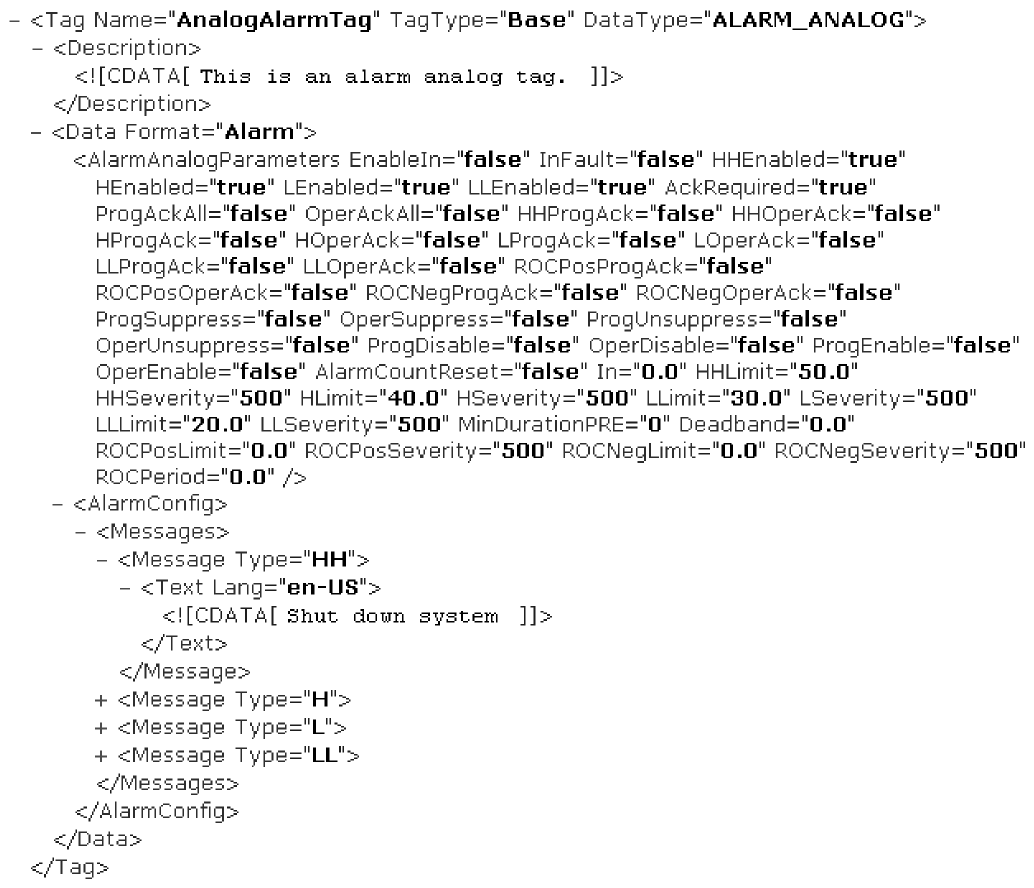
This example shows a consumed tag in a safety project.

```
safetyConsumed : mypcType (Class := Safety,
       Producer := PeerSafetyController,
       RemoteTag := productCount,
       RemoteFile := 0,
       RPI := 10,
       IncludeConnectionStatus := Yes,
       TimeoutMultiplier := 2,
       NetworkDelayMultiplier := 100,
       ReactionTimeLimit := 29.952) := [[2],[0,0,0]],
       TagForceData :=
[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0];
```

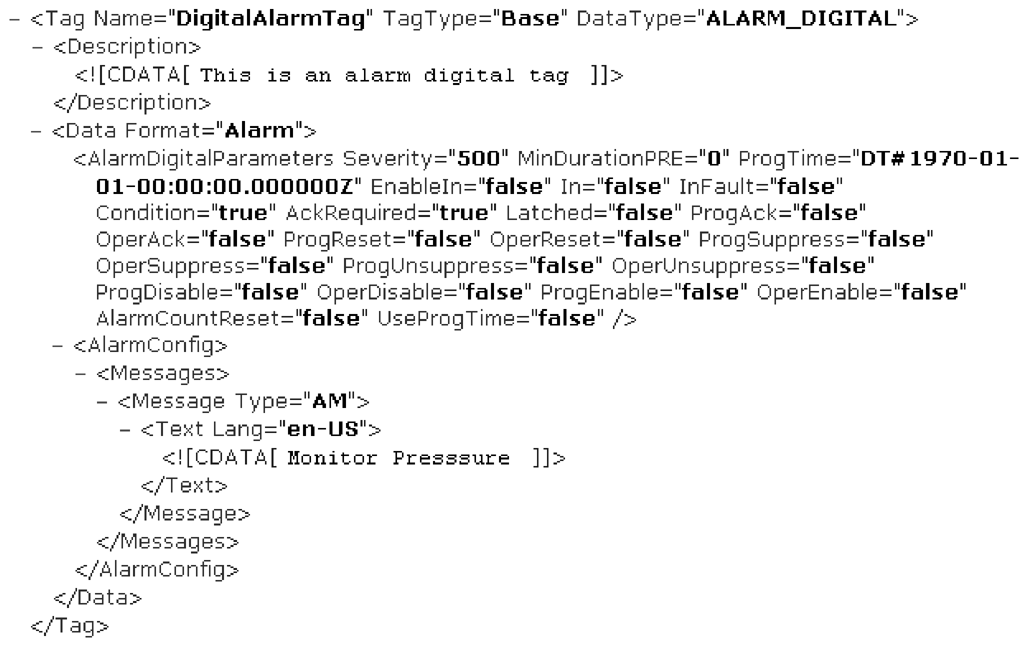
This example shows a produced tag in a safety project:

```
safetyProduced : mypcType (Class := Safety,
      ProduceCount := 3,
      ProgrammaticallySendEventTrigger := Yes,
      IncludeConnectionStatus := Yes) := [[0],[0,0,0]],
      TagForceData :=
[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0];
```

L5X ALARM_ANALOG and ALARM_DIGITAL tag examples



```
- <Tag Name="AnalogAlarmTag" TagType="Base" DataType="ALARM_ANALOG">
  - <Description>
      <![CDATA[ This is an alarm analog tag.  ]]>
    </Description>
  - <Data Format="Alarm">
      <AlarmAnalogParameters EnableIn="false" InFault="false" HHEnabled="true"
        HEnabled="true" LEnabled="true" LLEnabled="true" AckRequired="true"
        ProgAckAll="false" OperAckAll="false" HHProgAck="false" HHOperAck="false"
        HProgAck="false" HOperAck="false" LProgAck="false" LOperAck="false"
        LLProgAck="false" LLOperAck="false" ROCPosProgAck="false"
        ROCPosOperAck="false" ROCNegProgAck="false" ROCNegOperAck="false"
        ProgSuppress="false" OperSuppress="false" ProgUnsuppress="false"
        OperUnsuppress="false" ProgDisable="false" OperDisable="false" ProgEnable="false"
        OperEnable="false" AlarmCountReset="false" In="0.0" HHLimit="50.0"
        HHSeverity="500" HLimit="40.0" HSeverity="500" LLimit="30.0" LSeverity="500"
        LLLimit="20.0" LLSeverity="500" MinDurationPRE="0" Deadband="0.0"
        ROCPosLimit="0.0" ROCPosSeverity="500" ROCNegLimit="0.0" ROCNegSeverity="500"
        ROCPeriod="0.0" />
    - <AlarmConfig>
      - <Messages>
        - <Message Type="HH">
          - <Text Lang="en-US">
              <![CDATA[ Shut down system  ]]>
            </Text>
          </Message>
        + <Message Type="H">
        + <Message Type="L">
        + <Message Type="LL">
        </Messages>
      </AlarmConfig>
    </Data>
  </Tag>
```



```
- <Tag Name="DigitalAlarmTag" TagType="Base" DataType="ALARM_DIGITAL">
  - <Description>
      <![CDATA[ This is an alarm digital tag  ]]>
    </Description>
  - <Data Format="Alarm">
      <AlarmDigitalParameters Severity="500" MinDurationPRE="0" ProgTime="DT#1970-01-
        01-00:00:00.000000Z" EnableIn="false" In="false" InFault="false"
        Condition="true" AckRequired="true" Latched="false" ProgAck="false"
        OperAck="false" ProgReset="false" OperReset="false" ProgSuppress="false"
        OperSuppress="false" ProgUnsuppress="false" OperUnsuppress="false"
        ProgDisable="false" OperDisable="false" ProgEnable="false" OperEnable="false"
        AlarmCountReset="false" UseProgTime="false" />
    - <AlarmConfig>
      - <Messages>
        - <Message Type="AM">
          - <Text Lang="en-US">
              <![CDATA[ Monitor Presssure  ]]>
            </Text>
          </Message>
        </Messages>
      </AlarmConfig>
    </Data>
  </Tag>
```

L5K ALARM_ANALOG and ALARM_DIGITAL tag examples

```
my_alarm2 : ALARM_ANALOG (ALMSG.HH:en-us := "High high alarm message",
       ALMMSG.POS:en-us := "pos alarm message",       ALMMSG.NEG:en-us := "neg alarm message",
       EnableIn := false,  InFault := false,   HHEnabled := true,  HEnabled := false,
       LEnabled := false,  LLEnabled := false,        AckRequired := true,       ProgAckAll := false,
       OperAckAll := false,       HHProgAck := false,        HHOperAck := false,        HProgAck := false,
       HOperAck := false,  LProgAck := false,  LOperAck := false,  LLProgAck := false,
       LLOperAck := false,        ROCPosProgAck := false,    ROCPosOperAck := false,
       ROCNegProgAck := false,    ROCNegOperAck := false,    ProgSuppress := false,
       OperSuppress := false,     ProgUnsuppress := false,   OperUnsuppress := false,
       ProgDisable := false,      OperDisable := false,      ProgEnable := false,       OperEnable := false,
       AlarmCountReset := false,  In := 0.0,      HHLimit := 0.0,     HHSeverity := 500,
       HLimit := 0.0,      HSeverity := 500,   LLimit := 0.0,      LSeverity := 500,   LLLimit := 0.0,
       LLSeverity := 500,  MinDurationPRE := 0,       Deadband := 0.0,    ROCPosLimit := 0.0,
       ROCPosSeverity := 500,     ROCNegLimit := 0.0,        ROCNegSeverity := 500,     ROCPeriod := 0.0,
       AssocTag1 := "PlantNumber",      AssocTag2 := "ShiftNumber",      AssocTag3 := "BatchNumber",
       AssocTag4 := "LotNumber",  AlarmClass := "tank2",     HMICmd := "ft command");

my_alarm : ALARM_DIGITAL (ALMMSG.AM:en-us := "my message",
       Severity := 500,    MinDurationPRE := 0,       ProgTime := DT#1970-01-01-00:00:00.000000Z,
       EnableIn := false,  In := false,  InFault := false,   Condition := true,
       AckRequired := true,       Latched := false,   ProgAck := false,   OperAck := false,
       ProgReset := false,        OperReset := false,        ProgSuppress := false      OperSuppress := false,
       ProgUnsuppress := false,   OperUnsuppress := false,   ProgDisable := false,
       OperDisable := false,      ProgEnable := false,       OperEnable := false,
       AlarmCountReset := false,  AssocTag1 := "BatchNumber",      AssocTag2 := "LotNumber",
       AssocTag3 := "PlantNumber",      AssocTag4 := "ShiftNumber",      AlarmClass := "tank1",
       HMICmd := "ft command");
```

Define a program component

Introduction

This chapter explains the overall structure of the Program component.

Program component

The Program component defines the programs used in the logic you export.

The maximum number of programs depends on the type of controller.

Controller	Maximum Number of Programs
ControlLogix	1000 (32 in firmware revisions prior to 15)
SoftLogix 5800	100 (32 in firmware revisions prior to 15)
FlexLogix	32
CompactLogix	32
DriveLogix	32

L5X program structure

```
<Programs>
      <Program [Program_Attributes]>
            <Description>
                  <![CDATA[ text ]]  >
            </Description>
            <Tags>
                  tags
            </Tags>
            <Routines>
                  routines
            </Routines>
            <ChildPrograms>
                  child_programs
            </ChildPrograms>
      </Program>
</Programs>
```

L5K PROGRAM structure

```
PROGRAM <program_name> [(Description := "text",
      Program_Attributes)]
      [TAG declaration]
      [ROUTINE declaration]
      [FBD_ROUTINE declaration]
      [SFC_ROUTINE declaration]
      [ST_ROUTINE declaration]
      [CHILD_PROGRAMS]
END_PROGRAM
```

Program elements

L5X Item	L5K Item	Description
Not applicable	*program_name*	The name of the program. In L5X, use a Name attribute on the <Program> element.
Description	Description	User information about the program.
tags	TAG	Program-scoped tags. Follows same format as controller-scoped tags. For more details on defining a tag, see Chapter 6 Defining a Tag Component on page 105.
routines	ROUTINE FBD_ROUTINE ST_ROUTINE SFC_ROUTINE	Routines within the program. For more details on defining a: • Ladder logic routine, see Chapter 8 Defining a Ladder Logic Routine on page 147. • Function block diagram routine, see Chapter 9 defining a Function Block Diagram Routine on page 159. • Sequential function chart routine, see Chapter 10 Defining a Sequential Function Chart Routine on page 181. • Structured text routine, see Chapter 11 Defining a Structured Text Routine on page 201.
ChildPrograms	CHILD_PROGRAMS	Child programs of the parent program. The child-parent relationship is visible in only the Logical Organizer in the Logix Designer application, and not in the Controller Organizer.

Program attributes

Attribute	Description
Name	L5X only. Specify the name of the program. In L5K, the name is an element of the statement.
Type	Specify the type of program. If this program is a Equipment Phase program, type **EquipmentPhase**. If this program is a Sequence program, type **Sequence**. Otherwise, type **Normal**.

Attribute	Description
Class	Specify the class of the program. This attribute applies only to safety controller projects. Type **Standard** or **Safety**. Do not use this attribute if the program is an Equipment Phase program. (Type = EquipmentPhase).
Main (L5K) MainRoutineName (L5X)	Specify the name of the main routine of the program (40 characters maximum).
Fault (L5K) FaultRoutineName (L5X)	L5K only. Specify the name of the program fault routine, if any (40 characters maximum).
Mode	L5K only. Type **0** for not testing edits; type **1** for testing edits.
TestEdits	L5X only. Type **false** for not testing edits; type **true** for testing edits.
DisableFlag	L5K only. Type **1** to disable the program; type **0** to enable the program.
Disabled	L5X only. Type **true** to disable the program; type **false** to enable the program.
SynchronizeRedundancyData AfterExecution	Type **1** to synchronize data after the program scan in a redundant system; type **0** to not synchronize data after the program scan.
UseAsFolder	Type **1** to use the program as a folder. Logix Designer application does not execute any routines or update any parameters in a program that is used as a folder.

Program attributes for EquipmentPhase programs

In addition to the program connection attributes previously described, an Equipment Phase program (Program Type = EquipmentPhase) has the following attributes.

Attribute	Description
PreState (L5K) PreStateRoutineName (L5X)	L5K only. Specify the name of the prestate routine (40 characters maximum).
InitialStepIndex	Specify an integer value for the initial step index of the phase.
InitialState	Specify state of the phase. Type Aborted, Completed, Stopped, or Idle (default).
CompleteStateIfNotImpl	If the phase does not implement all the expected states, enter StateComplete (default) so the program can continue to execute when it expects a state that was omitted. The program ignores the omitted state and continues to the next state. Otherwise, enter NoAction.
LossOfCommCmd	If the phase uses an external sequencer, such as FactoryTalk Batch® software, specify that appropriate action to take if communication fails between the controller and the external sequencer. Type **Abort**, **Hold**, **Stop**, or **none** (default).
ExternalRequestAction	Specify how to handle an external request (PXRQ instruction) that is in process when the phase receives the command to go to a Holding state. Type **Clear** to abort outstanding external requests. Otherwise, type **none** (default).
EquipmentId	The FactoryTalk Batch equipment identifier for the Equipment Phase. This value is set by the FactoryTalk Batch software when you synchronize with a project file. Do not modify this value.
RecipePhaseNames	The FactoryTalk Batch recipe phases for the Equipment Phase. This value is set by the FactoryTalk Batch software when you synchronize with a project file. Do not modify this value.
AutoValueAssignStepToPhase	Specify whether the value of sequence step inputs are automatically assigned to phase inputs when a sequence step starts the phase and the phase is used in a sequence. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.

Attribute	Description
AutoValueAssignPhaseToStepOnComplete	Specify whether the value of phase outputs are automatically assigned to step outputs when the phase is completed and the phase is used in a sequence. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.
AutoValueAssignPhaseToStepOnStopped	Specify whether the value of phase outputs are automatically assigned to step outputs when the phase is stopped and the phase is used in a sequence. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.
AutoValueAssignPhaseToStepOnAborted	Specify whether the value of phase outputs are automatically assigned to step outputs when the phase is stopped and the phase is used in a sequence. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.

Program attributes for Sequence programs

In addition to the program connection attributes previously described, a Sequence program (Program Type = Sequence) has the following attributes.

Attribute	Description
Revision	Revision number for the program, consisting of major and minor revision.
RevisionExtension	Additional revision information.
UnitID	Numeric identifier to designate the equipment that the sequence is controlling. Example value: 1-0x7FFFFFFF
RetainSequenceIDOnReset	Specify whether the sequence ID is retained when the sequence resets. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.
GenerateSequenceEvents	Specify whether the sequence events are generated. In L5K, type **Yes** or **No**. In L5X, type **true** or **false**.
ValuesToUseOnStart	Specify the values of sequence parameters and step tags that are used when starting the sequence. • **Use Initial Values** – Copy the initial values to the current values when starting the sequence. • **Retain Current Values** – Use the current values of sequence parameters and step tags when starting the sequence.
ValuesToUseOnReset	Specify the how the values of sequence parameters and step tags are set when the sequence resets. • **Use Initial Values** – Restore the current values of sequence parameters and step tags to the initial values when resetting the sequence. • **Retain Current Values** – Maintain the current values of sequence parameters and step tags when resetting the sequence.
RevisionNote	Optional detailed information about the revision. For L5X, this is a sub element: <RevisionNote>.

Child program component

The Child Program component defines the child programs used in the logic you export. A child program is a program defined as the logical child of another program in the Logical Organizer in the Logix Designer.

L5K CHILD_PROGRAM structure

```
PROGRAM <program_name> [(Description := "text",
      Program_Attributes)]
      [TAG declaration]
      [ROUTINE declaration]
      [FBD_ROUTINE declaration]
      [SFC_ROUTINE declaration]
      [ST_ROUTINE declaration]
      [CHILD_PROGRAMS]
END_PROGRAM
```

L5X child program structure

```
<Programs>
      <Program [Program_Attributes]>
            <Description>
                  <![CDATA[ text ]]  >
            </Description>
            <Tags>
                  tags
            </Tags>
            <Routines>
                  routines
            </Routines>
            <ChildPrograms>
                  child_programs
            </ChildPrograms>
      </Program>
</Programs>
```

Child program attributes

Attribute	Description
child_program_name	L5X only. Specify the name of the child program. In L5K, the name is an element of the statement.

Child program guidelines

Observe these guidelines when defining a child program.

- Since child programs are a way to organize existing programs, adding a child program component does not add to the number of programs.

Encoded/Unencoded routines

These examples are for protected (encoded) and unprotected (clear text) codes for routines.

If the project contains a source-protected routine, the routine appears within an encoded data component in the program. See Exporting Source-protected Logic on page 28 on page 32 for procedures.

L5X EncodedData Structure

```
<EncodedData EncodedType= "type", Name="name",
Type="routinetype"
             [,other_attributes]>
      <Description>
             <![CDATA[ text ]] >
      </Description>
      encoded_data
</EncodedData>
```

L5K ENCODED_DATA Structure

```
ENCODED_DATA [( EncodedType: type, Name:= name,
               Type:= routinetype,
               other_attributes)]
      encoded_data
END_ENCODED_DATA
```

Encoded Data Elements

L5X Item	L5K Item	Description
type	*type*	The type of data encoded. For L5K: ROUTINE For L5X: Routine
name	*name*	The name of the protected routine.
routinetype	*routinetype*	The type of the routine protected (RLL, FBD, SFC, or ST).
other_attributes	*other_attributes*	Attributes of the routine that are not protected during export.
encoded_data	*encoded_data*	The protected portion of the routine.

Important: When the routine is source protected, the *encoded_data* information is encrypted. If you modify this encrypted information, you will not be able to re-import the routine.

Encoded Information elements

L5X Item	L5K Item	Identifies
EncryptionKey	ENCRYPTION_KEY	Identifies the options the user has chosen for protecting and locking their content.

Encoded key attributes

Attribute	Description
Name	Identifies the type of protection.
ID	Identifier for the key (Firm code, product code).
Description	Description of what the key is associated with (license name).
Vendor	Indicates the vendor who supplied the key.
PublicKey	Stores the public key that will be used for the locking of the associated object.

Encoded content attributes

Attribute	Description
EncryptedType	Indicates the underlying language of the routine for this encoded content (for example, RLL or Structured text).
OnlineEditType	L5X only. Specify the online edit logic type (**Original**, **PendingEdits**, or **TestEdits**). This attribute is not specified if there are no edits.

L5K source protected routine example

```
                         ENCODED_DATA (EncodedType := ROUTINE,
                                       Name := "ProcessControl",
                                       Description := "description on routine",
                                       Type := SFC,
                                       EncryptionConfig := 2)

17r8GxtsZCMLfk3JHFYmU7emZMNhRh9oEuuPQb5IKS676d/xRznQ+56vf8IVQNNEIDoDL1u+UEC3OIMDetvnJAX2Cdw
NPRnC1N3cjPApchCL9ShdF1y2x3/T47RDSI1z99blXN5v5xUQTG1eVktB6dSpatujrGLLTf4mOEdFvHmD9qQTNep+e/
M9V9Cx5Iz2s4xc3Rll3OF9KKobr7j1RdDmAuyRRZLyqKTE01zDpZAS9AlcebPoYUhM1gCF1AuK9eYBkzm/VI5gpH4Oc
vUci/xdt0/9/xPPXKiZjoDI2ZoPFdkZ74VOGrL43wK0NQX2wPc/u4RCCDehNMxBdSYffba1UIvy9FDrJwxOd/k8wrlr
6BW0kLeBylVGxCuCxa8OYersEhBLz6nrTYd/wybHvNmp0TLgpI1bhzWyTVttWf4ZW8qBN6Yu762cUwba/btkCQ40Uic
6Mit6vMt/TFUR45J3Hw/dWGPKUaxDBNBbbBvDB11FncORX/Mtm+HAyqF5vtt6LWKwoZaEvI76sojhC8mNJ0LuBdPtZc
LafqSF2OMbwedr9CW6w
                         END_ENCODED_DATA
```

L5X source-protected routine examples

```
– <EncodedData EncodedType="Routine" Name="ProcessControl" Type="SFC" EncryptionConfig="2">
  – <Description>
      <![CDATA[ description on routine  ]]>
    </Description>

    uLqFGyBsViM1fiLJP1YXU4ymWcNNRlBoLOvAQfNIey7w6ZzxFjmz+5Svf8ICQM5EKzoGLxW
  </EncodedData>
```

Program guidelines

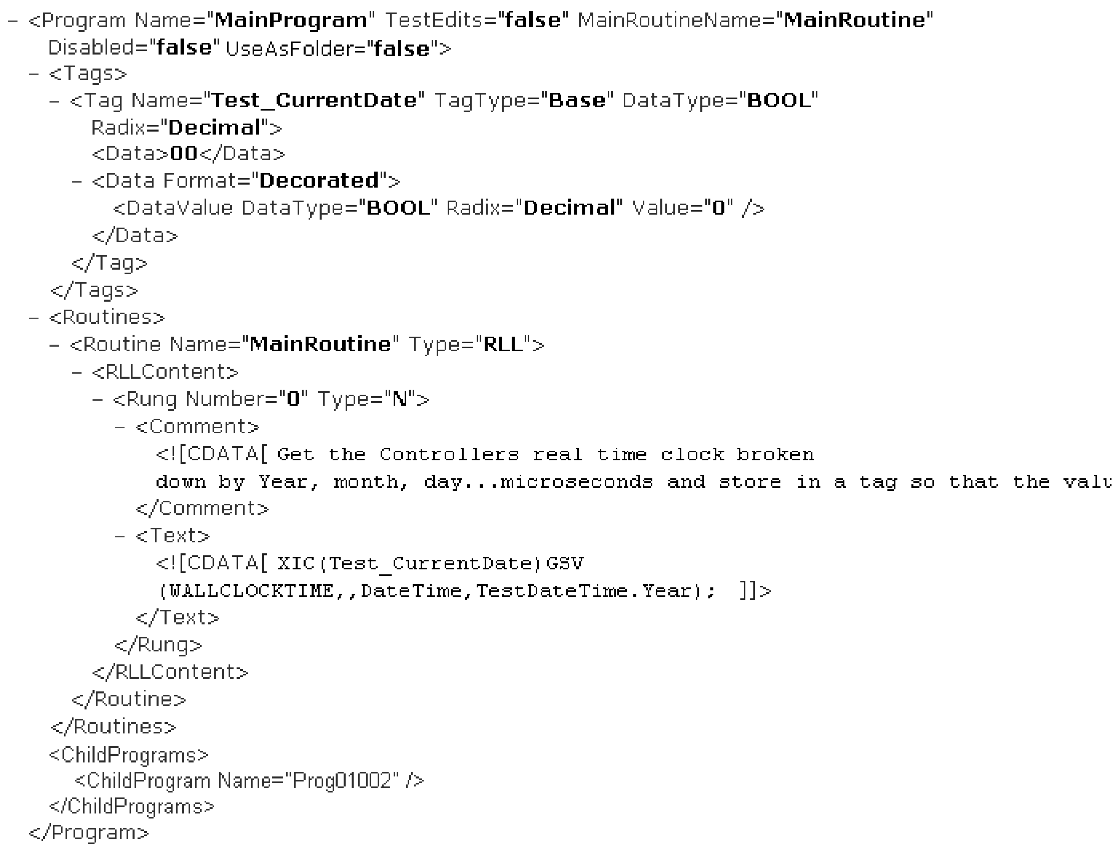
Observe these guidelines when defining a program.

- Define the main and fault attributes in any order.
- You must put the tag declaration block before the routine block.

- Define up to 1000 programs per task.
- When you import a project:
  - All tag collection declaration blocks in a program definition block are imported as local tags of a given program and are seen only by routines under that program.
  - Program parameters are imported as parameters of a given program, but are seen by other tags, parameters, and routines in the project.
  - Controller tags are seen by routines in any program.

Examples

L5X Program Example



```
- <Program Name="MainProgram" TestEdits="false" MainRoutineName="MainRoutine"
    Disabled="false" UseAsFolder="false">
  - <Tags>
    - <Tag Name="Test_CurrentDate" TagType="Base" DataType="BOOL"
        Radix="Decimal">
        <Data>00</Data>
      - <Data Format="Decorated">
          <DataValue DataType="BOOL" Radix="Decimal" Value="0" />
        </Data>
      </Tag>
    </Tags>
  - <Routines>
    - <Routine Name="MainRoutine" Type="RLL">
      - <RLLContent>
        - <Rung Number="0" Type="N">
          - <Comment>
              <![CDATA[ Get the Controllers real time clock broken
              down by Year, month, day...microseconds and store in a tag so that the valu
            </Comment>
          - <Text>
              <![CDATA[ XIC(Test_CurrentDate)GSV
              (WALLCLOCKTIME,,DateTime,TestDateTime.Year);  ]]>
            </Text>
          </Rung>
        </RLLContent>
      </Routine>
    </Routines>
    <ChildPrograms>
      <ChildProgram Name="Prog01002" />
    </ChildPrograms>
  </Program>
```

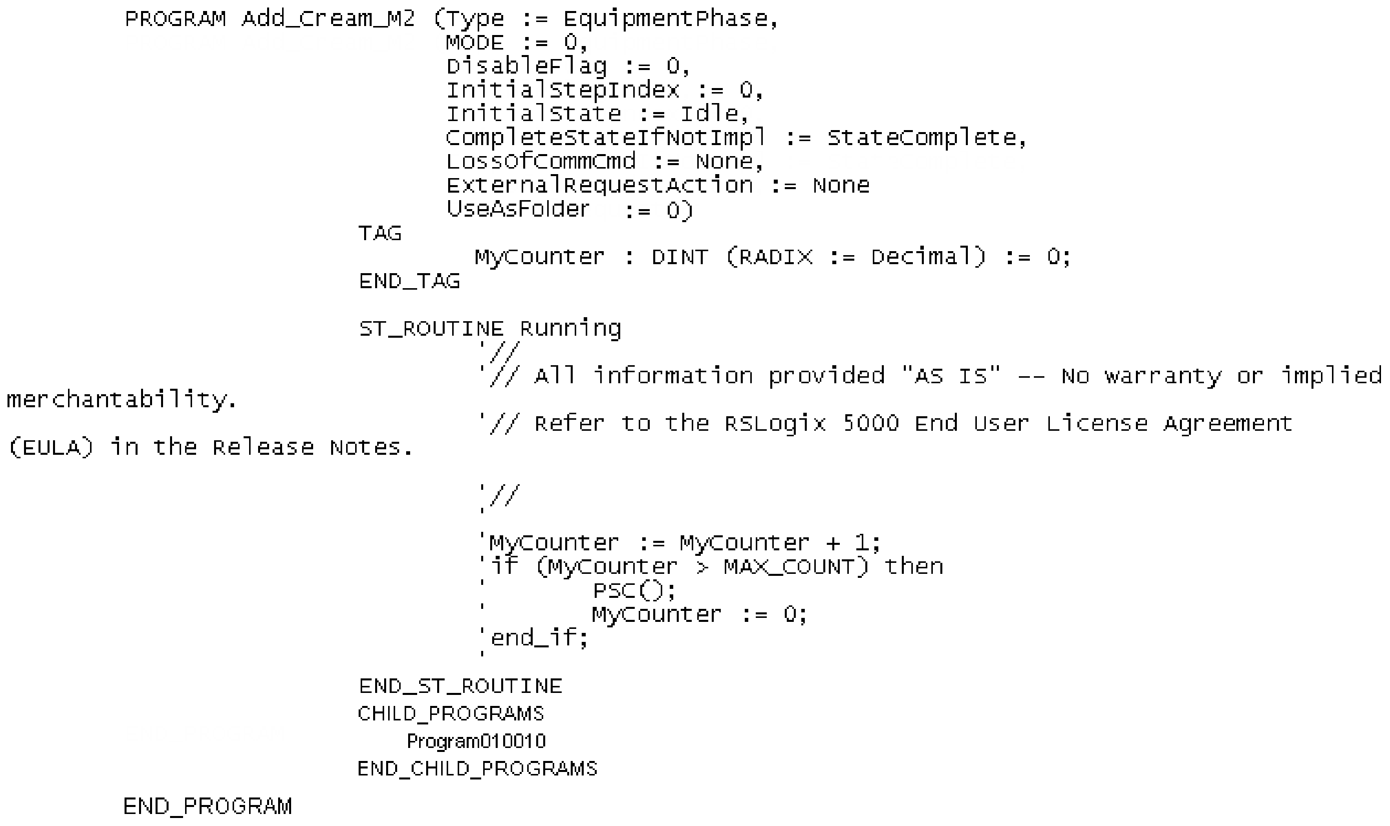
L5K PROGRAM Example

```
        PROGRAM MainProgram (MAIN := "MainRoutine",
                             MODE := 0,
                             DisableFlag := 0,
                             UseAsFolder  := 0)
                        TAG
                              Test_CurrentDate : BOOL (RADIX := Decimal) := 0;
                        END_TAG

                        ROUTINE MainRoutine
                                    RC: "Get the Controllers real time clock broken down
by Year, month, day...microseconds and store in a tag so that the values can be used.";
                                    N: XIC(Test_CurrentDate)GSV
(WALLCLOCKTIME,,DateTime,TestDateTime.Year);
                        END_ROUTINE
                        CHILD_PROGRAMS
                            Program010010
                        END_CHILD_PROGRAMS
        END_PROGRAM
```

L5X Equipment Phase Program Example

```
- <Program Name="Add_Cream_M2" Type="EquipmentPhase" TestEdits="false"
    Disabled="false" InitialStepIndex="0" InitialState="Idle"
    CompleteStateIfNotImpl="StateComplete" LossOfCommCmd="None"
    ExternalRequestAction="None" UseAsFolder="false">
  - <Tags>
    - <Tag Name="MyCounter" TagType="Base" DataType="DINT" Radix="Decimal">
        <Data>00 00 00 00</Data>
      - <Data Format="Decorated">
          <DataValue DataType="DINT" Radix="Decimal" Value="0" />
        </Data>
      </Tag>
    </Tags>
  - <Routines>
    + <Routine Name="Running" Type="ST">
    </Routines>
    <ChildPrograms>
       <ChildProgram Name="Prog01002" />
    </ChildPrograms>
  </Program>
```

L5K Equipment Phase PROGRAM Example



```
    PROGRAM Add_Cream_M2 (Type := EquipmentPhase,
                          MODE := 0,
                          DisableFlag := 0,
                          InitialStepIndex := 0,
                          InitialState := Idle,
                          CompleteStateIfNotImpl := StateComplete,
                          LossOfCommCmd := None,
                          ExternalRequestAction := None
                          UseAsFolder  := 0)
                    TAG
                            MyCounter : DINT (RADIX := Decimal) := 0;
                    END_TAG

                    ST_ROUTINE Running
                            '//
                            '// All information provided "AS IS" -- No warranty or implied
merchantability.
                            '// Refer to the RSLogix 5000 End User License Agreement
(EULA) in the Release Notes.

                            '//
                            '
                            'MyCounter := MyCounter + 1;
                            'if (MyCounter > MAX_COUNT) then
                            '       PSC();
                            '       MyCounter := 0;
                            'end_if;
                            '
                    END_ST_ROUTINE
                    CHILD_PROGRAMS
                        Program010010
                    END_CHILD_PROGRAMS
    END_PROGRAM
```

Define a ladder logic routine

Introduction

This chapter explains how to enter ladder diagram logic in a complete import/export file.

Ladder logic routine

These examples show the ladder logic routine structure.

L5X ladder logic routine structure

```
<Routines>
      <Routine [Routine_Attributes]>
            <Description>
                  <![CDATA[ text ]]  >
            </Description>
            <RLLContent>
                  logic
            </RLLContent>
      </Routine>
</Routines>
```

L5K Ladder Logic ROUTINE structure

```
ROUTINE <routine_name> [(Description := "text")]
      <ladder_rungs>
END_ROUTINE
```

Ladder logic routine elements

L5X Item	L5K Item	Description
N/A	*routine_name*	The name of the routine. In L5X, use a Name attribute in the <Routine> element.
Description	Description	User information about the routine.
RLLContent	*ladder_rungs*	Rung logic.
EncryptionInfo	ENCRYPTION_INFO	Details of the license-based Source Protection for the lockable object. Only exists for protected routines exported in plain text.
EncryptedContent	N/A	Source Protected and locked routine content. Only exists for locked routines exported in plain text.
EncryptedSegments	N/A	Locked logic for the routine. Only exists for locked routines exported in plain text.

RLL Routine attributes

Attribute	Description
Name	L5X only. Specify the name of the routine. In L5K, the name is an element of the statement.
Type	L5X only. Specify RLL. In L5K, the type of routine is part of the routine statement.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Rung logic

Enter rung logic within a routine component in an import/export file.

L5X rung structure

```
<RLLContent>
      <Rung [Rung_Attributes]>
            <Comment>
                  <![CDATA[ comment_text ]] >
            </Comment>
            <Text >
                  <![CDATA[ rung_neutral_text; ] ] >
            </Text>
      </Rung>
</RLLContent>
```

L5K RUNG structure

```
RC: "comment" "more" "etc";
<RungType> : <rung_neutral_text>;
```

Rung elements

L5X Item	L5K Item	Description
N/A	RungType	The type of rung. In L5X, use a Type attribute on the <Rung> element.
Comment	RC	Rung comment. In a L5K file, a rung comment must be followed by a rung.
Text	*rung_neutral_text*	The logic.

These rung types are available.

Item	Identifies
N	Normal
I	Insert
D	Delete

Item	Identifies
IR	Insert with a replace
rR	Pending replace IR
R	Replace
rI	Pending replace I
rN	Pending replace N
e	Pending insert rung
er	Pending replace rung
d	Pending delete rung

Rung attributes

Attribute	Description
Number	L5X only. Specify the rung number within the routine. In L5K, the rung number is defined by the order the rung appears in the L5K format.
Type	L5X only. Specify RLL. In L5K, the type of rung is part of the rung statement.

Rung guidelines

Use these guidelines for rung logic:

- Rungs are specified by using neutral language. See Neutral Text for Ladder Instructions on page 156 on page 151 for the format for the supported instructions.
- Each rung ends with a semicolon (;)

Branches

Enter a single branch or simultaneous branches on a rung.

L5X branch structure

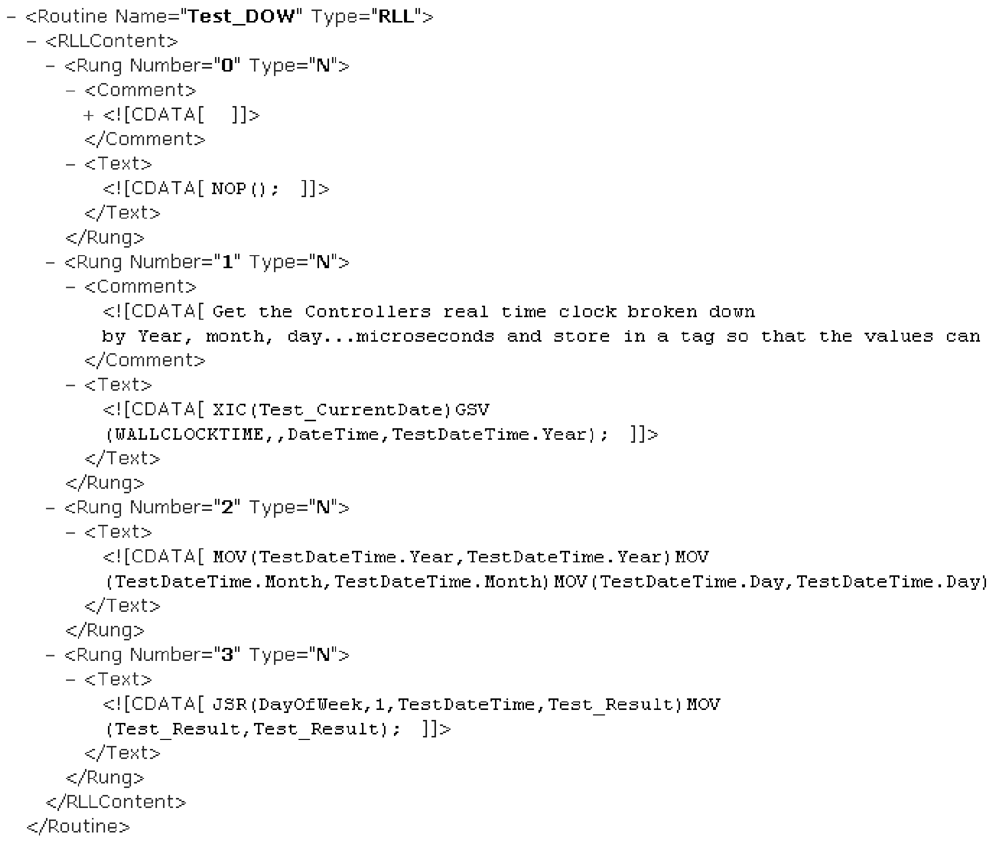
```
<Branch [BranchAttributes]>
      <Leg [LegAttributes]/>
</Branch>
```

L5K BRANCH structure

```
BRANCH (Branch_Attributes)
      LEG (Leg_Attributes)
      END_LEG
END_BRANCH
```

L5X Examples

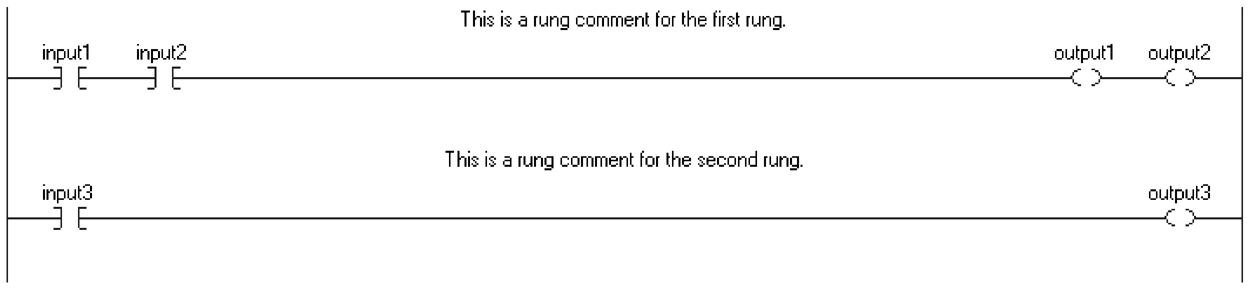
L5X Ladder ROUTINE Example



```
- <Routine Name="Test_DOW" Type="RLL">
  - <RLLContent>
    - <Rung Number="0" Type="N">
      - <Comment>
        + <![CDATA[   ]]>
        </Comment>
      - <Text>
          <![CDATA[ NOP();  ]]>
        </Text>
      </Rung>
    - <Rung Number="1" Type="N">
      - <Comment>
          <![CDATA[ Get the Controllers real time clock broken down
          by Year, month, day...microseconds and store in a tag so that the values can
        </Comment>
      - <Text>
          <![CDATA[ XIC(Test_CurrentDate)GSV
          (WALLCLOCKTIME,,DateTime,TestDateTime.Year);  ]]>
        </Text>
      </Rung>
    - <Rung Number="2" Type="N">
      - <Text>
          <![CDATA[ MOV(TestDateTime.Year,TestDateTime.Year)MOV
          (TestDateTime.Month,TestDateTime.Month)MOV(TestDateTime.Day,TestDateTime.Day)
        </Text>
      </Rung>
    - <Rung Number="3" Type="N">
      - <Text>
          <![CDATA[ JSR(DayOfWeek,1,TestDateTime,Test_Result)MOV
          (Test_Result,Test_Result);  ]]>
        </Text>
      </Rung>
    </RLLContent>
  </Routine>
```

L5K examples

Ladder ROUTINE example


This is a rung comment for the first rung.
input1
input2
output1
output2
This is a rung comment for the second rung.
input3
output3

```
ROUTINE Ladder_example
      RC: "This is a rung comment for the first rung.";
      N: XIC(input1)XIC(input2)OTE(output1)OTE(output2);
      RC: "This is a rung comment for the second rung.";
      N: XIC(input3)OTE(output3);
END_ROUTINE
```

Example with a single branch

```
N: XIC(conveyor_a)[,XIC(input_1) XIO(input_2) ]OTE(light_1);
```

Example with two simultaneous branches

```
N: XIC(conveyor_b)[,XIC(input_1) XIO(input_2) ,XIC(input_a)
XIO(input_b)  ]OTE(light_2);
```

Neutral text for ladder instructions

These tables lists each ladder instruction and its neutral text format. For details about a specific instruction, see the listed reference manuals.

Ladder Logic Instruction Reference Manuals

Instruction Type	Resource
Basic, sequential instruction	Logix5000 Controllers General Instructions Set Reference Manual, publication 1756-RM003.
Process control or drives instruction	Logix5000 Controllers Advanced Process Control and Drives Instruction Set Reference Manual, publication 1756-RM006.
Motion instruction	Logix5000 Controllers Motion Instructions Reference Manual, publication MOTION-RM002.

Relay Ladder Instructions

Instruction	Neutral Text Format
ABL	ABL(*channel,serial_port_control,character_count*);
ABS	ABS(*source,destination*);
ACB	ACB(*channel,serial_port_control,character_count*);
ACL	ACL(*channel,clear_serial_port_read,clear_serial_port_write*);
ACS	ACS(*source,destination*);
ADD	ADD(*source_A,source_B,destination*);
AFI	AFI();
AHL	AHL(*channel,ANDMask,ORMask,serial_port_control,channel_status*);
ALMA	ALMA (*alma_tag,in,program_acknowledge_all,program_disable,program_enable*);
ALMD	ALMD (*almd_tag,program_acknowledge,program_reset,program_disable, program_enable*);
AND	AND(*source_A,source_B,destination*);
ARD	ARD(*channel,destination,serial_port_control,string_length, characters_read*);
ARL	ARL(*channel,destination,serial_port_control,string_length, characters_read*);
ASN	ASN(*source,destination*);
ATN	ATN(*source,destination*);
AVC	AVC(*avc_tag,feedback_type,feedback_reation_time,delay_type,delay_time, output_follows_actuate,actuate,delay_enable,feedback_1,input_status, output_status,reset*);
AVE	AVE(*array,dim_to_vary,destination,control,length,position*);
AWA	AWA(*channel,source,serial_port_control,string_length,characters_sent*);
AWT	AWT(*channel,source,serial_port_control,string_length,characters_sent*);
BRK	BRK();

Instruction	Neutral Text Format
BSL	BSL(*array,control,source_bit,length*);
BSR	BSR(*array,control,source_bit,length*);
BTD	BTD(*source,source_bit,destination,destination_bit,length*);
CBCM	CBCM(*cbcm_tag,ack_type,mode,takeover_mode,enable,safety_enable, standard_enable,arm_continuous,start,stop_at_top,press_in_motion, motion_monitor_fault,slide_zone,safety_enable_ack*)
CBIM	CBIM(*cbim_tag,ack_type,inch_time,enable,safety_enable,standard_enable, start,press_in_motion,motion_monitor_fault,slide_zone,safety_enable_ack*);
CBSSM	CBSSM(*cbssm_tag,ack_type,takeover_mode,enable,safety_enable, standard_enable,start,press_in_motion,motion_monitor_fault,slide_zone, saefty_enable_ack*);
CLR	CLR(*destination*);
CMP	CMP(*expression*);
CONCAT	CONCAT(*sourceA,sourceB,destination*)
COP	COP(*source,destination,length*);
COS	COS(*source,destination*);
CPM	CPM(*cpm_tag,cam_profile,enable,brake_cam,takeover_cam,dynamic_cam, input_status,reverse,press_motion_status,reset*);
CPS	CPS(*source,destination,length*);
CPT	CPT(*destination,expression*);
CROUT	CROUT(*crout_tag,feedback_type,feedback_reaction_time,actuate,feedback_1, feedback_2,input_status,output_status,reset*);
CSM	CSM(*csm_tag,mechanical_delay_timer,max_pulse_period,motion_request, channel_A,channel_B,input_status,reset*);
CTD	CTD(*counter,preset,accum*);
CTU	CTU(*counter,preset,accum*);
DCM	DCM(*dcm_tag,safety_function,input_type,descrepancy_time,channel_A, channel_B,input_status,reset*);
DCS	DCS(*dcs_tag,safety_function,input_type,discrepancy_time,restart_type, cold_start_type,channel_A,channel_B,input_status,reset*);
DCSRT	DCSRT(*dcsrt_tag,safety_function,input_type,discrepancy_time,enable, channel_A,channel_B,input_status,reset*);
DCST	DCST(*dcst_tag,safety_function,input_type,discrepancy_time,restart_type, cold_start_type,channel_A,channel_B,test_request,input_status,reset*);
DCSTM	DCSTM(*dcstm_tag,safety_function,input_type,discrepancy_time,restart_type, cold_start_type,test_type,test_time,channel_A,channel_B,test_request,mute, muting_lamp_status,input_status,reset*);
DCSTL	DCSTL(*dcstl_tag,safety_function,input_type,discrepancy_time,restart_type, cold_start_type,channel_A,channel_B,test_request,unlock_request, lock_feedback,hazard_stopped,input_status,reset*);
DDT	DDT(*source,reference,result,cmp_control,length,position,result_control, length,position*);
DEG	DEG(*source,destination*);
DELETE	DELETE(*source,quantity,start,destination*);
DIN	DIN(*din_tag,reset_type,channel_A,channel_B,circuit_reset,fault_reset*);

Instruction	Neutral Text Format
DIV	DIV(*source_A,source_B,destination*);
DTOS	DTOS(*source,destination*);
DTR	DTR(*source,mask,reference*);
ENPEN	ENPEN(*enpen_tag,reset_type,channel_A,channel_B,circuit_reset,fault_reset*);
EOT	EOT(*data_bit*);
EPMS	EPMS(*epms_tag,input_1,input_2,input_3,input_4,input_5,input_6,input_7, input_8,input_status,lock,reset*);
EQU	EQU(*source_A,source_B*);
ESTOP	ESTOP(*estop_tag,reset_type,channel_A,channel_B,circuit_reset,fault_reset*);
EVENT	EVENT(*task*);
FAL	FAL(*control,length,position,mode,destination,expression*);
FBC	FBC(*source,reference,result,cmp_control,length,position,result_control, length,position*);
FFL	FFL(*source,FIFO,control,length,position*);
FFU	FFU(*FIFO,destination,control,length,position*);
FIND	FIND(*source,search,start,result*);
FLL	FLL(*source,destination,length*);
FOR	FOR(*routine_name,index,initial_value,terminal_value,step_size*);
FPMS	FPMS(*fpms_tag,input_1,input_2,input_3,input_4,input_5,fault_reset*);
FRD	FRD(*source,destination*);
FSBM	FSBM(*fsbm_tag,restart_type,S1-S2_time,S2-LC_time,LC-S3_time,S3-S4_time, maximum_mute_time,maximum_override_time,direction,light_curtain,sensor_1, sensor_2,sensor_3,sensor_4,enable_mute,override,input_status, muting_lamp_status,reset*);
FSC	FSC(*control,length,position,mode,expression*);
GEQ	GEQ(*source_A,source_B*);
GRT	GRT(*source_A,source_B*);
GSV	GSV(*class_name,instance_name,attribute_name,destination*);
INSERT	INSERT(*sourceA,sourceB,start,destination*);
IOT	IOT(*output_tag*);
JMP	JMP(*label_name*);
JSR	JSR(*routine_name,input_1,...input_n,return_1,..return_n*);
JXR	JXR(*external_routine_name,external_routine_control,parameter, return_parameter*);
LBL	LBL(*label_name*);
LC	LC(*lc_tag,reset_type,channel_A,channel_B,input_filter_time, mute_light_curtain,circuit_reset,fault_reset*);
LEQ	LEQ(*source_A,source_B*);
LES	LES(*source_A,source_B*);
LFL	LFL(*source,LIFO,control,length,position*);
LFU	LFU(*LIFO,destination,control,length,position*);
LIM	LIM(*low_limit,test,high_limit*);

Instruction	Neutral Text Format
LN	LN(*source,destination*);
LOG	LOG(*source,destination*);
LOWER	LOWER(*source,destination);*
MAAT	MAAT(*axis,motion_control*);
MAFR	MAFR(*axis,motion_control*);
MAG	MAG(slave*_axis,master_axis,motion_control,direction,ratio,slave_counts,master_counts,master_reference,ratio_format,clutch,accel_rate,accel_ units*);
MAH	MAH(*axis,motion_control*);
MAHD	MAHD(*axis,motion_control,diagnostic_test,observed_direction*);
MAJ	MAJ(*axis,motion_control,direction,speed,speed_units,accel_rate, accel_units,decel_rate,decel_units,profile,merge,merge_speed*);
MAM	MAM(*axis,motion_control,move_type,position,speed,speed_units,accel_rate, accel_units,decel_rate,decel_units,profile,merge,merge_speed*);
MAOC	MAOC(*axis,execution_target,motion_control,output,input,output_cam, cam_start_position,cam_end_position,output_compensation,execution_mode, execution_schedule,axis_arm_position,cam_arm_position,reference*);
MAPC	MAPC(*slave_axis,master_axis,motion_control,direction,cam_profile, slave_scaling,master_scaling,execution_mode,execution_schedule, master_lock_position,cam_lock_position,master_reference, master_direction*);
MAR	MAR(*axis,motion_control,trigger_condition,windowed_registration, minimum_position,maximum_position*);
MAS	MAS(*axis,motion_control,stop_type,change_decel,decel_rate,decel_units*);
MASD	MASD(*axis,motion_control*);
MASR	MASR(*axis,motion_control*);
MATC	MATC(*axis,motion_control,direction,cam_profile,distance_scaling, time_scaling,execution_mode,execution_schedule*);
MAW	MAW(*axis,motion_control,trigger_condition,position*);
MCCD	MCCD(*coordinate_system,motion_control,motion_type,change_speed,speed, speed_units,change_accel,accel_rate,accel_units,change_decel,decel_rate, decel_units,scope*);
MCCM	MCCM(*coordinate_system,motion_control,move_type,position,circle_type, via/center/radius,direction,speed,speed_units,accel_rate,accel_units, decel_rate,decel_units,profile,termination_type,merge,merge_speed*);
MCCP	MCCP(*motion_control,cam,length,start_slope,end_slope,cam_profile*);
MCLM	MCLM(*coordinate_system,motion_control,move_type,position,speed, speed_units,accel_rate,accel_units,decel_rate,decel_units,profile, termination_type,merge,merge_speed*);
MCD	MCD(a*xis,motion_control,motion_type,change_speed,speed,change_accel, accel_rate,change_decel,decel_rate,speed_units,accel_units, decel_units*);
MCR	MCR();
MCS	MCS(*coordinate_system,motion_control,stop_type,change_decel,decel_rate, decel_units*);
MCSD	MCSD(*coordinate_system,motion_control*);
MCSR	MCSR(*coordinate_system,motion_control*);
MCSV	MCSV(*motion_control,cam_profile,master_value,slave_value,slope_value, slope_derivative*);
MCT	MCT(*source_system,target_system,motion_control,orientation,translation*);

Instruction	**Neutral Text Format**
MCTP	MCTP(*source_system,target_system,motion_control,orientation,translation, transform_direction,reference_position,transform_position*);
MDF	MDF(*axis,motion_control*);
MDO	MDO(*axis,motion_control,drive_output,drive_units*);
MDOC	MDOC(*axis,execution_target,motion_control,disarm_type*);
MDR	MDR(*axis,motion_control*);
MDW	MDW(*axis,motion_control*);
MEQ	MEQ(*source,mask,compare*);
MGS	MGS(*group,motion_control,stop_mode*);
MGSD	MGSD(*group,motion_control*);
MGSP	MGSP(*group,motion_control*);
MGSR	MGSR(*group,motion_control*);
MID	MID(*source,quantity,start,destination*);
MMVC	MMVC(*mmvc_tag,enable,keyswitch,bottom,flywheel_stopped,safety_enable, actuate,input_status,output_status,reset*);
MOD	MOD(*source_A,source_B,destination*);
MOV	MOV(*source,destination*);
MRAT	MRAT(*axis,motion_control*);
MRHD	MRHD(*axis,motion_control,diagnostic_test*);
MRP	MRP(a*xis,motion_control,type,position_select,position*);
MSF	MSF(*axis,motion_control*);
MSG	MSG(*message_control*);
MSO	MSO(*axis,motion_control*);
MUL	MUL(*source_A,source_B,destination*);
MVC	MVC(*mvc_tag,feedback_type,feedback_reaction_time,actuate,feedback_1, feedback_2,input_status,output_status,reset*);
MVM	MVM(*source,mask,destination*);
NEG	NEG(*source,destination*);
NEQ	NEQ(*source_A,source_B*);
NOP	NOP();
NOT	NOT(*source,destination*);
ONS	ONS(*storage_bit*);
OR	OR(*source_A,source_B,destination*);
OSF	OSF(*storage_bit,output_bit*);
OSR	OSR(*storage_bit,output_bit*);
OTE	OTE(*data_bit*);
OTL	OTL(*data_bit*);
OTU	OTU(*data_bit*);
PATT	PATT(*phase_name,result*);
PCLF	PCLF(*phase_name*);
PCMD	PCMD(*phase_name,command,result*);

Instruction	**Neutral Text Format**
PDET	PDET(*phase_name*);
PFL	PFL(*source*);
PID	PID(PID,*process_variable,tieback,control_variable,pid_master_loop, inhold_bit,inhold_value);*
POVR	POVR(*phase_name,command,result);*
PPD	PPD();
PRNP	PRNP();
PSC	PSC();
PXRQ	PXRQ(*phase_instruction,external_request,data_value*);
RAD	RAD(*source,destination*);
RES	RES(*structure*);
RET	RET(*return_1,...return_n*);
RIN	RIN(*rin_tag,reset_type,channel_A,channel_B,circuit_reset,fault_reset*);
ROUT	ROUT(*rout_tag,feedback_type,enable,feedback_1,feedback_2,fault_reset*);
RTO	RTO(*timer,preset,accum*);
RTOS	RTOS(*source,destination*)
SBR	SBR(*routine_name,input_1,...input_n*);
SFP	SFP(SFC_routine_name,target_state);
SFR	SFR(SFC_routine_name,step_name);
SIN	SIN(*source,destination*);
SIZE	SIZE(*souce,dimension_to_vary,size*);
SMAT	SMAT(*smat_tag,restart_type,short_circuit_detect_delay_time,channel_A, channel_B,input_status,reset*);
SQI	SQI(*array,mask,source,control,length,position*);
SQL	SQL(*array,source,control,length,position*);
SQO	SQO(*array,mask,destination,control,length,position*);
SQR	SQR(*source,destination*);
SRT	SRT(*array,dim_to_vary,control,length,position*);
SSV	SSV(*class_name,instance_name,attribute_name,source*);
STD	STD(*array,dim_to_vary,destination,control,length,position*);
STOD	STOD(*source,destination*)
STOR	STOR(*source,destination*)
SUB	SUB(*source_A,source_B,destination*);
SWPB	SWPB(*source,order_mode,destination*);
TAN	TAN(*source,destination*);
THRS	THRS(*thrs_tag,active_pin_type,active_pin,right_button_normally_open, right_button_normally_closed,left_button_normally_open, left_button_normally_closed,fault_reset*);
THRSE	THRSE(*thrse_tag,discprepancy_time,enable,disconnected, right_button_normally_open,right_button_normally_closed, left_button_normally_open,left_button_normally_closed,input_status,resest*);
TND	TND();

Instruction	Neutral Text Format
TOD	TOD(*source,destination*);
TOF	TOF(*timer,preset,accum*);
TON	TON(*timer,preset,accum*);
TRN	TRN(*source,destination*);
TSAM	TSAM(*tsam_tag,restart_type,S1-S2_time,S2-LC_time,maximum_mute_time, maximum_override_time,light_curtain,sensor_1,sensor_2,enable_mute, override,input_status,muting_lamp_status,reset*);
TSSM	TSSM(*tssm_tag,restart_type,S1-S2_discrepancy_time,S1_S2-LC_minimum_time, S1_S2-LC_maximum_time,maximum_mute_time,maximum_override_time, light_curtain,sensor_1,sensor_2,enable_mute,override,input_status, muting_lamp_status,reset*);
UID	UID();
UIE	UIE();
UPPER	UPPER(*source,destination);*
XIC	XIC(*data_bit*);
XIO	XIO(*data_bit*);
XOR	XOR(*source_A,source_B,destination*);
XPY	XPY(*source_A,source_B,destination*);

Define a function block diagram routine

Introduction

This chapter explains how to enter function block diagram logic in a complete import/export file.

Function BlockDiagram Routine

These examples show the function block routine structure.

L5X function block diagram routine structure

```
<Routines>
      <Routine [Routine_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <FBDContent [FBDContent_Attributes]>
                  <Sheet [Sheet_Attributes]>
                        logic
                  </Sheet>
            </FBDContent>
      </Routine>
</Routines>
```

L5K Function Block FBD_ROUTINE structure

```
FBD_ROUTINE <routine_name> [(Description := "text",
      Routine_attributes, FBD_Attributes)]
      <function block sheets>
END_FBD_ROUTINE
```

Function block routine elements

L5X Item	L5K Item	Identifies
N/A	*routine_name*	The name of the routine. In L5X, use a Name attribute on the <Routine> element.
Description	Description	User information about the routine.
FBDContent	*function block sheets*	Function block diagram logic.
EncryptionInfo	ENCRYPTION_INFO	Details of the license-based Source Protection for the lockable object. Only exists for protected routines exported in plain text.
EncryptedContent	N/A	Source Protected and locked routine content. Only exists for locked routines exported in plain text.
EncryptedSegments	N/A	Locked logic for the routine. Only exists for locked routines exported in plain text.

FBD_routine attributes

Attribute	Description
Name	L5X only. Specify the name of the routine. In L5K, the name is an element of the statement.
Type	L5X only. Specify FBD. In L5K, the type of routine is part of the routine statement.
SheetSize	Select one of these sizes. • Letter (8.5x11in) • Legal (8.5x14in) • Tabloid (11x17in) • A4 (210x297mm) • A3 (297x420mm) For L5X, this attribute is on the <FBDContent> element.
SheetOrientation	Select the orientation of the sheet as Portrait or Landscape. For L5X, this attribute is on the <FBDContent> element.
OnlineEditType	L5X only. Specify the online edit logic type (**Original**, **PendingEdits**, or **TestEdits**). This attribute is not specified if there are no edits. For L5X, this attribute is on the <FBDContent> element.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Sheet

Enter the function block diagram logic in sheets within a routine component in an import/export file.

L5X sheet structure

```
<Sheet [Sheet_Attributes]>
       <Description>
            <![CDATA[ text ]]>
       </Description>
      <IRef [Iref_Attributes]/>
      <ORef [Oref_Attributes]/>
      <ICon [Icon_Attributes]/>
      <OCon [Ocon_Attributes]/>
      <Block [Block_Attributes]/>
      <AddOnInstruction [AddOnInstruction_Attributes]/>
      <JSR [JSR_Attributes]/>
      <SBR [SBR_Attributes]/>
      <RET [RET_Attributes]/>
      <Wire [Wire_Attributes]/>
      <FeedbackWire [FeedbackWire_Attributes]/>
      <TextBox [TextBox_Attributes]>
            text
      </TextBox>
      <Attachment [Attachment_Attributes]/>
</Sheet>
```

L5K SHEET structure

```
SHEET (Name := <sheet_name>)
      <IREF declaration>
      <OREF declaration>
      <ICON declaration>
      <OCON declaration>
      <mnemonic_BLOCK declaration>
      <ADD_ON_INSTRUCTION declaration>
      <JSR declaration>
      <SBR declaration>
      <RET declaration>
      <WIRE declaration>
      <FEEDBACK_WIRE declaration>
      <TEXT_BOX declaration>
      <ATTACHMENT declaration>
END_SHEET
```

Sheet elements

L5X Item	L5K Item	Identifies
IRef	IREF	Input references.
ORef	OREF	Output references.
ICon	ICON	Input wire connectors.
OCon	OCON	Output wire connectors.
Block	mnemonic_BLOCK	Function block instructions and their locations.
AddOnInstruction	ADD_ON_INSTRUCTION	Add-On Instructions
JSR	JSR	Jump to Subroutine instructions.
SBR	SBR	Subroutine instructions.
RET	RET	Return instructions.
Wire	WIRE	Wires and their corresponding attachments
FeedbackWire	FEEDBACK_WIRE	Feedback wires and what they are attached to.
TextBox	TEXT_BOX	Text box to hold comments.
Attachment	ATTACHMENT	Attachment from a text box to another function block element.

Sheet attributes

Attribute	Description
Number	L5X only. Specify the number of the sheet. In L5K, the sheet number is determined by the order the SHEET statement appears in the L5K format.
Name	L5K only. Specify the name of the sheet. In L5X, the name of the sheet is specified in a **<Description>** element under the **<Sheet>** element.

Sheet guidelines

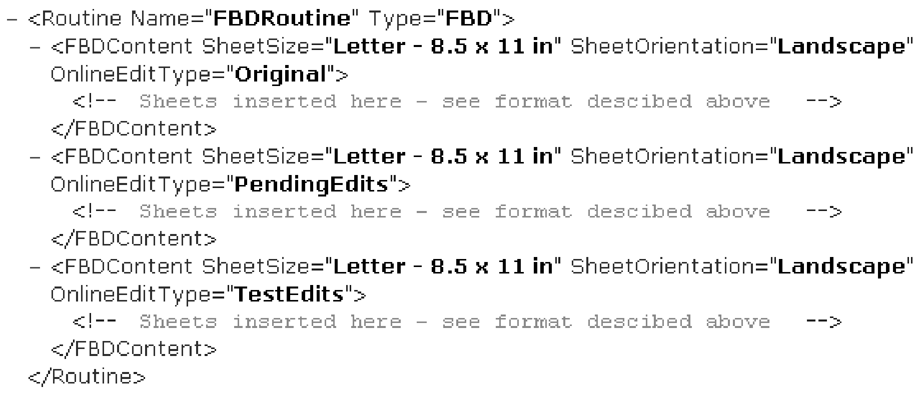
Use these sheet guidelines in your import/export files:

- The sheets in the routine appear in order in the export file. Each sheet section contains all the drawing elements and wires for that sheet.
- On import, sheet numbers are assigned based on order in the file, not on the number attribute on the sheet.
- The sheet name is stored as description on the sheet.
- Input references, blocks, output references, special drawing elements, and wires are contained within the sheet. On export, the elements appear in the order shown. On import in the L5K format, elements can be interspersed in the file. On import in the L5X format, the elements must appear in the exported order.
- Wire and feedback wire statements must appear after all the other components.
- Be careful when copying and pasting function block components within an import/export file. Each component within a sheet must have a unique ID number within that sheet.

Export function block logic while editing online

If you export function block logic that contains online edits, the export file exports LOGIC blocks, in L5K format, or additional <FBDContent> elements, in L5X format, to indicate the original, test edits, and pending edits states. If there are no online edits, these LOGIC blocks or additional <FBDContent> elements are not shown.

L5X Example: Test Edits and Pending Edits Exist



```
- <Routine Name="FBDRoutine" Type="FBD">
  - <FBDContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape"
    OnlineEditType="Original">
      <!--  Sheets inserted here - see format descibed above   -->
    </FBDContent>
  - <FBDContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape"
    OnlineEditType="PendingEdits">
      <!--  Sheets inserted here - see format descibed above   -->
    </FBDContent>
  - <FBDContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape"
    OnlineEditType="TestEdits">
      <!--  Sheets inserted here - see format descibed above   -->
    </FBDContent>
  </Routine>
```

L5K Example 1: Both Test Edits and Pending Edits Exist

```
FBD_ROUTINE MyFbdRoutine (SheetSize := "Letter (8.5x11in)",
SheetOrientation := Landscape)
        LOGIC (Online_Edit_Type := Orig)
                (* Sheets inserted here - see format described
above *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Test)
                (* Sheets inserted here - see format described
above *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Pend)
                (* Sheets inserted here - see format described
above *)
        END_LOGIC
END_FBD_ROUTINE
```

L5K Example 2: Only Pending Edits Exist

```
FBD_ROUTINE MyFbdRoutine (SheetSize := "Letter (8.5x11in)",
SheetOrientation := Landscape)
        LOGIC (Online_Edit_Type := Orig)
                (* Sheets inserted here - see format described
above *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Pend)
                (* Sheets inserted here - see format described
above *)
        END_LOGIC
END_FBD_ROUTINE
```

Online Edit Types

Item	Identifies
Online_Edit_Type	If online edits exist when the logic is exported, there will be a LOGIC block for Online_Edit_Type := Orig and the appropriate LOGIC block for the existing edits. Online_Edit_Type : = Pend indicates pending edits. Online_Edit_Type := Test indicates test edits. If there are no online edits when the logic is exported, there are no LOGIC blocks and the main components in the routine are SHEET components.

Input and output references

Input and output references have similar formats and identical attributes.

L5X IREFand OREF structure

```
<IRef [Reference_Attributes]/>

<ORef [Reference_Attributes]/>
```

L5K IREF and OREF structure

```
IREF (Reference_Attributes)
END_IREF

OREF (Reference_Attributes)
END_OREF
```

Reference attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	Function block instruction.
HideDesc	HideDescription	Whether or not to hide the description. Specify **true** or **false**.

Reference guidelines

Use these reference guidelines for function blocks:

- If the operand is not a qualified tag or literal value, the reference is not verified.
- The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

Input and output connectors

Input and output wire connectors have similar formats and identical attributes.

L5X ICON and OCON structure

```
<ICon [Connector_Attributes]/>

<OCon [Connector_Attributes]/>
```

L5K ICON and OCON structure

```
ICON (Connector_Attributes)
END_ICON

OCON (Connector_Attributes)
END_OCON
```

Connector attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Name	Name	(optional) The name of the wire connector.

Connector guidelines

Use these connector guidelines for function blocks:

- Output connector names must be unique within a function block routine.
- Multiple input connector names can reference the same output connector name.
- Input and output connectors with unmatched or blank connector names are not verified.
- The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

Blocks

These examples show block structure.

L5X block structure

```
<Block [Block_Attributes]>
      <Array Name="name", Operand="operand"/>
</Block>
```

L5K BLOCK structure

```
mnemonic_BLOCK (Block_Attributes)
END_mnemonic_BLOCK
```

Block attributes

L5X Item	L5K Item	Identifies
Type	*mnemonic*	L5X only. The type of Block. Specify the mnemonic name for the block (for example *DEDT*).
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	(optional) Tag name for the block. For L5X, this attribute is on the <Array> element.
Name	ArrayName	(optional) Tag name for array. For L5X , this attribute is on the <Array> element.
VisiblePins	VisiblePins	List of the names of all the parameters with pins visible for wiring. The names match the member names on the block tag. In an .L5X file, separate pin names with spaces. In an .L5K file, separate pin names with commas.
AutotuneTag	AutotuneTag	Tag name for the autotune tag.
HideDesc	HideDescription	Whether or not to hide the description. Specify true or false.

Block guidelines

Use these block guidelines with function blocks:

- If the operand is not a qualified tag of the correct data type, the blocks are not verified.
- Some function block instructions require specific arrays. The table lists the valid array name for each of these instructions.

Instruction	Array Name
DEDT	Storage (required)
FGEN	X1 (required) Y1 (required) X2 (optional) Y2 (optional)
MAVE	Storage (required) Weight (optional)
RMPS	RampValue (required) SoakValue (required) SoakTime (required)

- The X and Y grid locations are in a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

Add-On instructions

The Add-On Instruction elements in a function block diagram routine structure represent the use of the Add-On Instruction in the routine, not the definition of the Add-On Instruction.

L5X Add-On Instruction structure

<AddOnInstruction [*AddOnInstruction_Attributes*]>

<InOutParameter Name="*InOutArgument*", Argument="*argument*"/>

</Add0nInstruction>

L5K ADD_ON_INSTRUCTION structure

```
ADD_ON_INSTRUCTION name (Add_On_Instruction_Attributes)
      FBD_PARAMETERS (InOutParmName := InOutArgument, ...)
      END_FBD_PARAMETERS
END_ADD_ON_INSTRUCTION
```

Add-On Instruction Attributes

L5X Item	L5K Item	Identifies
Name	*name*	L5X only. Specify the name of the Add-On Instruction. In L5K, the name is an element of the statement.
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	(optional) Operand name for the Add-On Instruction block.
VisiblePins	VisiblePins	List of the names of all the parameters with pins visible for wiring. In an .L5X file, separate pin names with spaces. In an .L5K file, separate pin names with commas.
Name	N/A	L5X only. Specify the tag name for the InOut Parameter on the Add-On Instruction For L5X, this attribute is on the <InOutParameter> element. For L5K, the InOut Parameter name is one of the attribute names on the FBD_PARAMETERS statement.
Argument	N/A	L5X only. Specify the InOut Parameter argument. For L5X, this attribute is on the <InOutParameter> element.

Add-On Instruction Guidelines

Use these Add-On Instruction guidelines with function blocks:

- If the operand is not a qualified tag or literal value, the Add-On Instruction is not verified.
- The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

JSR

L5X JSR structure

```
<JSR [JSR_Attributes]>
</JSR>
```

L5K JSR structure

```
JSR (JSR_Attributes)
END_JSR
```

JSR attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Routine	Routine	Specify the JSR routine name.
In	In	Specify the input parameters. In an .L5X file, separate input parameter names with spaces. In an .L5K file, separate input parameter names with commas.
Ret	Ret	Specify the return parameters. In an .L5X file, separate return parameter names with spaces. In an .L5K file, separate return parameter names with commas.

JSR guidelines

The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

SBR

L5X SBR structure

```
<SBR [SBR_Attributes]>
</SBR>
```

L5K SBR structure

```
SBR (SBR_Attributes)
END_SBR
```

SBR attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Routine	Routine	Specify the SBR routine name.
Ret	Ret	Specify the return parameters. In an .L5X file, separate return parameter names with spaces. In an .L5K file, separate return parameter names with commas.

SBR guidelines

The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

RET

L5X RET structure

```
<RET [RET_Attributes]>
</RET>
```

L5K RET structure

```
RET (RET_Attributes)
END_RET
```

RET attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Routine	Routine	Specify the JSR routine name.
In	In	Specify the input parameters. In an .L5X file, separate input parameter names with spaces. In an .L5K file, separate input parameter names with commas.

RET guidelines

The X and Y grid locations are a relative position from the upper-left corner of the sheet. X is the horizontal position; Y is the vertical position.

Wires and feedback wires

The wire and feedback wire formats describe a wire by specifying what it is attached to at each end, which is always a pin on another drawing element.

L5X wire structure

```
<Wire [Wire_Attributes]/>

<FeedbackWire [Wire_Attributes]/>
```

L5K WIRE structure

```
WIRE (Wire_Attributes)
END_WIRE

FEEDBAK_WIRE (Wire_Attributes)
END_FEEDBACK_WIRE
```

Wire attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The source drawing element. Type an unsigned, 32-bit integer.
FromParam	FromParameter	The pin on the source drawing element. **For:** **Type:** Blocks Parameter name Irefs In Icons In
ToID	ToElementID	The destination drawing element. Type an unsigned, 32-bit integer.
ToParam	ToParameter	The pin on the destination drawing element. **For:** **Type:** Blocks Parameter name Orefs Out Ocons Out

Wire guidelines

Use these wire guidelines:

- Wires that are not correctly specified are not imported.
- A feedback wire follows the same format as a wire. Just connect the Source and Destination elements to form a feedback wire.

Text boxes

The text box blocks in an SFC routine hold descriptions about SFC components.

L5X TextBox structure

```
<TextBox [TextBoxAttributes]>
      <![CDATA[ text  ]] >
</TextBox>
```

L5K TEXTBOX structure

```
TEXT_BOX (Text_Box_Attributes,
      Text := <"text">)
END_TEXT_BOX
```

Text box attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Width	Width	This attribute is not currently used; it is there for future use. Type **0**.
Text	Text	The descriptive text.

Text box guidelines

Use these guidelines for text boxes:

- All text box blocks must come after all block sections.
- Text boxes can be free-standing or they can be attached to FBD elements.

Attachments

The attachment blocks identify the attachments from text boxes to other function block elements.

L5X attachment structure
L5K ATTACHMENT structure

```
<Attachment [Attachment_Attributes]/>
ATTACHMENT (Attachment_Attributes)
END_ATTACHMENT
```

Attachment attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The ID of the attached object. Type an unsigned, 32-bit integer value.
ToID	ToElementID	The ID of the object that the FromID object is attached to. Type an unsigned, 32-bit integer value.

Attachment guidelines

Use these guidelines for attachments:

- Use an attachment to link a text box to an FBD element.
- All attachment blocks must come after all text box blocks.

Examples

L5X Function Block Diagram Example

```
- <Routine Name="MainFBD" Type="FBD">
  - <FBDContent SheetSize="Tabloid - 11 x 17 in" SheetOrientation="Landscape">
    - <Sheet Number="1">
      - <Description>
          <![CDATA[ Level_control_and_simulation  ]]>
        </Description>
        <IRef ID="0" X="160" Y="420" Operand="FlowIntoTank"
          HideDesc="false" />
        <OCon ID="1" X="520" Y="280" Name="TankLevel" />
        <Block Type="ADD" ID="2" X="300" Y="100" Operand="ADD_01"
          VisiblePins="SourceA SourceB Dest" HideDesc="false" />
      - <Block Type="DEDT" ID="3" X="40" Y="100" Operand="DEDT_01"
          VisiblePins="In Out" HideDesc="false">
          <Array Name="StorageArray" Operand="DEDT_01array" />
        </Block>
        <Block Type="HLL" ID="4" X="520" Y="100" Operand="HLL_01"
          VisiblePins="In Out HighAlarm LowAlarm" HideDesc="false" />
        <Block Type="LDLG" ID="5" X="40" Y="280" Operand="LDLG_01"
          VisiblePins="In Out" HideDesc="false" />
        <Block Type="MUL" ID="6" X="480" Y="400" Operand="MUL_01"
          VisiblePins="SourceA Dest" HideDesc="false" />
        <Block Type="PIDE" ID="7" X="760" Y="60" Operand="LevelController"
          VisiblePins="PV SPProg SPCascade RatioProg CVProg FF HandFB
          ProgProgReq ProgOperReq ProgCasRatReq ProgAutoReq
          ProgManualReq ProgOverrideReq ProgHandReq CVEU SP
          PVHHAlarm PVHAlarm PVLAlarm PVLLAlarm PVROCPosAlarm
          PVROCNegAlarm DevHHAlarm DevHAlarm DevLAlarm DevLLAlarm
          ProgOper CasRat Auto Manual Override Hand" HideDesc="false" />
        <Block Type="SUB" ID="8" X="280" Y="380" Operand="SUB_01"
          VisiblePins="SourceA SourceB Dest" HideDesc="false" />
        <Wire FromID="0" ToID="8" ToParam="SourceA" />

        <Wire FromID="8" FromParam="Dest" ToID="6" ToParam="SourceA" />
        <FeedbackWire FromID="4" FromParam="Out" ToID="2"
          ToParam="SourceB" />
        <FeedbackWire FromID="7" FromParam="CVEU" ToID="3"
          ToParam="In" />
      </Sheet>
    - <Sheet Number="2">
      - <Description>
          <![CDATA[ Agitator_control  ]]>
        </Description>
        <IRef ID="9" X="140" Y="300" Operand="20" HideDesc="false" />
        <ICon ID="10" X="160" Y="140" Name="TankLevel" />
        <Block Type="D2SD" ID="11" X="440" Y="220" Operand="TankAgitator"
          VisiblePins="ProgCommand State0Perm State1Perm FB0 FB1
          HandFB ProgProgReq ProgOperReq ProgOverrideReq
          ProgHandReq Out Device0State Device1State CommandStatus
          FaultAlarm ModeAlarm ProgOper Override Hand"
          HideDesc="false" />
        <Block Type="GRT" ID="12" X="240" Y="220" Operand="GRT_01"
          VisiblePins="SourceA SourceB Dest" HideDesc="false" />
        <Wire FromID="9" ToID="12" ToParam="SourceB" />
        <Wire FromID="10" ToID="12" ToParam="SourceA" />
        <Wire FromID="12" FromParam="Dest" ToID="11"
          ToParam="ProgCommand" />
      </Sheet>
    + <Sheet Number="3">
    </FBDContent>
  </Routine>
```

L5K FBD_ROUTINE Example

```
FBD_ROUTINE My_FBD_Routine (SheetSize := "Tabloid (11x17in)",
SheetOrientation := Landscape)
       SHEET  (Name := Input_Scaling)
              IREF  (ID := 3,
                     X := 120,
                     Y := 120,
                     Operand := Input_Tag)
              END_IREF

              OREF  (ID := 5,
                     X := 520,
                     Y := 320,
                     Operand := Output_Tag)
              END_OREF

              ICON  (ID := 4,
                     X := 160,
                     Y := 320,
                     Name := ConnectorName)
              END_ICON

              OCON  (ID := 6,
                     X := 680,
                     Y := 100,
                     Name := ConnectorName)
              END_OCON

              MUL_BLOCK  (ID := 0,
                          X := 440,
                          Y := 60,
                          Operand := MUL_01,
                          VisiblePins := "SourceA, SourceB,
Dest")
              END_MUL_BLOCK

              SCL_BLOCK  (ID := 1,
                          X := 240,
                          Y := 60,
                          Operand := SCL_01,
                          VisiblePins := "In, InEUMax, Out,
MaxAlarm")
              END_SCL_BLOCK

              PI_BLOCK  (ID := 2,
                         X := 260,
                         Y := 260,
                         Operand := PI_01,
                         VisiblePins := "In, Initialize,
InitialValue, Out, HighAlarm, LowAlarm")
```

```
             END_PI_BLOCK

             WIRE  (FromElementID := 3,
                    FromParameter := "",
                    ToElementID := 1,
                    ToParameter := In)
             END_WIRE

             WIRE  (FromElementID := 4,
                    FromParameter := "",
                    ToElementID := 2,
                    ToParameter := In)
             END_WIRE

             WIRE  (FromElementID := 0,
                    FromParameter := Dest,
                    ToElementID := 6,
                    ToParameter := "")
             END_WIRE

             WIRE  (FromElementID := 1,
                    FromParameter := Out,
                    ToElementID := 0,
                    ToParameter := SourceA)
             END_WIRE

             WIRE  (FromElementID := 2,
                    FromParameter := Out,
                    ToElementID := 5,
                    ToParameter := "")
             END_WIRE

             FEEDBACK_WIRE  (FromElementID := 0,
                             FromParameter := Dest,
                             ToElementID := 0,
                             ToParameter := SourceB)
             END_FEEDBACK_WIRE

       END_SHEET

END_FBD_ROUTINE
```

Parameters for function block instructions

These tables list each function block instruction and its format in the Block component of an import/export file. For details about a specific instruction, see the listed reference manuals.

Function block instruction reference manuals

Instruction Type	**Resource**
Basic, sequential instruction	Logix5000 Controllers General Instructions Set Reference Manual, publication 1756-RM003.
Process control or drives instruction	Logix5000 Controllers Advanced Process Control and Drives Instruction Set Reference Manual, publication1756-RM006.
Motion instruction	Logix5000 Controllers Motion Instructions Reference Manual, publication -RM002.

Function block instructions

Instruction	**Default Operand and VisiblePins formats (components within the Block structure)**

ABS	Operand := ABS_01,
	VisiblePins := "*Source, Destination*")

ACS	Operand := ACS_01,
	VisiblePins := "*Source, Destination"*)

ADD	Operand := ADD_01,
	VisiblePins := "*SourceA, SourceB, Destination"*)

ALM	Operand := ALM_01,
	VisiblePins := "*In, HHAlarm, HAlarm, LAlarm, LLAlarm, ROCPosAlarm, ROCNegAlarm*")

ALMA	Operand := ALMA_01,
	VisiblePins := "*In, HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled*")

ALMD	Operand := ALMD_01,
	VisiblePins := "*In, InAlarm, Acked, Suppressed, Disabled*")

AND	Operand := AND_01,
	VisiblePins := "*SourceA, SourceB, Destination*")

ASN	Operand := ASN_01,
	VisiblePins := "*Source, Destination*")

ATN	Operand := ATN_01,
	VisiblePins := "*Source, Destination"*)

BAND	Operand := BAND_01,
	VisiblePins := "*In1, In2, In3, In4, Out*")

BNOT	Operand := BNOT_01,
	VisiblePins := "*In, Out*")

BOR	Operand := BOR_01,
	VisiblePins := "*In1, In2, In3, In4, Out*")

BTDT	Operand := BTDT_01,
	VisiblePins := *"Source, SourceBit, Length, DestBit, Target, Dest"*)

BXOR	Operand := BXOR_01,
	VisiblePins := "*In1, In2, Out*")

Instruction	Default Operand and VisiblePins formats (components within the Block structure)

COS	Operand := COS_01,
	VisiblePins := "*Source, Dest*")

CTUD	Operand := CTUD_01,
	VisiblePins := "*CUEnable, CDEnable, PRE, Reset, ACC, DN*")

D2SD	Operand := D2SD_01,
	VisiblePins := "*ProgCommand, State0Perm, State1Perm, FB0, FB1, HandFB, ProgProgReq, ProgOperReq, ProgOverrideReq, ProgHandReq, Out, Device0State, Device1State, CommandStatus, FaultAlarm, ModeAlarm, ProgOper, Override, Hand*")

D3SD	Operand := D3SD_01,
	VisiblePins := "*Prog0Command, Prog1Command, Prog2Command, State0Perm, State1Perm, State2Perm, FB0, FB1, FB2, FB3, HandFB0, HandFB1, HandFB2, ProgProgReq, ProgOperReq, ProgOverrideReq, ProgHandReq, Out0, Out1, Out2, Device0State, Device1State, Device2State, Command0Status, Command1Status, Command2Status, FaultAlarm, ModeAlarm, ProgOper, Override, Hand*")

DEDT	Operand := DEDT_01,
	VisiblePins := "*In, Out*",
	Storage := *array_name*)

DEG	Operand := DEG_01,
	VisiblePins := "*Source, Dest*")

DERV	Operand := DERV_01,
	VisiblePins := "*In, ByPass, Out*")

DFF	Operand := DFF_01,
	VisiblePins := "*D, Clear, Clock, Q, QNot*")

DIV	Operand := DIV_01,
	VisiblePins := "*SourceA, SourceB, Dest*")

ESEL	Operand := ESEL_01,
	VisiblePins := "*In1, In2, In3, In4, In5, In6, ProgSelector, ProgProgReq, ProgOperReq, ProgOverrideReq, Out, SelectedIn, ProgOper, Override*")

EQU	Operand := EQU_01,
	VisiblePins := "*SourceA, SourceB*")

FGEN	Operand := FGEN_01,
	VisiblePins := "*In, Out*",
	X1 := *array_name*,
	X2 := *array_name*,
	Y2 := *array_name*,
	Y2 := *array_name*)

FRD	Operand := FRD_01,
	VisiblePins := "*Source, Dest*")

GEQ	Operand := GEQ_01,
	VisiblePins := "*SourceA, SourceB*")

GRT	Operand := GRT_01,
	VisiblePins := "*SourceA, SourceB*")

HLL	Operand := HLL_01,
	VisiblePins := "*In, Out, HighAlarm, LowAlarm*")

HPF	Operand := HPF_01,
	VisiblePins := "*In, Out*")

INTG	Operand := INTG_01,
	VisiblePins := "*In, Out*")

JKFF	Operand := JKFF_01,
	VisiblePins := "*Clear, Clock, Q, QNot*")

Instruction	**Default Operand and VisiblePins formats (components within the Block structure)**

LEQ	Operand := LEQ_01,
	VisiblePins := "*SourceA, SourceB"*)

LES	Operand := LES_01,
	VisiblePins := "*SourceA, SourceB"*)

LIM	Operand := LIM_01,
	VisiblePins := "*LowLlimit, Test, HighLimit"*)

LN	Operand := LN_01,
	VisiblePins := "*Source, Dest"*)

LOG	Operand := LOG_01,
	VisiblePins := "*Source, Dest"*)

LPF	Operand := LPF_01,
	VisiblePins := "*In, Out*")

MAVE	Operand := MAVE_01,
	VisiblePins := "*In, Out*",
	Storage := *array_name*,
	Weight := *array_name*)

MAXC	Operand := MAXC_01,
	VisiblePins := "*In, Reset, ResetValue, Out*")

MEQ	Operand := MEQ_01,
	VisiblePins := "*Source, Mask, Compare"*)

MINC	Operand := MINC_01,
	VisiblePins := "*In, Reset, ResetValue, Out*")

MOD	Operand := MOD_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

MSTD	Operand := MSTD_01,
	VisiblePins := "*In, SampleEnable, Out*",
	Storage := *array_name*)

MUL	Operand := MUL_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

MUX	Operand := MUX_01,
	VisiblePins := "*In1, In2, In3, In4, In5, In6, In7, In8, Selector, Out*")

MVMT	Operand := MVMT_01,
	VisiblePins := "*Source, Mask, Target, Dest"*)

NEG	Operand := NEG_01,
	VisiblePins := "*Source, Dest"*)

NEQ	Operand := NEQ_01,
	VisiblePins := "*SourceA, SourceB"*)

NOT	Operand := NOT_01,
	VisiblePins := "*Source, Dest"*)

NTCH	Operand := NTCH_01,
	VisiblePins := "*In, Out*")

OR	Operand := OR_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

OSFI	Operand := OSFI_01,
	VisiblePins := "*InputBit, OutputBit"*)

Instruction	**Default Operand and VisiblePins formats (components within the Block structure)**

OSRI	Operand := OSRI_01,
	VisiblePins := "*InputBit, OutputBit*")

PI	Operand := PI_01,
	VisiblePins := "*In, Out*")

PIDE	Operand := PIDE_01,
	VisiblePins := "*PV, SPProg, SPCascade, RatioProg, CVProg, FF, HandFB, ProgProgReq, ProgOperReq, ProgCasRatReq, ProgAutoReq, ProgManuaReq, ProgOverrideReq, ProgHandReq, CVEU, SP, PVHHAlarm, PVHAlarm, PVLAlarm, PVLLAlarm, PVROCPosAlarm, PVROCNegAlarm, DevHHAlarm, DevHAlarm, DevLAlarm, DevLLAlarm, ProgOper, CasRat, Auto, Manual, Override, Hand*")

PMUL	Operand := PMUL_01,
	VisiblePins := "*In, Multipler, Out*")

POSP	Operand := POSP_01,
	VisiblePins := "*SP, Position, OpenedFB, ClosedFB, OpenOut, CloseOut*")

RAD	Operand := RAD_01,
	VisiblePins := "*Source, Dest"*)

RESD	Operand := RESD_01,
	VisiblePins := "*Set, Reset, Out, OutNot*")

RLIM	Operand := RLIM_01,
	VisiblePins := "*In, ByPass, Out*")

RMPS	Operand := RMPS_01,
	VisiblePins := "*PV, CurrentSegProg, OutProg, SoakTimeProg, ProgProgReq, ProgOperReq, ProgAutoReq, ProgManualReq, ProgHoldReq, Out, CurrentSeg, SoakTimeLeft, GuarRampOn, GuarSoakOn, ProgOper, Auto, Manual, Hold*",
	RampValue := *array_name*,
	SoakValue := *array_name*,
	SoakTime := *array_name*)

RTOR	Operand := RTOR_01,
	VisiblePins := *TimerEnable, PRE, Reset, ACC, DN")*

SCL	Operand := SCL_01,
	VisiblePins := "*In, Out*")

SCRV	Operand := SCRV_01,
	VisiblePins := "*In, Out*")

SEL	Operand := SEL_01,
	VisiblePins := "*In1, In2, SelectorIn, Out*")

SETD	Operand := SETD_01,
	VisiblePins := "*Set, Reset, Out, OutNot*")

SIN	Operand := SIN_01,
	VisiblePins := SIN(*source,destination*);

SNEG	Operand := SNEG_01,
	VisiblePins := "*In, NegateEnable, Out*")

SOC	Operand := SOC_01,
	VisiblePins := "*In, Out*")

SQR	Operand := SQR_01,
	VisiblePins := "*Source, Dest"*)

SRTP	Operand := SRTP_01,
	VisiblePins := "*In, HeatOut, CoolOut, HeatTimePercent, CoolTimePercent*")

SSUM	Operand := SSUM_01,
	VisiblePins := "*In1, Select1, In2, Select2, In3, Select3, In4, Select4, Out*")

Instruction	Default Operand and VisiblePins formats (components within the Block structure)

SUB	Operand := SUB_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

TAN	Operand := TAN_01,
	VisiblePins := "*Source, Dest")*

TOD	Operand := TOD_01,
	VisiblePins := "*Source, Dest")*

TOFR	Operand := TOFR_01,
	VisiblePins := "*TimerEnable, PRE, Reset, ACC, DN*")

TONR	Operand := TONR_01,
	VisiblePins := "*TimerEnable, PRE, Reset, ACC, DN*")

TOT	Operand := TOT_01,
	VisiblePins := "*In, ProgProgReq, ProgOperReq, ProgStartReq, ProgStopReq, ProgResetReq, Total, OldTotal, ProgOper, RunStop, ProgResetDone, TargetFlag, TargetDev1Flag, TargetDev2Flag*")

TRN	Operand := TRN_01,
	VisiblePins := "*Source, Dest")*

UPDN	Operand := UPDN_01,
	VisiblePins := "*InPlus, InMinus, Out*")

XOR	Operand := XOR_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

XPY	Operand := XPY_01,
	VisiblePins := "*SourceA, SourceB, Dest"*)

Define a sequential function chart routine

Introduction

This chapter explains how to enter sequential function chart logic in a complete import/export file.

For more information on creating sequential function charts and correct syntax, see the Logix5000 Controller Common Procedures Programming Manual, publication 1756-PM001.

Sequential function chart routine

These examples show sequential function chart structure.

L5X sequential function chart structure

```
<Routines>
      <Routine [Routine_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <SFCContent [SFCContent_Attributes]>
                  <Step [Step_Attributes]/>
                  <Transition [Transition_Attributes]/>
                  <Branch [Branch_Attributes]/>
                  <SbrRet [SbrRet_Attributes]/>
                  <Stop [Stop_Attributes]/>
                  <Branch [Branch_Attributes]/>
                  <DirectedLink [DirectedLink_Attributes]/>
                  <TextBox [TextBox_Attributes]>
                        text
                  </TextBox>
                  <Attachment [Attachment_Attributes]/>
            </SFCContent>
      </Routine>
</Routines>
```

L5K sequential function chart SFC_ROUTINE structure

```
SFC_ROUTINE <routine_name> [(Routine_Attributes,
            SFC_Attributes)]
      <STEP declaration>
      <TRANSITION declaration>
      <BRANCH declaration>
      <SBR_RET declaration>
      <STOP declaration>
      <BRANCH declaration>
```

```
            <DIRECTED_LINK declaration>
            <TEXT_BOX declaration)
            <ATTACHMENT declaration>
    END_SFC_ROUTINE
```

Sequential function chart elements

L5X Item	L5K Item	Identifies
N/A	routine_name	The name of the routine. In L5X, use a Name attribute on the <Routine> element.
Description	Description	User information about the routine.
SFCContent	N/A	Sequential function chart logic.
EncryptionInfo	ENCRYPTION_INFO	Details of the license-based Source Protection for the lockable object. Only exists for protected routines exported in plain text.
EncryptedContent	N/A	Source Protected and locked routine content. Only exists for locked routines exported in plain text.
EncryptedSegments	N/A	Locked logic for the routine. Only exists for locked routines exported in plain text.

SFC_Routine attributes

Attribute	Description
Name	L5X only. Specify the name of the routine. For L5K, the name is an element of the statement.
Type	L5X only. Specify SFC. In L5K, the type of routine is part of the routine statement.
SheetSize	The size of the SFC. Select one of these options. • Letter (8.5x11in) • Legal (8.5x14in) • Tabloid (11x17in) • A4 (210x297mm) • A3 (297x420mm) In L5X, this attribute is on the <SFCContent> element.
SheetOrientation	The orientation of the SFC sheet. Select **Portrait** or **Landscape**. In L5X, this attribute is on the <SFCContent> element.

Attribute	Description
StepName	The prefix for the name of the step blocks within this SFC routine. The Logix Designer application uses this prefix when it automatically generates an SFC_STEP tag. In L5X, this attribute is on the <SFCContent> element.
TransitionName	The prefix for the name of the transition blocks with this SFC routine. The Logix Designer application uses this prefix when it automatically generates a transition tag. In L5X, this attribute is on the <SFCContent> element.
ActionName	The prefix for the name of the action blocks in this SFC routine. The Logix Designer application uses this prefix when it automatically generates an SFC_ACTION tag. In L5X, this attribute is on the <SFCContent> element.
StopName	The prefix for the name of the stop blocks in this SFC routine. The Logix Designer application uses this prefix when it automatically generates an SFC_STOP tag. In L5X, this attribute is on the <SFCContent> element.
OnlineEditType	L5X only. Specify the online edit logic type (**Original**, **PendingEdits**, or **TestEdits**). This attribute is not specified if there are no edits. In L5X, this attribute is on the <SFCContent> element.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Export sequential function chart logic while editing online

If you export sequential function chart logic that contains online edits, the export file exports LOGIC blocks (in L5K format) or additional <SFCContent> elements (in L5X format) to indicate the original, test edits, and pending edits states. If there are no online edits, you will not see these LOGIC blocks or additional <SFCContent> elements.

L5X Example: Test edits and pending edits exist

```
- <Routine Name="SFCRoutine" Type="SFC">
  - <SFCContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape" StepName="Step"
    TransitionName="Tran" ActionName="Action" StopName="Stop" OnlineEditType="Original">
      <!--  SFC content inserted here - see format descibed above   -->
    </SFCContent>
  - <SFCContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape" StepName="Step"
    TransitionName="Tran" ActionName="Action" StopName="Stop" OnlineEditType="PendingEdits">
      <!--  SFC content inserted here - see format descibed above   -->
    </SFCContent>
  - <SFCContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape" StepName="Step"
    TransitionName="Tran" ActionName="Action" StopName="Stop" OnlineEditType="TestEdits">
      <!--  SFC content inserted here - see format descibed above   -->
    </SFCContent>
  </Routine>
```

L5K Example 1: Both test edits and pending edits exist

```
SFC_ROUTINE MySFCRoutine (SheetSize := "Letter (8.5x11in)",
       SheetOrientation := Landscape, StepName := "Step",
       TransitionName := "Tran", ActionName := "Action",
       StopName := "Stop")
       LOGIC (Online_Edit_Type := Orig)
              (* SFC logic here *)
       END_LOGIC

       LOGIC (Online_Edit_Type := Test)
              (* SFC logic here *)
       END_LOGIC

       LOGIC (Online_Edit_Type := Pend)
              (* SFC logic here *)
       END_LOGIC
END_SFC_ROUTINE
```

L5K Example 2: Only pending edits exist

```
SFC_ROUTINE MySFCRoutine (SheetSize := "Letter (8.5x11in)",
       SheetOrientation := Landscape, StepName := "Step",
       TransitionName := "Tran", ActionName := "Action",
       StopName := "Stop")
       LOGIC (Online_Edit_Type := Orig)
              (* SFC logic here *)
       END_LOGIC

       LOGIC (Online_Edit_Type := Pend)
              (* SFC logic here *)
       END_LOGIC
END_SFC_ROUTINE
```

Online edit types

Item	Identifies
Online_Edit_Type	When you export logic: • If online edits exist, there is a LOGIC block for Online_Edit_Type := Orig and the appropriate LOGIC block for the existing edits. Online_Edit_Type : = Pend indicates pending edits. Online_Edit_Type := Test indicates test edits. • If there are no online edits when you export the logic, there are no LOGIC blocks and the main components in the routine are SFC logic components.

Steps

These examples show the step structure.

L5X step structure

```
<Step [Step_Attributes]>
      <Preset>
            logic
      </Preset>
      <LimitHigh>
            logic
      </LimitHigh>
      <LimitLow>
            logic
      </LimitLow>
      <Action>
            logic
      </Action>
</Step>
```

L5K STEP structure

```
STEP (Step_Attributes)
      <PRESET declaration>
      <LIMIT_HIGH declaration>
      <LIMIT_LOW declaration>
      <ACTION_LIST declaration>
END_STEP
```

Step elements

L5X Item	L5K Item	Identifies
Preset	PRESET	A structured text expression that specifies the preset time in milliseconds for the step timer. If the PresetUsesExpression attribute (above) is **Yes**, type preset logic.
LimitHigh	LIMIT_HIGH	A structured text expression that specifies the preset time in milliseconds for a limit high alarm. If the LimitHighUsesExpression attribute (above) is **Yes**, type limit high logic.
LimitLow	LIMIT_LOW	A structured text expression that specifies the preset time in milliseconds for a limit low alarm. If the LimitLowUsesExpression attribute (above) is **Yes**, type limit low logic.
ActionList	ACTION_LIST	The actions in the step.

Step attributes

L5X Item	L5K Item	Identifies
ID	ID	The step identifier. This ID uniquely identifies this step from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The step tag. Type a tag of datatype SFC_STEP. The import process uses this tag name to name the step.
HideDesc	HideDescription	Whether or not to hide the step description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.
InitialStep	InitialStep	Whether this step is the initial step of the routine. Type **Yes** or **No**. If you have multiple steps identified as the initial step, which is incorrect syntax, the import process designates the last initial step it encounters as the initial step and removes the initial step indicators from any other steps.
PresetUsesExpr	PresetUsesExpression	Whether the preset for the step timer is a structured text expression. Type **Yes** if you plan to enter an expression in a preset element, otherwise, type **No**.
LimitHighUsesExpr	LimitHighUsesExpression	Whether the preset for the limit high alarm is a structured text expression. Type **Yes** if you plan to enter an expression in a limit high element, otherwise, type **No**.
LimitLowUsesExpr	LimitLowUsesExpression	Whether the preset for the limit low alarm is a structured text expression. Type **Yes** if you plan to enter an expression in a limit low element, otherwise, type **No**.
ShowActions	ShowActions	Whether to show or hide the step's actions. Type **Yes** or **No**.

Preset

The preset component contains a structured text expression that specifies the preset time in milliseconds for the step timer.

L5X preset structure

```
<Preset>
      <STContent>
            <Line Number="number">
                  <![CDATA[ structured_text; ]]>
            </Line>
      </STContent>
</Preset>
```

L5K PRESET structure

```
PRESET (LanguageType := ST)
      '<structured_text>
END_PRESET
```

Each line of L5K structured text begins with a single quote (').

Limit high

The limit high component contains a structured text expression that specifies the preset time in milliseconds for a limit high alarm.

L5X limit high structure

```
<LimitHigh>
      <STContent>
            <Line Number="0">
                   <![CDATA[ structured_text; ]]>
            </Line>
      </STContent>
</LimitHigh>
```

L5K LIMITHIGH structure

```
LIMITLOW (LanguageType := ST)
      '<structured_text>
END_LIMITLOW
```

Each line of L5K structured text begins with a single quote (').

Limit low

The limit low component contains a structured text expression that specifies the preset time in milliseconds for a limit low alarm.

L5X limit low structure

```
<LimitLow>
      <STContent>
            <Line Number="0">
                   <![CDATA[ structured_text; ]]>
            </Line>
      </STContent>
</LimitLow>
```

L5K LIMITHIGH structure

```
LIMITLOW (LanguageType := ST)
      '<structured_text>
END_LIMITLOW
```

Each line of L5K structured text begins with a single quote (').

Action list

Each step can contain multiple actions.

L5X Action Structure

```
<Action [Action_Attributes]>
      <Preset>
            logic
      </Preset>
      <Body>
            logic
      </Body>
</Action>
```

L5K ACTION structure

```
ACTION (Action_Attributes)
      <PRESET declaration>
      <BODY declaration>
END_ACTION
```

Action attributes

L5X Item	L5K Item	Identifies
ID	ID	The action identifier. This ID uniquely identifies this action from all other blocks. Enter an unsigned, 32-bit integer value.
Operand	Operand	The action tag. Enter a tag of datatype SFC_ACTION. The import process uses this tag name to name the action.
Qualifier	Qualifier	The action qualifier. **Qualifier** **Description** N non-stored R reset S stored L time limited D time delayed P pulse P1 pulse (rising edge) P0 pulse (falling edge) SL stored and time limited SD stored and time delayed DS time delayed and stored
IsBoolean	IsBoolean	Whether or not the action is boolean. Enter Yes or No.
PresetUsesExpr	PresetUsesExpression	Whether the preset for the action timer is a structured text expression. Enter Yes if you plan to enter an expression in a PRESET block, otherwise, enter No.
IndicatorTag	IndicatorTag	The indicator tag. Enter tag.

Transitions

These examples show transition structure.

L5X transition structure

```
<Transition [Transition_Attributes]>
       <Condition>
              logic
       </Condition>
</Transition>
```

L5K TRANSITION structure

```
TRANSITION (Transition_Attributes)
       <CONDITION declaration>
END_TRANSITION
```

Transition elements

L5X Item	L5K Item	Identifies
Condition	CONDITION	The condition to evaluate for the transition.

Transition attributes

L5X Item	L5K Item	Identifies
ID	ID	The step identifier. This ID uniquely identifies this step from all other blocks. Type an unsigned, 32-bit integer value.

L5X Item	L5K Item	Identifies
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The step tag. Type a tag of datatype SFC_STEP. The import process uses this tag name to name the step.
HideDesc	HideDescription	Whether or not to hide the step description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.
Force	Force	The transition is forced. Type **true** for forced true (set) or type **false** for forced false (cleared). If the transition is not forced, do not enter this attribute.

Condition

The condition component uses a structured text expression to specify a condition to evaluate for the transition.

L5X condition structure

```
<Condition>
      <STContent>
            <Line Number="0">
                  <![CDATA[ structured_text; ]]>
            </Line>
      </STContent>
</Condition>
```

L5K CONDITION structure

```
CONDITION (LanguageType := ST)
      ‘<structured_text>
END_CONDITION
```

Each line of L5K structured text begins with a single quote (‘).

Subroutine calls

Subroutine calls pass values into and out of the SFC routine.

L5X SbrRet structure
L5K SBR_RET structure

```
<SbrRet [Subroutine_Attributes]/>
SBR_RET (Subroutine_Attributes)
END_SBR_RET
```

Subroutine attributes

L5X Item	L5K Item	Identifies
ID	ID	The SBR_RET identifier. This ID uniquely identifies this subroutine call from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
In	In	List of values to receive from the calling routine. Type list of tags or literal values and separate each entry by a comma (,). Enter empty quotes if there are no values to receive.
Ret	Out	List of values to pass to the calling routine. Type list of tags or literal values and separate each entry by a comma (,). Enter empty quotes if there are no values to pass.

Stops

These examples show stop structure.

L5X stop structure

```
<Stop [StopAttributes]/>
```

L5K STOP structure

```
STOP (Stop_Attributes)
END_STOP
```

Stop attributes

L5X Item	L5K Item	Identifies
ID	ID	The stop identifier. This ID uniquely identifies this stop from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The stop tag. Type a tag of datatype SFC_STOP. The import process uses this tag name to name the stop.
HideDesc	HideDescription	Whether or not to hide the stop description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.

Branches

The branch blocks in an SFC routine identify simultaneous or selection branches in the routine.

L5X branch structure

```
<Branch [BranchAttributes]>
      <Leg [LegAttributes]/>
</Branch>
```

L5K BRANCH structure

```
BRANCH (Branch_Attributes)
      LEG (Leg_Attributes)
      END_LEG
END_BRANCH
```

Branch attributes

L5X Item	L5K Item	Identifies
ID	ID	The branch identifier. This ID uniquely identifies this branch from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
BranchType	BranchType	The type of branch. Type **Simultaneous** or **Selection**.
BranchFlow	BranchFlow	The direction of the branch. Type **Converge** or **Diverge**.
Priority	Priority	Whether the priority of a divergent selection branch is defined by the user. This attribute applies only to divergent selection branches. Type **Default** or **UserDefined**.

Leg attributes

L5X Item	L5K Item	Identifies
ID	ID	The leg identifier. This ID uniquely identifies this leg from all other blocks. Type an unsigned, 32-bit integer value.
Force	Force	Whether the leg is forced or not. You can force only a leg in a simultaneous branch. Omit this attribute, for no forces, or type **false** to force the leg false.

Directed links

The directed link blocks in an SFC routine identify the links between SFC components.

L5X DirectedLink structure

```
<DirectedLink  [DirectedLinkAttributes]/>
```

L5K DIRECTED_LINK structure

```
DIRECTED_LINK (Directed_Link_Attributes)
END_DIRECTED_LINK
```

Directed link attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The ID of the object. Type an unsigned, 32-bit integer value.
ToID	ToElementID	The ID of the object that the FromID object is attached to. Type an unsigned, 32-bit integer value.
Show	ShowLink	Whether or not to show the link. Type **TRUE** or **FALSE**.

Directed link guidelines

Use these guidelines for directed links:

- All directed link blocks must come after all step, transition, stop, and branch blocks.
- A directed link links only one element to one other element.

Text boxes

The text box blocks in an SFC routine hold descriptions about SFC components.

L5X TextBox structure

```
<TextBox [TextBoxAttributes]>
      <![CDATA[ text  ]] >
</TextBox>
```

L5K TEXTBOX structure

```
TEXT_BOX (Text_Box_Attributes,
      Text := <"text">)
END_TEXT_BOX
```

Text box attributes

L5X Item	L5K Item	Identifies
ID	ID	The element identifier; uniqueness is important for wiring. Type an unsigned, 32-bit integer value.
X	X	X-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinates on internal grid. Type an unsigned, 32-bit integer value.
Width	Width	This attribute is not currently used; it is there for future use. Type **0**.
Text	Text	The descriptive text.

Text box guidelines

Use these guidelines for text boxes:

- All text box blocks must come after all directed link blocks.
- Text boxes can be free-standing or they can be attached to SFC elements.

Attachments

The attachment blocks in an SFC routine identify the attachments from text boxes to other SFC elements.

L5X attachment structure

```
<Attachment [Attachment_Attributes]/>
```

L5K ATTACHMENT structure

```
ATTACHMENT (Attachment_Attributes)
END_ATTACHMENT
```

Attachment attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The ID of the attached object. Type an unsigned, 32-bit integer value.
ToID	ToElementID	The ID of the object that the FromID object is attached to. Type an unsigned, 32-bit integer value.

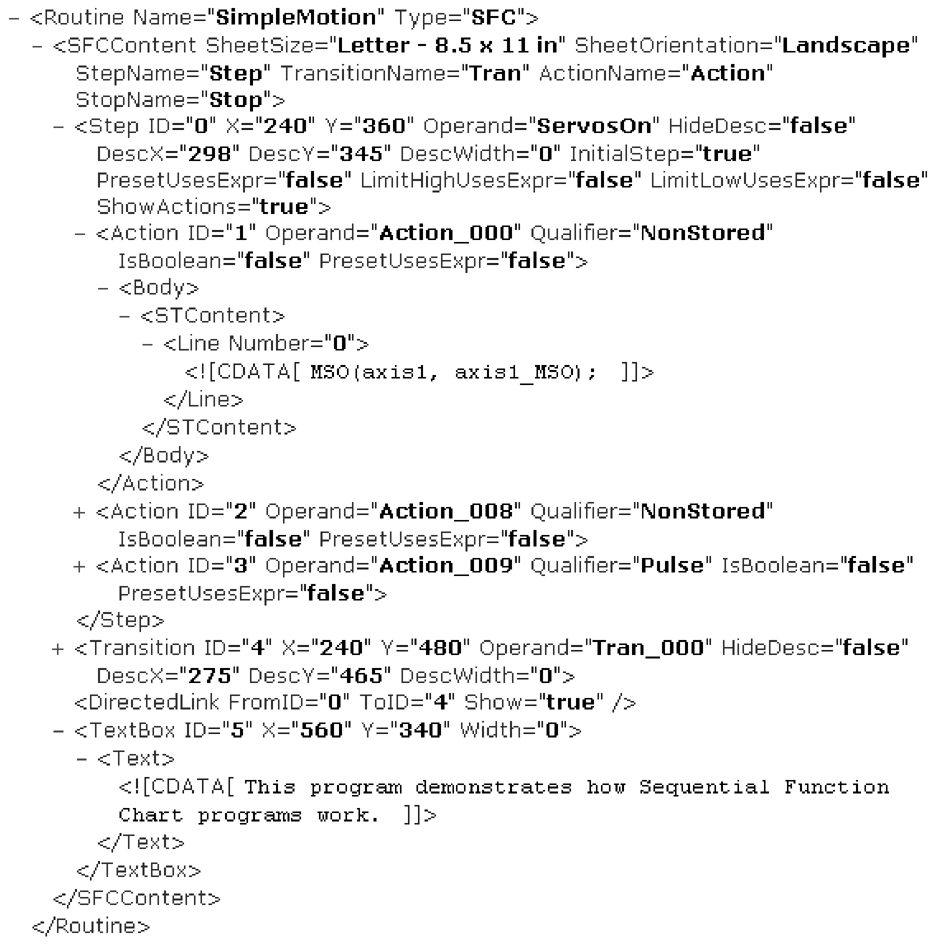
Attachment guidelines

Use these guidelines for attachments:

- Use an attachment to link a text box to an SFC element.
- All attachment blocks must come after all text box blocks.

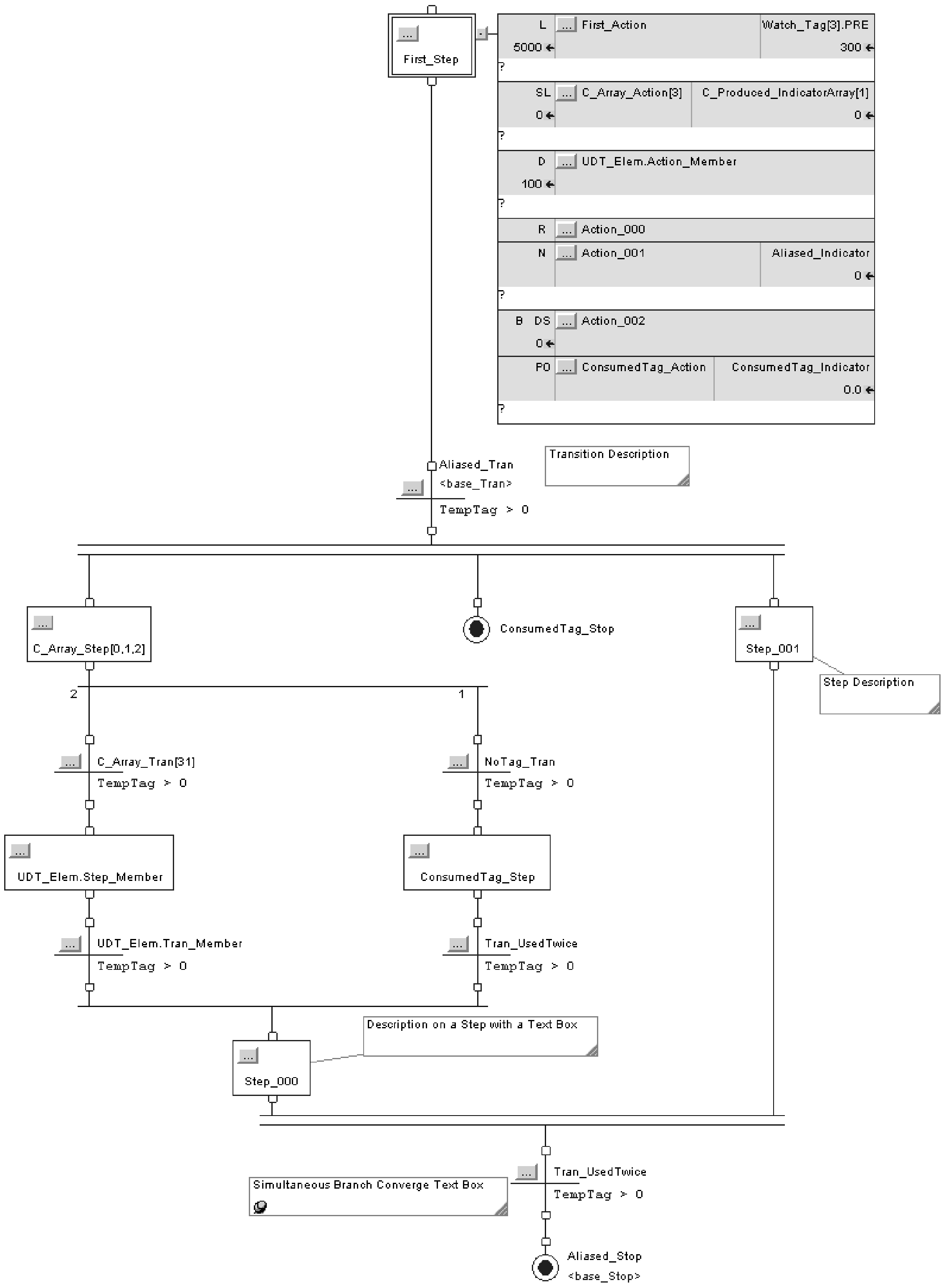
Examples

L5X sequential function chart example



```
- <Routine Name="SimpleMotion" Type="SFC">
  - <SFCContent SheetSize="Letter - 8.5 x 11 in" SheetOrientation="Landscape"
      StepName="Step" TransitionName="Tran" ActionName="Action"
      StopName="Stop">
    - <Step ID="0" X="240" Y="360" Operand="ServosOn" HideDesc="false"
        DescX="298" DescY="345" DescWidth="0" InitialStep="true"
        PresetUsesExpr="false" LimitHighUsesExpr="false" LimitLowUsesExpr="false"
        ShowActions="true">
      - <Action ID="1" Operand="Action_000" Qualifier="NonStored"
          IsBoolean="false" PresetUsesExpr="false">
        - <Body>
          - <STContent>
            - <Line Number="0">
                <![CDATA[ MSO(axis1, axis1_MSO);  ]]>
              </Line>
            </STContent>
          </Body>
        </Action>
      + <Action ID="2" Operand="Action_008" Qualifier="NonStored"
          IsBoolean="false" PresetUsesExpr="false">
      + <Action ID="3" Operand="Action_009" Qualifier="Pulse" IsBoolean="false"
          PresetUsesExpr="false">
      </Step>
    + <Transition ID="4" X="240" Y="480" Operand="Tran_000" HideDesc="false"
        DescX="275" DescY="465" DescWidth="0">
      <DirectedLink FromID="0" ToID="4" Show="true" />
    - <TextBox ID="5" X="560" Y="340" Width="0">
      - <Text>
          <![CDATA[ This program demonstrates how Sequential Function
          Chart programs work.  ]]>
        </Text>
      </TextBox>
    </SFCContent>
  </Routine>
```

L5K SFC_ROUTINE Example



```
SFC_ROUTINE Sample_SFC_Routine1 (SheetSize := "Letter
(8.5x11in)",
             SheetOrientation := Landscape, StepName :=
"Step",
             TransitionName := "Tran", ActionName := "Action",
             StopName := "Stop")
      TRANSITION  (ID := 0, X := 120, Y := 1000, Operand :=
C_Array_Tran[31],
             HideDescription := Yes, DescriptionX := 155,
DescriptionY := 985,
             DescriptionWidth := 0)
             CONDITION  (LanguageType := ST)
             'TempTag > 0
             END_CONDITION
      END_TRANSITION
      BRANCH  (ID := 2, Y := 820, BranchType := Simultaneous,
BranchFlow := Diverge)
             LEG  (ID := 3)
             END_LEG
             LEG  (ID := 4)
             END_LEG
             LEG  (ID := 5)
             END_LEG
      END_BRANCH
      TRANSITION  (ID := 6, X := 420, Y := 760, Operand :=
Aliased_Tran,
             HideDescription := No, DescriptionX := 520,
DescriptionY := 740,
             DescriptionWidth := 0)
             CONDITION  (LanguageType := ST)
             'TempTag > 0
             END_CONDITION
      END_TRANSITION
      STOP  (ID := 8, X := 460, Y := 880, Operand :=
ConsumedTag_Stop,
             HideDescription := Yes, DescriptionX := 565,
DescriptionY := 865,
             DescriptionWidth := 0)
      END_STOP
      TRANSITION  (ID := 10, X := 520, Y := 1360, Operand :=
Tran_UsedTwice,
             HideDescription := Yes, DescriptionX := 555,
DescriptionY := 1345,
             DescriptionWidth := 0)
             CONDITION  (LanguageType := ST)
             'TempTag > 0
             END_CONDITION
      END_TRANSITION
      TRANSITION  (ID := 12, X := 460, Y := 1160, Operand :=
Tran_UsedTwice,
             HideDescription := Yes, DescriptionX := 495,
DescriptionY := 1145,
             DescriptionWidth := 0)
             CONDITION  (LanguageType := ST)
```

```
                'TempTag > 0
                END_CONDITION
        END_TRANSITION

        BRANCH  (ID := 14, Y := 940, BranchType := Selection,
BranchFlow := Diverge,
                Priority := UserDefined)
                LEG  (ID := 15)
                END_LEG
                LEG  (ID := 16)
                END_LEG
        END_BRANCH
        BRANCH  (ID := 17, Y := 1320, BranchType :=
Simultaneous, BranchFlow := Converge)
                LEG  (ID := 18)
                END_LEG
                LEG  (ID := 19)
                END_LEG
        END_BRANCH
        STOP  (ID := 20, X := 520, Y := 1440, Operand :=
Aliased_Stop, HideDescription := No,
                DescriptionX := 400, DescriptionY := 1480,
DescriptionWidth := 0)
        END_STOP
        STEP  (ID := 22, X := 420, Y := 360, Operand :=
First_Step, HideDescription := Yes,
                DescriptionX := 478, DescriptionY := 345,
DescriptionWidth := 0,
                InitialStep := Yes, PresetUsesExpression := No,
LimitHighUsesExpression := No,
                LimitLowUsesExpression := No, ShowActions := Yes)
                ACTION  (ID := 24, Operand := First_Action,
Qualifier := L, IsBoolean := No,
                PresetUsesExpression := No, IndicatorTag :=
Watch_Tag[3].PRE)
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION
                ACTION  (ID := 25, Operand := C_Array_Action[3],
Qualifier := SL,
                IsBoolean := No, PresetUsesExpression := No,
                IndicatorTag := C_Produced_IndicatorArray[1])
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION
                ACTION  (ID := 26, Operand :=
UDT_Elem.Action_Member, Qualifier := D,
                IsBoolean := No, PresetUsesExpression := No,
IndicatorTag := "")
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION
                ACTION  (ID := 27, Operand := Action_000,
Qualifier := R, IsBoolean := No,
                PresetUsesExpression := No, IndicatorTag := "")
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION

                ACTION  (ID := 28, Operand := Action_001,
Qualifier := N, IsBoolean := No,
                PresetUsesExpression := No, IndicatorTag :=
Aliased_Indicator)
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION
                ACTION  (ID := 29, Operand := Action_002,
Qualifier := DS, IsBoolean := Yes,
                PresetUsesExpression := No, IndicatorTag := "")
                END_ACTION
                ACTION  (ID := 30, Operand := ConsumedTag_Action,
Qualifier := P0,
                IsBoolean := No, PresetUsesExpression := No,
                IndicatorTag := ConsumedTag_Indicator)
                BODY  (LanguageType := ST)
                '
                END_BODY
                END_ACTION
        END_STEP
        STEP  (ID := 31, X := 120, Y := 880, Operand :=
"C_Array_Step[0,1,2]",
                HideDescription := Yes, DescriptionX := 179,
DescriptionY := 865,
                DescriptionWidth := 0, InitialStep := No,
PresetUsesExpression := No,
                LimitHighUsesExpression := No,
LimitLowUsesExpression := No, ShowActions := Yes)
        END_STEP
        TRANSITION  (ID := 33, X := 460, Y := 1000, Operand :=
NoTag_Tran,
                HideDescription := Yes, DescriptionX := 495,
DescriptionY := 985,
                DescriptionWidth := 0)
                CONDITION  (LanguageType := ST)
                'TempTag > 0
                END_CONDITION
        END_TRANSITION
        STEP  (ID := 35, X := 120, Y := 1080, Operand :=
UDT_Elem.Step_Member,
             HideDescription := Yes, DescriptionX := 199,
DescriptionY := 1065,
             DescriptionWidth := 0, InitialStep := No,
PresetUsesExpression := No,
             LimitHighUsesExpression := No,
LimitLowUsesExpression := No, ShowActions := Yes)
      END_STEP
      STEP  (ID := 37, X := 720, Y := 880, Operand :=
Step_001, HideDescription := No,
             DescriptionX := 760, DescriptionY := 940,
DescriptionWidth := 0,
             InitialStep := No, PresetUsesExpression := No,
LimitHighUsesExpression := No,
             LimitLowUsesExpression := No, ShowActions := Yes)
      END_STEP
      BRANCH  (ID := 39, Y := 1220, BranchType := Selection,
BranchFlow := Converge)
             LEG  (ID := 40)
             END_LEG
             LEG  (ID := 41)
             END_LEG
      END_BRANCH

      STEP  (ID := 42, X := 280, Y := 1260, Operand :=
Step_000, HideDescription := No,
             DescriptionX := 360, DescriptionY := 1240,
DescriptionWidth := 0,
             InitialStep := No, PresetUsesExpression := No,
LimitHighUsesExpression := No,
             LimitLowUsesExpression := No, ShowActions := Yes)
      END_STEP
      STEP  (ID := 44, X := 460, Y := 1080, Operand :=
ConsumedTag_Step,
             HideDescription := Yes, DescriptionX := 514,
DescriptionY := 1065,
             DescriptionWidth := 0, InitialStep := No,
PresetUsesExpression := No,
             LimitHighUsesExpression := No,
LimitLowUsesExpression := No, ShowActions := Yes)
      END_STEP
      TRANSITION  (ID := 46, X := 120, Y := 1160, Operand :=
UDT_Elem.Tran_Member,
             HideDescription := Yes, DescriptionX := 155,
DescriptionY := 1145,
             DescriptionWidth := 0)
             CONDITION  (LanguageType := ST)
             'TempTag > 0
             END_CONDITION
      END_TRANSITION
      DIRECTED_LINK  (FromElementID := 46, ToElementID := 41,
ShowLink := True)
      END_DIRECTED_LINK
      DIRECTED_LINK  (FromElementID := 15, ToElementID := 33,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 35, TToElementID := 46,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 3, ToElementID := 37,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 5, ToElementID := 31,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 6, ToElementID := 2,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 22, ToElementID := 6,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 16, ToElementID := 0,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 44, ToElementID := 12,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 33, ToElementID := 44,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 17, ToElementID := 10,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 42, ToElementID := 19,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 37, ToElementID := 18,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 4, ToElementID := 8,
ShowLink := True)
       END_DIRECTED_LINK

       DIRECTED_LINK  (FromElementID := 39, ToElementID := 42,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 10, ToElementID := 20,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 0, ToElementID := 35,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 31, ToElementID := 14,
ShowLink := True)
       END_DIRECTED_LINK
       DIRECTED_LINK  (FromElementID := 12, ToElementID := 40,
ShowLink := True)
```

```
        END_DIRECTED_LINK
        TEXT_BOX  (ID := 48, X := 260, Y := 1380, Width := 0,
               Text := "Simultaneous Branch Converge Text Box")
        END_TEXT_BOX
        ATTACHMENT  (FromElementID := 48, ToElementID := 17)
        END_ATTACHMENT
END_SFC_ROUTINE
```

Define a structured text routine

Introduction

This chapter explains how to enter structured text logic in a complete import/export file.

Structured text routine

These examples show the structured text routine structure.

L5X structured text structure

```
<Routines>
      <Routine [Routine_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <STContent [StContent_Attributes]>
                  <Line Number="number">
                       <![CDATA[ structured_text ]]>
                  </Line>
            </STContent>
      </Routine>
</Routines>
```

L5K structured text ST_ROUTINE structure

```
ST_ROUTINE <routine_name> [(Description := "text")]
      '(*comment_text*)
      '<statements>;
END_ST_ROUTINE;
```

Structured Text routine elements

L5X Item	L5K Item	Description
N/A	*routine_name*	The name of the routine. In L5X, use a Name attribute on the <Routine> element.
Description	Description	User information about the routine.
STContent	*statements*	Structured text logic.
N/A	*comment_text*	Comment text within the structured text logic.
EncryptionInfo	ENCRYPTION_INFO	Details of the license-based Source Protection for the lockable object. Only exists for protected routines exported in plain text.
EncryptedContent	N/A	Source Protected and locked routine content. Only exists for locked routines exported in plain text.
EncryptedSegments	N/A	Locked logic for the routine. Only exists for locked routines exported in plain text.

ST_Routine attributes

Attribute	Description
Name	L5X only. Specify the name of the routine. In L5K, the name is an element of the statement.
Type	L5X only. Specify ST. In L5K, the type of routine is part of the routine statement.
OnlineEditType	L5X only. Specify the online edit logic type. The options include **Original**, **PendingEdits**, or **TestEdits**. This attribute is not specified if there are no edits. In L5X, this attribute is on the <STContent> element.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.
TrackingGroups	The group of tracked objects to which this item belongs. Components can be marked for tracking to determine whether they have been changed. Version 30 of the Logix Designer application supports only one tracking group.

Structured text logic

Enter the structured text logic within a routine component in an import/export file. Each line of structured text must begin with a single quote (‘).

Structured text is not case sensitive. Structured text can contain these elements.

Term	Definition		Examples
Assignment	Use an assignment statement to assign values to tags. The := operator is the assignment operator. Terminate the assignment with a semi colon ";".		`tag := expression;`
Expression	An expression is part of a complete assignment or construct statement. An expression evaluates to a number (numerical expression) or to a true or false state (BOOL expression). An expression contains these elements.		
	Tags	A named area of the memory where data is stored (BOOL, SINT, INT, DINT, REAL, string).	`value1`
	Immediates	A constant value.	`4`

	Operators	A symbol or mnemonic that specifies an operation within an expression.	`tag1 + tag2`
			`tag1 >= value1`

	Functions	When executed, a function yields one value. Use parentheses to contain the operand of a function. Functions can be used only in expressions.	`function(tag1)`

Term	Definition	Examples

Instruction	An instruction is a standalone statement.
	An instruction uses parenthesis to contain its operands.
	Depending on the instruction, there can be zero, one, or multiple operands.
	When executed, an instruction yields one or more values that are part of a data structure.
	Terminate the instruction with a semi colon ";".
	
	Instructions cannot be used in expressions.
		`instruction();`
		
		`instruction(operand);`
		
		`instruction(operand1, operand2,operand3);`

Construct	A conditional statement used to trigger structured text code.
	Terminate the construct with a semi colon ";".
		`IF...THEN`
		`CASE`
		`FOR...DO`
		`WHILE...DO`
		`REPEAT...UNTIL`
		`EXIT`

Comment	Text that explains or clarifies what a section of structured text does.
	• Use comments to make it easier to interpret the structured text.
	• Comments do not affect the execution of the structured text.
	• Comments can appear anywhere in structured text.
		`//comment`
		
		`(*start of comment . . . end of comment*)`
		
		`/*start of comment . . . end of comment*/`

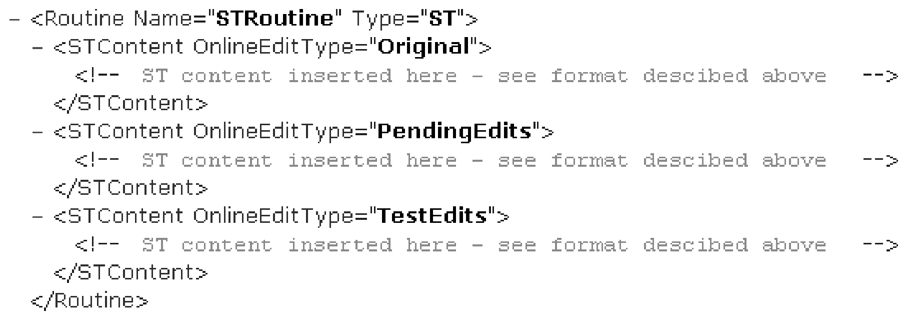
Export structured text logic while editing online

If you export structured text logic that contains online edits, the export file exports LOGIC blocks (in L5K format) or additional <STContent> elements (in L5X format) to indicate the original test edits and pending edits states. If there are no online edits, you will not see these LOGIC blocks or additional <STContent> elements.

Item	Identifies
Online_Edit_Type	When you export the logic: • If online edits exist, there is a LOGIC block for Online_Edit_Type := Orig and the appropriate LOGIC block for the existing edits. Online_Edit_Type : = Pend indicates pending edits. Online_Edit_Type := Test indicates test edits. • If there are no online edits when you export the logic, there are no LOGIC blocks and the main components in the routine are structured text statements.

Examples

L5X example: test edits and pending edits exist



```
- <Routine Name="STRoutine" Type="ST">
  - <STContent OnlineEditType="Original">
      <!--  ST content inserted here - see format descibed above   -->
    </STContent>
  - <STContent OnlineEditType="PendingEdits">
      <!--  ST content inserted here - see format descibed above   -->
    </STContent>
  - <STContent OnlineEditType="TestEdits">
      <!--  ST content inserted here - see format descibed above   -->
    </STContent>
  </Routine>
```

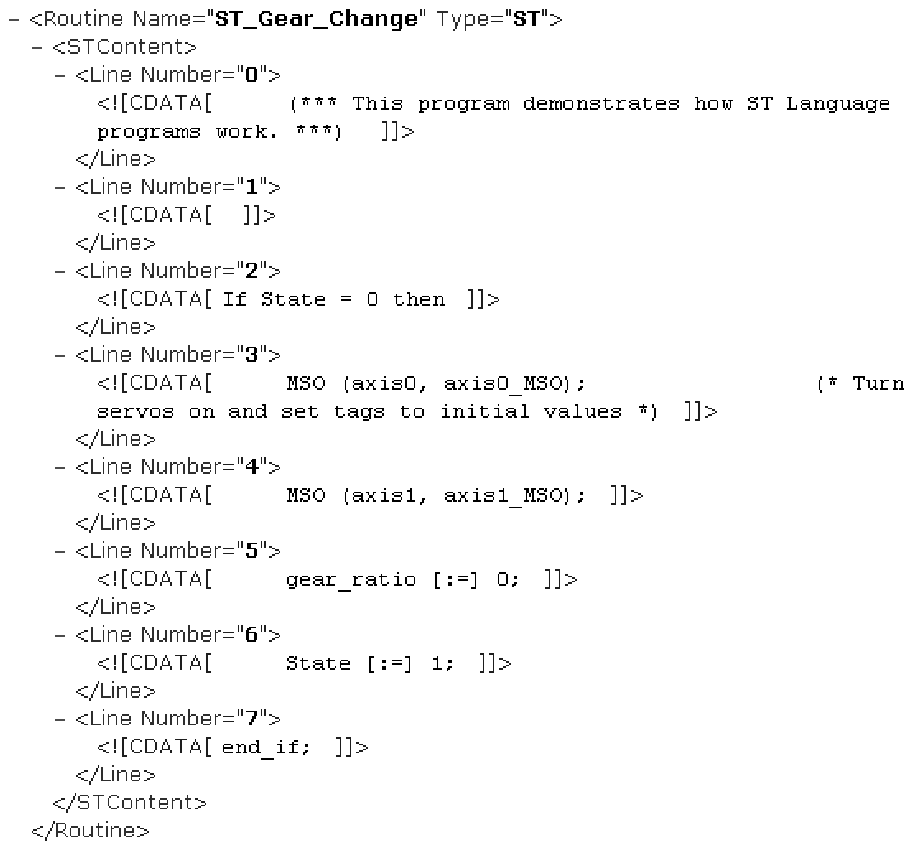
L5K Example 1: Test edits and pending edits exist

```
ST_ROUTINE MySTRoutine
        LOGIC (Online_Edit_Type := Orig)
                (* structured text logic here *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Test)
                (* structured text logic here *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Pend)
                (* structured text logix here *)
        END_LOGIC
END_ST_ROUTINE
```

L5K Example 2: Only pending edits exist

```
ST_ROUTINE MySTRoutine
        LOGIC (Online_Edit_Type := Orig)
                (* structured text logic here *)
        END_LOGIC

        LOGIC (Online_Edit_Type := Pend)
                (* structured text logic here *)
        END_LOGIC
END_ST_ROUTINE
```

L5X structured text routine example



```
- <Routine Name="ST_Gear_Change" Type="ST">
  - <STContent>
    - <Line Number="0">
        <![CDATA[      (*** This program demonstrates how ST Language
        programs work. ***)   ]]>
      </Line>
    - <Line Number="1">
        <![CDATA[   ]]>
      </Line>
    - <Line Number="2">
        <![CDATA[ If State = 0 then  ]]>
      </Line>
    - <Line Number="3">
        <![CDATA[      MSO (axis0, axis0_MSO);                  (* Turn
        servos on and set tags to initial values *)  ]]>
      </Line>
    - <Line Number="4">
        <![CDATA[      MSO (axis1, axis1_MSO);  ]]>
      </Line>
    - <Line Number="5">
        <![CDATA[      gear_ratio [:=] 0;  ]]>
      </Line>
    - <Line Number="6">
        <![CDATA[      State [:=] 1;  ]]>
      </Line>
    - <Line Number="7">
        <![CDATA[ end_if;  ]]>
      </Line>
    </STContent>
  </Routine>
```

L5K structured text ST_ROUTINE example

This is an example of an exported structured text routine.

```
ST_ROUTINE <routine_name>
(*----------- Sample of ST code-----------------------------*)
             ‘IF (myInteger = 12) THEN
             ‘      myInteger := ((5 * myInputInteger1) + (7 *
myInteger2)) - 71;
             ‘            WHILE (myTmpVar >= 0) DO
             ‘                   myInteger := myInteger + 3;
             ‘                   myTmpVar := myTmpVar - 1;
             ‘            END_WHILE;
             ‘END_IF;
ND_ST_ROUTINE
```

Structured text

These tables list each structured text instruction and function. For more details, see these reference manuals.

Instruction Type	Resource
Basic, sequential instruction	Logix5000 Controllers General Instructions Set Reference Manual, publication 1756-RM003.
Process control or drives instruction	Logix5000 Controllers Advanced Process Control and Drives Instruction Set Reference Manual, publication1756-RM006.
Motion instruction	Logix5000 Controllers Motion Instructions Reference Manual, publication MOTION-RM002.

Structured Text Instructions

Instruction	Neutral Text Format
ABL	`ABL(Channel,SerialPortControl);`
ABS	`dest := ABS(source);`
ACB	`ACB(Channel,SerialPortControl);`
ACL	`ACL(Channel,ClearSerialPortRead,ClearSerialPortWrite);`
ACOS	`dest := ACOS(source);`
ADD	`dest := sourceA + sourceB;`
AHL	`AHL(Channel,ANDMask,ORMask,SerialPortControl);`
ALM	`ALM(ALM_tag);`
ALMA	`ALMA (ALMA_tag,In,ProgAckAll,ProgramDisable,ProgEnable);`
ALMD	`ALMD (ALMD_tag,In,ProgAck,ProgReset,ProgDisable,ProgEnable);`

AND	`dest := sourceA & sourceB;`
	`dest := sourceA AND sourceB;`

ARD	`ARD(Channel,Destination,SerialPortControl);`
ARL	`ARL(Channel,Destination,SerialPortControl);`
ASIN	`dest := ASIN(source);`
ATAN	`dest := ATAN(source);`
AWA	`AWA(Channel,Source,SerialPortControl);`
AWT	`AWT(Channel,Source,SerialPortControl);`

BAND	`IF operandA AND operandB THEN`
	`       <statement>;`
	`ENDIF;`

BNOT	`IF NOT operand THEN`
	`       <statements>;`
	`ENDIF;`

BOR	`IF operandA OR operandB THEN`
	`       <statements>;`
	`ENDIF;`

BTDT	`BTD(BTDT_tag);`

Instruction	**Neutral Text Format**
BXOR	IF *operandA* XOR *operandB* THEN
	<statements>;
	ENDIF;
CASE...OF	CASE *numeric_expression* OF
	selector1: statement;
	selectorN: statement;
	ELSE
	statement;
	END_CASE;
CLR	*dest* := 0;
CONCAT	CONCAT(*SourceA,SourceB,Dest*)
COP	COP(*Source,Dest,Length*);
COS	*dest* := COS(*source*);
CPS	CPS(*Source,Dest,Length*)
CTUD	CTUD(*CTUD_tag*);
D2SD	D2SD(*D2SD_tag*);
D3SD	D3SD(*D3SD_tag*);
DEDT	DEDT(*DEDT_tag,storage*);
DEG	*dest* := DEG(*source*);
DELETE	DELETE(*Source,Qty,Start,Dest*);
DERV	DERV(*DERV_tag*);
DFF	DFF(*DFF_tag*);
DIV	dest := *sourceA / sourceB*;
DTOS	DTOS(*Source,Dest*);
EOT	EOT(*DataBit*);
EQU	IF *sourceA* = source*B* THEN
	<statements>;
	ENDIF;
ESEL	ESEL(*ESEL_tag*);
EVENT	EVENT(*task*);
FGEN	FGEN(*FGEN_tag,X1,Y1,X2,Y2*);
FIND	FIND(*Source,Search,Start,Result*)
FOR...DO	FOR *count*:= *initial_value* TO *final_value* BY *increment* DO
	<statement>;
	END_FOR;

Instruction	Neutral Text Format

GEQ	`IF sourceA >= sourceB THEN`
	 `<statements>;`
	 `ENDIF;`

GRT	`IF sourceA > sourceB THEN`
	 `<statements>;`
	 `ENDIF;`

GSV	`GSV(ClassName,InstanceName,AttributeName,Dest);`
HLL	`HLL(HLL_tag);`
HPF	`HPF(HPF_tag);`

IF...THEN	IF *bool_expression* THEN
	 <statement>;
	 `END_IF;`

INSERT	`INSERT(SourceA,SourceB,Start,Dest);`
INTG	`INTG(INTG_tag);`
IOT	`IOT(output_tag);`
JKFF	`JKFF(JKFF_tag);`
JSR	`JSR(RoutineName,InputCount,InputPar,ReturnPar);`
LDL2	`LDL2(LDL2_tag);`
LDLG	`LDLG(LDLG_tag);`

LEQ	`IF sourceA <= sourceB THEN`
	 `<statements>;`
	 `ENDIF;`

LES	`IF sourceA < sourceB THEN`
	 `<statements>;`
	 `ENDIF;`

LN	`dest := LN(source);`
LOG	`dest := LOG(source);`
LOWER	`LOWER(Source,Dest);`
LPF	`LPF(LPF_tag);`
MAAT	`MAAT(Axis,MotionControl);`
MAFR	`MAFR(Axis,MotionControl);`

MAG	`MAG(SlaveAxis,MasterAxis,MotionControl,Direction,Ratio,SlaveCounts,`
	 `MasterCounts,MasterReference,RatioFormat,Clutch,AccelRate,AccelUnits);`

MAH	`MAH(Axis,MotionControl);`
MAHD	`MAHD(Axis,MotionControl,DiagnosticTest,ObservedDirection);`

MAJ	`MAJ(Axis,MotionControl,Direction,Speed,SpeedUnits,AccelRate,AccelUnits,`
	 `DecelRate,DecelUnits,Profile,Merge,MergeSpeed);`

MAM	`MAM(Axis,MotionControl,MoveType,Position,Speed,SpeedUnits,AccelRate,`
	 `AccelUnits,DecelRate,DecelUnits,Profile,Merge,MergeSpeed);`

Instruction	**Neutral Text Format**
MAOC	MAOC(*Axis,ExecutionTarget,MotionControl,Output,Input,OutputCam, CamStartPosition,CamEndPosition,OutputCompensation,ExecutionMode, ExecutionSchedule,AxisArmPosition,CamArmPosition,Reference*);
MAPC	MAPC(*SlaveAxis,MasterAxis*,*MotionControl*,*Direction*,*CamProfile*, *SlaveScaling*,*MasterScaling*,*ExecutionMode*,*ExecutionSchedule*, *MasterLockPosition*,*CamLockPosition*,*MasterReference*,*MasterDirection*);
MAR	MAR(*Axis,MotionControl,TriggerCondition,WindowedRegistration, MinimumPosition,MaximumPosition*);
MAS	MAS(*Axis,MotionControl,StopType,ChangeDecel,DecelRate,DecelUnits*);
MASD	MASD(*Axis,MotionControl*);
MASR	MASR(*Axis,MotionControl*);
MATC	MATC(*Axis*,*MotionControl*,*Direction*,*CamProfile*,*DistanceScaling*, *TimeScaling*,*ExecutionMode*,*ExecutionSchedule*);
MAVE	MAVE(*MAVE_tag,storage,weight*);
MAW	MAW(*Axis,MotionControl,TriggerCondition,Position*);
MAXC	MAXC(*MAXC_tag*);
MCCD	MCCD(*Coordinate_system,MotionControl,MotionType,ChangeSpeed,Speed, SpeedUnits,ChangeAccel,AccelRate,AccelUnits,ChangeDecel,DecelRate, DecelUnits,Scope*);
MCCM	MCCM(*CoordinateSystem,MotionControl,MoveType,Position,CircleType, Via/Center/Radius,Direction,Speed,SpeedUnits,AccelRate,AccelUnits, DecelRate,DecelUnits,Profile,TerminationType,Merge,MergeSpeed*);
MCCP	MCCP(*MotionControl*,*Cam*,*Length*,*StartSlope*,*EndSlope*,*CamProfile*);
MCD	MCD(Ax*is,MotionControl,MotionType,ChangeSpeed,Speed,ChangeAccel, AccelRate,ChangeDecel,DecelRate,SpeedUnits,AccelUnits,DecelUnits*);
MCLM	MCLM(*CoordinateSystem,MotionControl,MoveType,Position,Speed,SpeedUnits, AccelRate,AccelUnits,DecelRate,DecelUnits,Profile,TerminationType,Merge, MergeSpeed*);
MCS	MCS(*CoordinateSystem*,*MotionControl*,*StopType*,*ChangeDecel*,*DecelRate*, *DecelUnits*);
MCSD	MCSD(*CoordinateSystem,MotionControl*);
MCSR	MCSR(*CoordinateSystem,MotionControl*);
MCSV	MCSV(*MotionControl,CamProfile,MasterValue,SlaveValue,SlopeValue, SlopeDerivative*);
MCT	MCT(*SourceSystem,TargetSystem,MotionControl,Orientation,Translation*);
MCTP	MCTP(*SourceSystem,TargetSystem,MotionControl,Orientation,Translation, TransformDirection*,*ReferencePosition*,*TransformPosition*);
MDF	MDF(*Axis,MotionControl*);
MDO	MDO(*Axis,MotionControl,DriveOutput,DriveUnits*);
MDOC	MDOC(*Axis,ExecutionTarget,MotionControl,DisarmType*);
MDR	MDR(*Axis,MotionControl*);
MDW	MDW(*Axis,MotionControl*);

Instruction	Neutral Text Format

MEQ	IF (Source AND Mask) = (Compare AND Mask) THEN
	<*statements*>;
	END_IF;

MGS	MGS(*Group*,*MotionControl*,*StopMode*);
MGSD	MGSD(*Group*,*MotionControl*);
MGSP	MGSP(*Group*,*MotionControl*);
MGSR	MGSR(*Group*,*MotionControl*);
MID	MID(*Source*,*Qty*,*Start*,*Dest*);
MINC	MINC(*MINC_tag*);
MOD	*dest* := *sourceA* MOD *sourceB*;
MRAT	MRAT(*Axis*,*MotionControl*);
MRHD	MRHD(*Axis*,*MotionControl*,*DiagnosticTest*);
MRP	MRP(A*xis*,*MotionControl*,*Type*,*PositionSelect*,*Position*);
MSF	MSF(*Axis*,*MotionControl*);
MSG	MSG(*MessageControl*);
MSO	MSO(*Axis*,*MotionControl*);
MUL	*dest* := *sourceA* * *sourceB*;
MVMT	MVMT(*MVMT_tag*);
NEG	*dest* := *-source*;

NEQ	IF *sourceA* <> *sourceB* THEN
	      <*statements*>;
	END_IF;

NOT	IF NOT *source* THEN
	      <*statements*>;
	END_IF;

OR	*dest* := *sourceA* OR *sourceB*
OSFI	OSFI(*OSFI_tag*);
OSRI	OSRI(*OSRI_tag*);
OTE	*data_bit* [:=] *BOOL_expression*;

OTL	IF *BOOL_expression* THEN
	      data_bit := 1;
	END_IF;

OTU	IF *BOOL_expression* THEN
	      data_bit := 0;
	END_IF;

PATT	PATT(P*haseName*,*Result*);
PCLF	PCLF(*PhaseName*);
PCMD	PCMD(*PhaseName*,*Command*,*Result*);
PDET	PDET(*PhaseName*);

Instruction	Neutral Text Format
PFL	PFL(Source);
PI	PI(PI_tag);
PID	PID(PID,ProcessVariable,Tieback,ControlVariable,PIDMasterLoop,InholdBit, InholdValue);
PIDE	PIDE(PIDE_tag);
PMUL	PMUL(PMUL_tag);
POSP	POSP(POSP_tag);
POVR	POVR(PhaseName,Command,Result);
PPD	PPD();
PRNP	PRNP();
PSC	PSC();
PXRQ	PXRQ(PhaseInstruction,ExternalRequest,DataValue);
RAD	dest := RAD(source);

REPEAT...UNTIL	REPEAT
	        <statement>;
	UNTIL bool_expression
	END_REPEAT;

RESD	RESD(RESD_tag);
RET	RET(ReturnPar);
RLIM	RLIM(RLIM_tag);
RMPS	RMPS(RMPS_tag,RampValue,SoakValue,SoakTime);
RTOR	RTOR(RTOR_tag);
RTOS	RTOS(Source,Dest)
SBR	SBR(InputPar);
SCRV	SCRV(SCRV_tag);
SETD	SETD(SETD_tag);
SFP	SFP(SFCRoutineName,TargetState);
SFR	SFR(SFCRoutineName,StepName);
SIN	dest := SIN(source);
SIZE	SIZE(Souce,Dimensiontovary,Size);
SNEG	SNEG(SNEG_tag);
SOC	SOC(SOC_tag);
SQRT	dest := SQRT(source);
SRT	SRT(Array,Dimtovary,Control);
SRTP	SRTP(SRTP_tag);
SSUM	SSUM(SSUM_tag);
SSV	SSV(ClassName,InstanceName,AttributeName,Source);

Instruction	Neutral Text Format
STOD	`STOD(`*`Source,Dest`*`)`
STOR	`STOR(`*`Source,Dest`*`)`
SUB	*`dest`* `:=` *`sourceA - sourceB`*`;`
SWPB	`SWPB(`*`Source,OrderMode,Dest`*`);`
TAN	*`dest`* `:= TAN(`*`source`*`);`
TOFR	`TOFR(`*`TOFR_tag`*`);`
TONR	`TONR(`*`TONR_tag`*`);`
TOT	`TOT(`*`TOT_tag`*`);`
TRUNC	*`dest`* `:= TRUNC(`*`source`*`);`
UID	`UID();`
UIE	`UIE();`
UPDN	`UPDN(`*`UPDN_tag`*`);`
UPPER	`UPPER(`*`Source,Destination);`*

WHILE...DO	`WHILE` *`bool_expression`* `DO`
	`<statement>;`
	`END_WHILE;`

XIC	`IF` *`data_bit`* `THEN`
	`<`*`statement`*`>;`
	`END_IF;`

XIO	`IF NOT` *`data_bit`* `THEN`
	`<`*`statement`*`>;`
	`END_IF;`

XOR	*`dest`* `:=` *`sourceA`* `XOR` *`sourceB`*`;`
XPY	*`dest`* `:=` *`sourceX`* `XPY` *`sourceY`*`;`

Define an Equipment Sequence routine

Introduction

This chapter explains how to define an Equipment Sequence routine in a complete import/export file.

Equipment Sequence Routine

The following examples show Equipment Sequence structure.

L5X Equipment Sequence structure

```
<Routines>
      <Routine [Routine_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <SEQContent [SEQContent_Attributes]>
                  <Step [Step_Attributes]/>
                  <Transition [Transition_Attributes]/>
                  <Branch [Branch_Attributes]/>
                  <Stop [Stop_Attributes]/>
                  <DirectedLink
[DirectedLink_Attributes]/>
                  <TextBox [TextBox_Attributes]>
                        text
                  </TextBox>
                  <Attachment [Attachment_Attributes]/>
                  <TagConfigurations>
                        [TagConfiguration]
```

```
                </TagConfigurations/>
            </SEQContent>
        </Routine>
    </Routines>
```

L5K Equipment Sequence ESQ_ROUTINE structure

```
ESQ_ROUTINE <routine_name> [(Routine_Attributes,
            SFC_Attributes)]
      <STEP declaration>
      <TRANSITION declaration>
      <BRANCH declaration>
      <STOP declaration>
      <DIRECTED_LINK declaration>
      <TEXT_BOX declaration)
      <ATTACHMENT declaration>
      <TAG_CONFIGURATION declaration>
END_ESQ_ROUTINE
```

Equipment Sequence elements

L5X Item	L5K Item	Identifies
N/A	routine_name	The name of the routine. In L5X, use a Name attribute on the <Routine> element.
Description	Description	User information about the routine.
SEQContent	N/A	Equipment sequence logic.

ESQ_Routine attributes

Attribute	Description
Name	L5X only. Specify the name of the routine. For L5K, the name is an element of the statement.
Type	L5X only. Specify "Sequence". In L5K, the type of routine is part of the routine statement.

Attribute	Description
SheetSize	The size of the Equipment Sequence. Select one of these options. • Letter (8.5x11in) • Legal (8.5x14in) • Tabloid (11x17in) • A4 (210x297mm) • A3 (297x420mm) In L5X, this attribute is on the <SEQContent> element.
SheetOrientation	The orientation of the Equipment Sequence sheet. Select **Portrait** or **Landscape**. In L5X, this attribute is on the <SEQContent> element.
PermissionSet	Name of the set of permissions, configured in FactoryTalk Security, to apply to this object.

Steps

These examples show the step structure.

L5X step structure

```
<Step [Step_Attributes] />
```

L5K STEP structure

```
STEP (Step_Attributes)

END_STEP
```

Step attributes

L5X Item	L5K Item	Identifies
ID	ID	The step identifier. This ID uniquely identifies this step from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The step tag. Type a tag of datatype ESQ_STEP. The import process uses this tag name to name the step.
HideDesc	HideDescription	Whether or not to hide the step description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.

L5X Item	L5K Item	Identifies
InitialStep	InitialStep	Whether this step is the initial step of the routine. Type **Yes** or **No**. If you have multiple steps identified as the initial step, which is incorrect syntax, the import process designates the last initial step it encounters as the initial step and removes the initial step indicators from any other steps.
NoPhaseStep	NoPhaseStep	Whether this step is a place holder step, a step which is configured not to start any equipment phase. PhaseName attributes are ignored if NoPhaseStep is set to **Yes** in L5K, **true** in L5X. L5K: **Yes**/**No**, L5X: **true**/**false**.
PhaseName	PhaseName	The name of the Phase associated with the step. Can be an empty string.
TransferOfControlSource	TransferOfControlSource	Specifies whether this step will transfer control of its equipment phase to an immediately following step without stopping and resetting the phase. L5K: **Yes**/**No**, L5X: **true**/**false**.
TransferOfControlTarget	TransferOfControlTarget	Specifies whether this step will accept the transfer control of its equipment phase from an immediately preceding step without starting the phase. The phase logic is expected to be executing a state routine. The executing routine is notified of the transfer of control and can request new input parameters, if programmed to do so, from the target step. L5K: **Yes**/**No**, L5X: **true**/**false**.

Transitions

These examples show transition structure.

L5X transition structure

```
<Transition [Transition_Attributes]>
       <Condition>
              logic
       </Condition>
</Transition>
```

L5K TRANSITION structure

```
TRANSITION (Transition_Attributes)
       <CONDITION declaration>
END_TRANSITION
```

Transition elements

L5X Item	L5K Item	Identifies
Condition	CONDITION	The condition to evaluate for the transition.

Transition attributes

L5X Item	L5K Item	Identifies
ID	ID	The step identifier. This ID uniquely identifies this step from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The step tag. Type a tag of datatype SFC_STEP. The import process uses this tag name to name the step.
HideDesc	HideDescription	Whether or not to hide the step description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.
Force	Force	The transition is forced. Type **true** for forced true (set) or type **false** for forced false (cleared). If the transition is not forced, do not enter this attribute.

Stops

These examples show stop structure.

L5X stop structure

```
<Stop [StopAttributes]/>
```

L5K STOP structure

```
STOP (Stop_Attributes)
END_STOP
```

Stop attributes

L5X Item	L5K Item	Identifies
ID	ID	The stop identifier. This ID uniquely identifies this stop from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Operand	Operand	The stop tag. Type a tag of datatype SFC_STOP. The import process uses this tag name to name the stop.
HideDesc	HideDescription	Whether or not to hide the stop description. Type **Yes** or **No**.
DescX	DescriptionX	X-coordinate on internal grid of the description box. Type an unsigned, 32-bit integer value.
DescY	DescriptionY	Y-coordinate on internal grid of the description box. Type unsigned, 32-bit integer value.
DescWidth	DescriptionWidth	This attribute is not currently used; it is there for future use. Type **0**.

Branches

The branch blocks in an Equipment Sequence routine identify simultaneous or selection branches in the routine.

L5X branch structure

```
<Branch [BranchAttributes]>
      <Leg [LegAttributes]/>
</Branch>
```

L5K BRANCH structure

```
BRANCH (Branch_Attributes)
      LEG (Leg_Attributes)
      END_LEG
END_BRANCH
```

Branch attributes

L5X Item	L5K Item	Identifies
ID	ID	The branch identifier. This ID uniquely identifies this branch from all other blocks. Type an unsigned, 32-bit integer value.
X	X	X-coordinate on internal grid. Type an unsigned, 32-bit integer value.
Y	Y	Y-coordinate on internal grid. Type an unsigned, 32-bit integer value.
BranchType	BranchType	The type of branch. Type **Simultaneous** or **Selection**.
BranchFlow	BranchFlow	The direction of the branch. Type **Converge** or **Diverge**.
Priority	Priority	Whether the priority of a divergent selection branch is defined by the user. This attribute applies only to divergent selection branches. Type **Default** or **UserDefined**.

Leg attributes

L5X Item	L5K Item	Identifies
ID	ID	The leg identifier. This ID uniquely identifies this leg from all other blocks. Type an unsigned, 32-bit integer value.
Force	Force	Whether the leg is forced or not. You can force only a leg in a simultaneous branch. Omit this attribute, for no forces, or type **false** to force the leg false.

Directed links

The directed link blocks in an Equipment Sequence routine identify the links between Equipment Sequence components.

L5X DirectedLink structure

```
<DirectedLink  [DirectedLinkAttributes]/>
```

L5K DIRECTED_LINK structure

```
DIRECTED_LINK (Directed_Link_Attributes)
END_DIRECTED_LINK
```

Directed link attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The ID of the object. Type an unsigned, 32-bit integer value.

L5X Item	L5K Item	Identifies
ToID	ToElementID	The ID of the object that the FromID object is attached to. Type an unsigned, 32-bit integer value.
Show	ShowLink	Whether or not to show the link. Type **TRUE** or **FALSE**.

Directed link guidelines

Use these guidelines for directed links:

- All directed link blocks must come after all step, transition, stop, and branch blocks.
- A directed link links only one element to one other element.

Attachments

The attachment blocks in an Equipment Sequence routine identify the attachments from text boxes to other Equipment Sequence elements.

L5X attachment structure

```
<Attachment [Attachment_Attributes]/>
```

L5K ATTACHMENT structure

```
ATTACHMENT (Attachment_Attributes)
END_ATTACHMENT
```

Attachment attributes

L5X Item	L5K Item	Identifies
FromID	FromElementID	The ID of the attached object. Type an unsigned, 32-bit integer value.
ToID	ToElementID	The ID of the object that the FromID object is attached to. Type an unsigned, 32-bit integer value.

Attachment guidelines

Use these guidelines for attachments:

- Use an attachment to link a text box to an Equipment Sequence element.
- All attachment blocks must come after all text box blocks.

Tag configuration

The following examples show the tag configuration structure.

L5X tag configuration structure

```
<TagConfigurations>

<TagConfiguration [Tag_Configuration_Attributes]>

      <Expression>

logic

      </Expression>

</TagConfiguration>

</TagConfigurations>
```

L5K TAG_CONFIGURATION structure

```
TAG_CONFIGURATION (Step_Attributes)

      <EXPRESSION declaration>

END_TAG_CONFIGURATION
```

Tag configuration elements

L5X Item	L5K Item	Description
Expression	EXPRESSION	The expression to evaluate for the tag.

Expression component

The expression component uses a structured text expression to specify an expression to evaluate for the sequence tag.

L5X expression structure

```
<Expression>

      <STContent>

            <Line Number="0">

                   <![CDATA[ structured_text; ]]>

            </Line>

      </STContent>

</Expression>
```

L5K EXPRESSION structure

```
EXPRESSION (LanguageType := ST)

      ‘<structured_text>

END_EXPRESSION
```

Tip: Each line of L5K structured text begins with a single quote (‘).

Define a task component

Introduction

This chapter explains the overall structure of the task component.

Task component

A task component defines a task in the controller project. The maximum number of tasks depends on the type of controller.

Controller	Maximum Number of Tasks
ControlLogix	32
SoftLogix5800	32
FlexLogix	8
CompactLogix • 1768-L30x • 1769-L33x • 1769-L36x	 32 32 23
DriveLogix	8

L5K TASK structure

```
TASK <task_name> [(Description := "text", Attributes)]
      <program_name>;
END_TASK
```

L5X task structure

```
<Tasks>
      <Task [Task_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <EventInfo [EventInfo_Attributes]>
            <ScheduledPrograms>
            <     ScheduledProgram Name="program_name" />
            </Programs>
      </Task>
</Tasks>
```

Task elements

L5X Item	L5K Item	Description
N/A	*task_name*	The name of the task. In L5X, use a Name attribute on the <Task> element.
Description	Description	User information about the task.
EventInfo	N/A	Event information for an event task
ScheduledProgram	*program_name*	Each program within the task.

Task attributes

Attribute	Description
Name	L5X only. Specify the name of the task. In L5K, the name is an element of the statement.
Type	Specify whether the type of task is **Continuous**, **Periodic**, or **Event**. There can be only one continuous task.
Class	Specify the class of the task. This attribute applies only to safety controller projects. Type **Standard** or **Safety**.
Rate	If the task is a periodic task, specify how often to run the task (1.000...2,000,000.000 µs).
Priority	Specify the priority of a periodic task (1...15)
Watchdog	Type the watchdog timeout for the task (1.000...2,000,000.000 µs).
EventTrigger	Only used for event tasks. Specify the trigger for the event task. Type **Axis Home**, **Axis Watch**, **Axis Registration 1**, **Axis Registration 2**, **Motion Group Execution**, **EVENT Instruction Only**, **Module Input Data State Change**, **Consumed Tag**, or **Windows Event**. In L5X, this attribute is on the <EventInfo> element.
EventTag	Only used for event tasks with a Consumed Tag trigger or a Module Input Data State Change trigger. Specify the tag to consume. In L5X, this attribute is on the <EventInfo> element.
EnableTimeout	Type **Yes** to enable timeouts for the task. Otherwise type **No**. In L5X, this attribute is on the <EventInfo> element.
DisableUpdateOutputs	Type **Yes** to disable updates to outputs while the task executes. Otherwise type **No**. The default for a periodic or continuous task is No. The default for an event task is **yes**.
InihibitTask	Type **Yes** to inhibit the task. Otherwise enter No.

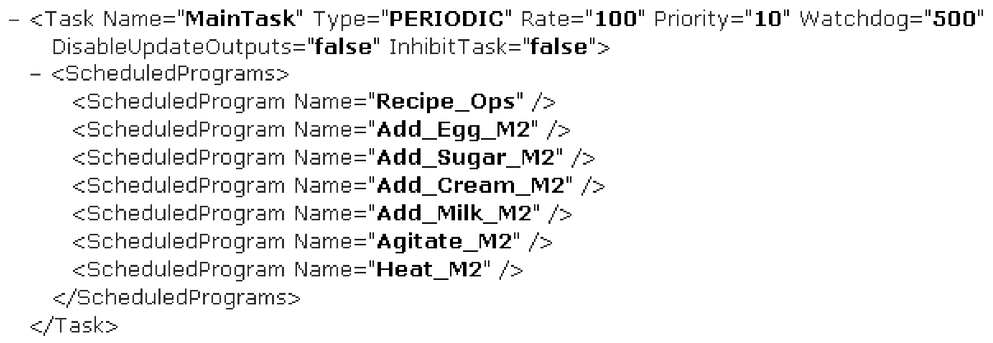
Task guidelines

Observe these guidelines when defining a task:

- Tasks must be defined after programs and before controller objects.
- There is a maximum of 32 tasks.
- There is one continuous task only.
- A program can be scheduled under one task only.
- Scheduled programs must be defined (must exist).

Examples

L5X Task example



```
- <Task Name="MainTask" Type="PERIODIC" Rate="100" Priority="10" Watchdog="500"
    DisableUpdateOutputs="false" InhibitTask="false">
  - <ScheduledPrograms>
      <ScheduledProgram Name="Recipe_Ops" />
      <ScheduledProgram Name="Add_Egg_M2" />
      <ScheduledProgram Name="Add_Sugar_M2" />
      <ScheduledProgram Name="Add_Cream_M2" />
      <ScheduledProgram Name="Add_Milk_M2" />
      <ScheduledProgram Name="Agitate_M2" />
      <ScheduledProgram Name="Heat_M2" />
    </ScheduledPrograms>
  </Task>
```

L5K TASK example

```
TASK joe (Type := Periodic,  Priority := 8, Rate := 10000)
      sue;
      betty;
END_TASK
```

You can define the task attributes (Type, Priority, Rate, and Watchdog) in any order. The list of programs scheduled for a task are listed in the task declarations block, as shown above. The programs are executed in the order they are specified.

L5K Safety TASK Example

```
TASK SafetyTask (Type := PERIODIC,
      Class := Safety,
      Rate := 10,
      Priority := 10,
      Watchdog := 10,
      DisableUpdateOutputs := No,
      InhibitTask := No)
      SafetyProgram;
END_TASK
```

Define a parameter connection component

Introduction

This chapter explains the overall structure of the parameter connection component.

Parameter connection component

A parameter connection component defines a connection between two program parameters, which allows you to share data between programs without using controller-scope tags.

L5K PARAMETER_CONNECTION structure

```
PARAMETER_CONNECTION (EndPoint1:=<program.parameter_name>,
                      EndPoint2:=<program.parameter_name>)
END_PARAMETER_CONNECTION
```

L5X ParameterConnection structure

```
<ParameterConnections>
      <ParameterConnection
EndPoint1="program_name.parameter_name",

EndPoint2="program_name.parameter_name" />
</ParameterConnections>
```

Parameter connection attributes

Attribute	Description
EndPoint1	Specify the first end point of the parameter connection.
EndPoint2	Specify the second end point of the parameter connection.

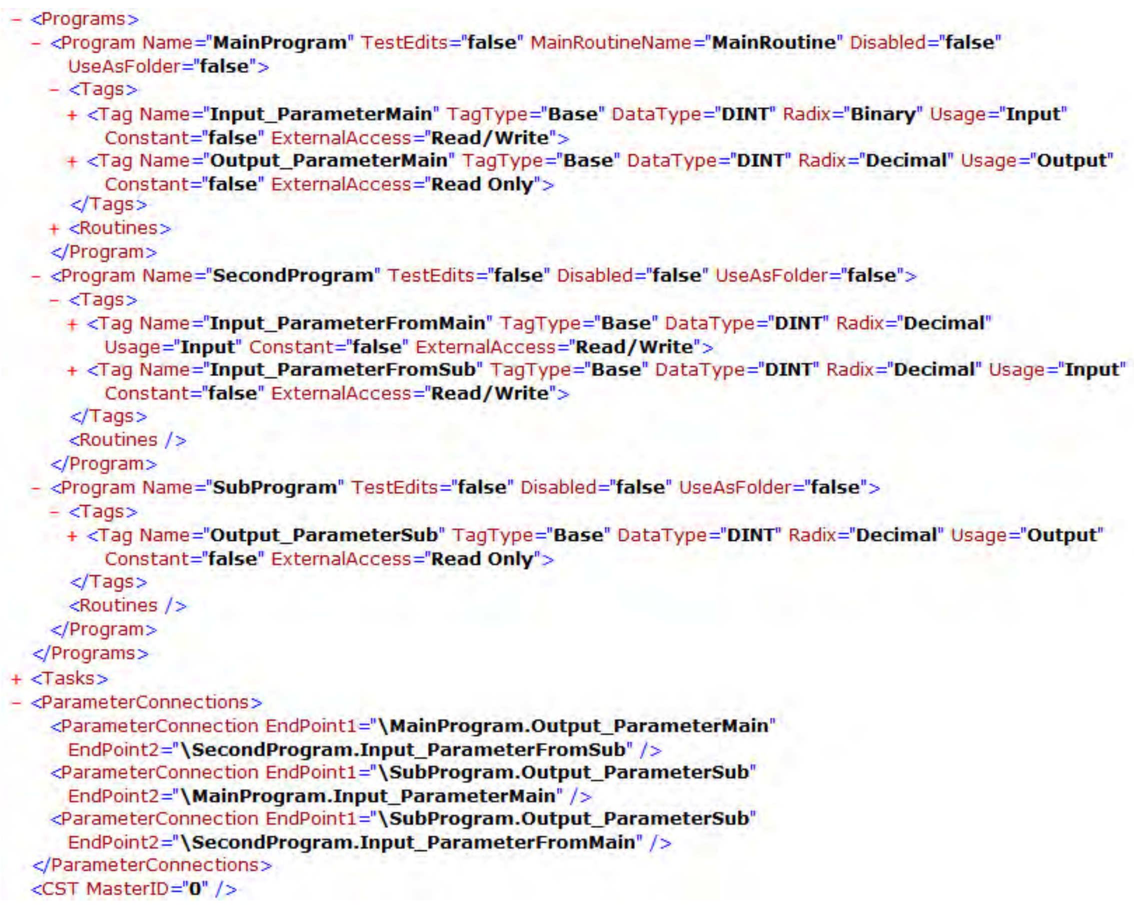
Parameter connection guidelines

Observe this guideline when defining a parameter connection:

- Parameter connections must be defined after tasks.

Examples

L5X ParameterConnection example



```
- <Programs>
  - <Program Name="MainProgram" TestEdits="false" MainRoutineName="MainRoutine" Disabled="false"
      UseAsFolder="false">
    - <Tags>
      + <Tag Name="Input_ParameterMain" TagType="Base" DataType="DINT" Radix="Binary" Usage="Input"
          Constant="false" ExternalAccess="Read/Write">
      + <Tag Name="Output_ParameterMain" TagType="Base" DataType="DINT" Radix="Decimal" Usage="Output"
          Constant="false" ExternalAccess="Read Only">
      </Tags>
    + <Routines>
    </Program>
  - <Program Name="SecondProgram" TestEdits="false" Disabled="false" UseAsFolder="false">
    - <Tags>
      + <Tag Name="Input_ParameterFromMain" TagType="Base" DataType="DINT" Radix="Decimal"
          Usage="Input" Constant="false" ExternalAccess="Read/Write">
      + <Tag Name="Input_ParameterFromSub" TagType="Base" DataType="DINT" Radix="Decimal" Usage="Input"
          Constant="false" ExternalAccess="Read/Write">
      </Tags>
      <Routines />
    </Program>
  - <Program Name="SubProgram" TestEdits="false" Disabled="false" UseAsFolder="false">
    - <Tags>
      + <Tag Name="Output_ParameterSub" TagType="Base" DataType="DINT" Radix="Decimal" Usage="Output"
          Constant="false" ExternalAccess="Read Only">
      </Tags>
      <Routines />
    </Program>
  </Programs>
+ <Tasks>
- <ParameterConnections>
    <ParameterConnection EndPoint1="\MainProgram.Output_ParameterMain"
      EndPoint2="\SecondProgram.Input_ParameterFromSub" />
    <ParameterConnection EndPoint1="\SubProgram.Output_ParameterSub"
      EndPoint2="\MainProgram.Input_ParameterMain" />
    <ParameterConnection EndPoint1="\SubProgram.Output_ParameterSub"
      EndPoint2="\SecondProgram.Input_ParameterFromMain" />
  </ParameterConnections>
  <CST MasterID="0" />
```

L5K PARAMETER_CONNECTION examples

```
PROGRAM MainProgram (MAIN := "MainRoutine",
                     MODE := 0,
                     DisableFlag := 0,
                     UseAsFolder := 0)
  TAG
    Input_ParameterMain : DINT (RADIX := Binary,
                Usage := Input) := 0;
    Output_ParameterMain : DINT (RADIX := Decimal,
                Usage := Output,
                ExternalAccess := Read Only) := 0;
    Program_tag1 : DINT (RADIX := Decimal,
                Constant := Yes,
                ExternalAccess := Read Only) := 0;
  END_TAG
  ROUTINE MainRoutine
  END_ROUTINE
  CHILD_PROGRAMS
  END_CHILD_PROGRAMS
END_PROGRAM
```

```
PROGRAM SecondProgram (MODE := 0,
                       DisableFlag := 0,
                       UseAsFolder := 0)
  TAG
    Input_ParameterFromMain : DINT (RADIX := Decimal,
                Usage := Input) := 0;
    Input_ParameterFromSub : DINT (RADIX := Decimal,
                Usage := Input) := 0;
  END_TAG
  CHILD_PROGRAMS
  END_CHILD_PROGRAMS
END_PROGRAM
PROGRAM SubProgram (MODE := 0,
                    DisableFlag := 0,
                    UseAsFolder := 0)
  TAG
    Output_ParameterSub : DINT (RADIX := Decimal,
                Usage := Output,
                ExternalAccess := Read Only) := 0;
  END_TAG
  CHILD_PROGRAMS
  END_CHILD_PROGRAMS
END_PROGRAM
TASK MainTask (Type := CONTINUOUS,
               Rate := 10,
               Priority := 10,
               Watchdog := 500,
               DisableUpdateOutputs := No,
               InhibitTask := No)
    MainProgram;
    SubProgram;
    SecondProgram;
END_TASK
PARAMETER_CONNECTION  (EndPoint1 :=
\MainProgram.Output_ParameterMain,
                       EndPoint2 :=
\SecondProgram.Input_ParameterFromSub)
END_PARAMETER_CONNECTION
PARAMETER_CONNECTION  (EndPoint1 :=
\SubProgram.Output_ParameterSub,
                       EndPoint2 :=
\MainProgram.Input_ParameterMain)
END_PARAMETER_CONNECTION
PARAMETER_CONNECTION  (EndPoint1 :=
\SubProgram.Output_ParameterSub,
                       EndPoint2 :=
\SecondProgram.Input_ParameterFromMain)
END_PARAMETER_CONNECTION
CONFIG CST(SystemTimeMasterID := 0) END_CONFIG
```

Define a trend component

Introduction

This chapter explains the overall structure of the trend component.

Trend component

A trend component defines a controller trend. Trend objects are optional. You can have as many as 32 trends per import/export file.

L5X trend structure

```
<Trends>
      <Trend [Trend_Attributes]>
            <Description>
                  <![CDATA[ text ]]>
            </Description>
            <Template>
                  template_data
            </Template>
            <Pens>
                  pen
            </Pens>
      </Trend>
</Trends>
```

L5K TREND structure

```
TREND <trend_name> [(Description := "text", Trend_Attributes)]
      Template := [template_data];
      [PEN declaration]
END_TREND
```

Trend elements

L5X Item	L5K Item	Description
N/A	*trend_name*	The name of the trend. In L5X, use a Name attribute on the <Trend> element.
Description	Description	User information about the trend.
Template	*template_data*	The trend template in a byte value list.
Pens	PEN	Individual pens within the trend. Each trend can support as many as 8 pens.

Trend attributes

Attribute	Description
Name	L5X only. Specify the name of the trend. In L5K, the name is an element of the statement.
SamplePeriod	Specify how often trending tags are collected in msec (1 msec…30 minutes).
NumberOfCaptures	Specifies the maximum number of captures allowed (1…100).
CaptureSizeType	Define how the capture size is specified. Type **Samples**, **TimePeriod**, or **NoLimit**.
CaptureSize	Specify the number of samples for each capture. The maximum number of samples is 2-hours worth of data samples or 1000 samples, whichever is greater. If the CaptureSizeType is Samples, the range is 1…(2 hours/SamplePeriod) or 1000 samples, whichever is greater. If the CaptureSizeType is TimePeriod, the range is SamplePeriod…2 hours or (SamplePeriod * 1000), whichever is greater.
StartTriggerType	Specify the type of the start trigger. Type **NoTrigger** or **EventTrigger**.
StartTriggerTag1	Specify the tag name of the first start trigger. The name must be one of the pen names.
StartTriggerOperation1	Specify the operation that is applied on StartTriggerTag1, and StartTriggerTargetValue1 or StartTriggerTargetTag1. **Enter:** **For:** 0 Exact Equal (Tag EQU Target) 1 Trigger Level Equal (Tag = Target) 2 Not Equal (Tag != Target) 3 Less Than (Tag < Target) 4 Greater Than (Tag > Target) 5 Less Than or Equal To (Tag <= Target) 6 Greater Than or Equal To (Tag >= Target) 7 Positive Slope (slope of Tag is positive) 8 Negative Slope (slope of Tag is negative) 9 Bitwise OR ((Tag OR Target) = 0) 10 Bitwise OR ((Tag OR Target) != 0) 11 Bitwise AND ((Tag AND Target) = 0) 12 Bitwise AND ((Tag AND Target) != 0) 13 Bitwise XOR ((Tag XOR Target) = 0) 14 Bitwise XOR ((Tag XOR Target) != 0)
StartTriggerTargetType1	Specify the type of the first start trigger target. Type **TargetValue** or **TargetTag**. If you type **TargetValue**, **StartTriggerTargetValue1** is expected. Otherwise, **StartTriggerTargetTag1** is expected.
StartTriggerTargetValue1	Specify a target value if the StartTriggerTargetType1 is **TargetValue**. Type a binary, octal, decimal, or hexadecimal integer number or type a floating point number.
StartTriggerTargetTag1	Specify a target tag if the StartTriggerTargetType is **TargetTag**. The tag must be one of the pen names.
StartTriggerLogicalOperation	Specify a logical operation (AND or OR) that is performed on StartTriggerxxx1 and StartTriggerxxx2. StartTriggerxxx1 consists of StartTriggerTag1, StartTriggerOperation1, StartTriggerTargetType1, and StartTriggerTargetValue1 or StartTriggerTargetTag1. StartTriggerxxx2 consists of StartTriggerTag2, StartTriggerOperation2, StartTriggerTargetType2, and StartTriggerTargetValue2 or StartTriggerTargetTag2.
StartTriggerTag2	Specify the tag name of the second start trigger. The name must be one of the pen names.

Attribute	**Description**
StartTriggerOperation2	Specify the operation that is applied on StartTriggerTag2, and StartTriggerTargetValue2 or StartTriggerTargetTag2. **Type:** **For:** 0 Exact Equal (Tag EQU Target) 1 Trigger Level Equal (Tag = Target) 2 Not Equal (Tag != Target) 3 Less Than (Tag < Target) 4 Greater Than (Tag > Target) 5 Less Than or Equal To (Tag <= Target) 6 Greater Than or Equal To (Tag >= Target) 7 Positive Slope (slope of Tag is positive) 8 Negative Slope (slope of Tag is negative) 9 Bitwise OR ((Tag OR Target) = 0) 10 Bitwise OR ((Tag OR Target) != 0) 11 Bitwise AND ((Tag AND Target) = 0) 12 Bitwise AND ((Tag AND Target) != 0) 13 Bitwise XOR ((Tag XOR Target) = 0) 14 Bitwise XOR ((Tag XOR Target) != 0)
StartTriggerTargetType2	Specify the type of the second start trigger target. Type **TargetValue** or **TargetTag**. If you type **TargetValue**, **StartTriggerTargetValue2** is expected. Otherwise, **StartTriggerTargetTag2** is expected.
StartTriggerTargetValue2	Specify a target value if the StartTriggerTargetType2 is TargetValue. Type a binary, octal, decimal, or hexadecimal integer number or type a floating point number.
StartTriggerTargetTag2	Specify a target tag if the StartTriggerTargetType is TargetTag. The tag must be one of the pen names.
PreSampleType	Define how pre-samples are specified. Type **Samples** or **TimePeriod**.
PreSamples	Specify the number of pre-samples (0...1000) if the PreSampleType is Samples. Specify a time period (0...(SamplePeriod * 1000)) that covers pre-samples if the PreSampleType is TimePeriod.
StopTriggerType	Specify the type of the stop trigger. Type **NoTrigger** or **Event Trigger**.
StopTriggerTag1	Specify the tag name of the first trigger. The name must be one of the pen names.
StopTriggerOperation1	Specify the operation that is applied on StopTriggerTag1 and StopTriggerTargetValue1 or StopTriggerTargetTag1. **Type:** **For:** 0 Exact Equal (Tag EQU Target) 1 Trigger Level Equal (Tag = Target) 2 Not Equal (Tag != Target) 3 Less Than (Tag < Target) 4 Greater Than (Tag > Target) 5 Less Than or Equal To (Tag <= Target) 6 Greater Than or Equal To (Tag >= Target) 7 Positive Slope (slope of Tag is positive) 8 Negative Slope (slope of Tag is negative) 9 Bitwise OR ((Tag OR Target) = 0) 10 Bitwise OR ((Tag OR Target) != 0) 11 Bitwise AND ((Tag AND Target) = 0) 12 Bitwise AND ((Tag AND Target) != 0) 13 Bitwise XOR ((Tag XOR Target) = 0) 14 Bitwise XOR ((Tag XOR Target) != 0)
StopTriggerTargetType1	Specify the type of the first stop trigger target. Type **TargetValue** or **TargetTag**. If you specify TargetValue, StopTriggerTargetValue1 is expected. Otherwise, StopTriggerTargetTag1 is expected.
StopTriggerTargetValue1	Specify a target value if the StopTriggerTargetType1 is **TargetValue**. Type a binary, octal, decimal, or hexadecimal integer number or type a floating point number.
StopTriggerTargetTag1	Specify a target tag if the StopTriggerTargetType is **TargetTag**. The name must be one of the pen names.

Attribute	Description
StopTriggerLogicalOperation	Specify a logical operation (AND or OR) that is performed on StopTriggerxxx1 and StopTriggerxxx2. StopTriggerxxx1 consists of StopTriggerTag1, StopTriggerOperation1, StopTriggerTargetType1, and StopTriggerTargetValue1 or StopTriggerTargetTag1. StopTriggerxxx2 consists of StopTriggerTag2, StopTriggerOperation2, StopTriggerTargetType2, and StopTriggerTargetValue2 or StopTriggerTargetTag2.
StopTriggerTag2	Specify the tag name of the second trigger. The name must be one of the pen names.
StopTriggerOperation2	Specify the operation that is applied on StopTriggerTag2 and StopTriggerTargetValue2 or StopTriggerTargetTag2. **Type:** **For:** 0 Exact Equal (Tag EQU Target) 1 Trigger Level Equal (Tag = Target) 2 Not Equal (Tag != Target) 3 Less Than (Tag < Target) 4 Greater Than (Tag > Target) 5 Less Than or Equal To (Tag <= Target) 6 Greater Than or Equal To (Tag >= Target) 7 Positive Slope (slope of Tag is positive) 8 Negative Slope (slope of Tag is negative) 9 Bitwise OR ((Tag OR Target) = 0) 10 Bitwise OR ((Tag OR Target) != 0) 11 Bitwise AND ((Tag AND Target) = 0) 12 Bitwise AND ((Tag AND Target) != 0) 13 Bitwise XOR ((Tag XOR Target) = 0) 14 Bitwise XOR ((Tag XOR Target) != 0)
StopTriggerTargetType2	Specify the type of the second stop trigger target. Type **TargetValue** or **TargetTag**. If you specify TargetValue, StopTriggerTargetValue2 is expected. Otherwise, StopTriggerTargetTag2 is expected.
StopTriggerTargetValue2	Specify a target value if the StopTriggerTargetType2 is **TargetValue**. Type a binary, octal, decimal, or hexadecimal integer number or type a floating point number.
StopTriggerTargetTag2	Specify a target tag if the StopTriggerTargetType is **TargetTag**. The name must be one of the pen names.
PostSampleType	Define how post-samples are specified. Type **Samples** or **TimePeriod**.
PostSamples	Specify the number of post-samples (0…1000) if the PostSampleType is Samples. Specify a time period (0…(SamplePeriod * 1000)) that covers post-samples if the PostSampleType is TimePeriod.
TrendxVersion	Specify the version of the Trend feature.

Pen declaration

A trend object can have as many as eight pen declarations. A pen declaration follows this structure.

L5X pen structure

```
<Pen [Pen_Attributes]>
      <Description>
            <![CDATA[ text ]]>
      </Description>
</Pen>
```

L5K PEN structure

```
PEN <pen_name> [(Description := "text", Pen_Attributes)];
END_PEN
```

Pen elements

L5X Item	L5K Item	Description
N/A	*pen_name*	The name of the pen. In L5X, use a Name attribute on the <Pen> element.
Description	Description	User information about the pen.

Pen attributes

Attribute	Description
Name	L5X only. Specify the name of the pen. In L5K, the name is an element of the statement.
Color	Specify the color of the line in RGB format. Type the hex number for the color (16#0000_0000 – 16#00FF_FFFF).
Visible	Specify whether or not the line should be visible. Type **TRUE** or **FALSE**.
Width	Specify the width of the line in pixels (1...10).
Type	Specify the line type. Type **Analog**, **Digital**, or **Full-Width**.
Style	Specify the style of line. **Type:** **For:** 0 ……………. 1 … … …… 2 ………. 3 …… . … . … 4 … .. … .. … ..
Marker	Specify the line marker (0...83)
Min	Specify the minimum value for the pen. The minimum cannot be greater than or equal to the maximum.
Max	Specify the maximum value for the pen. The maximum cannot be less than or equal to the minimum.
EngUnits	Specify engineering units. For example, rpm, gallon, fps, and degrees.

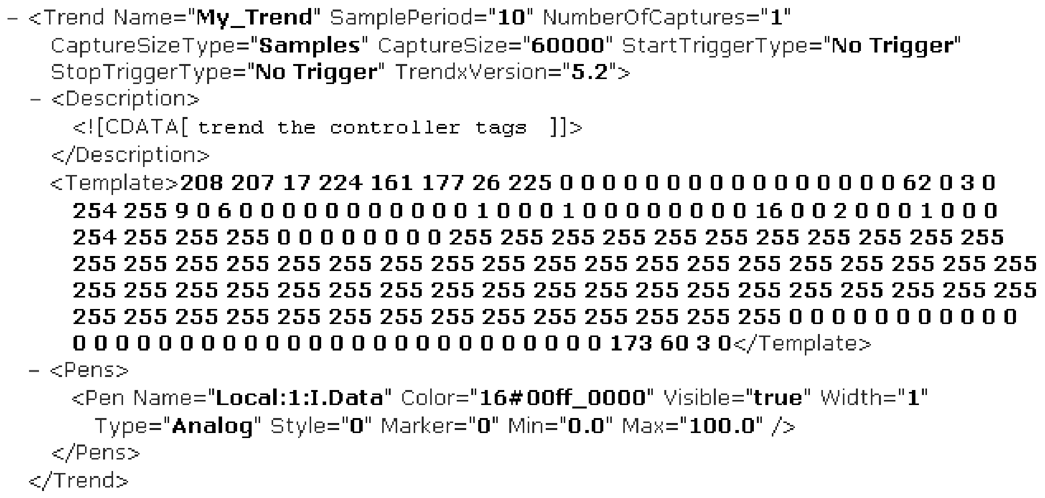
Trend guidelines

Observe these guidelines when defining a trend:

- A trend can support as many as eight pen declarations.
- Export just the trend of a controller project by right-clicking the trend in the Controller Organizer and choosing **Export**. This saves the trend as a .L5X file (XML format) in the same format as described above for the trend section in the complete project .L5K file.
- To import a trend .L5X file into a controller project, right-click **Trends** in the Control Organizer and select **Import**.

Examples

L5X Trend example



```
– <Trend Name="My_Trend" SamplePeriod="10" NumberOfCaptures="1"
    CaptureSizeType="Samples" CaptureSize="60000" StartTriggerType="No Trigger"
    StopTriggerType="No Trigger" TrendxVersion="5.2">
  – <Description>
      <![CDATA[ trend the controller tags  ]]>
    </Description>
    <Template>208 207 17 224 161 177 26 225 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 62 0 3 0
      254 255 9 0 6 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 16 0 0 2 0 0 0 1 0 0 0
      254 255 255 255 0 0 0 0 0 0 0 0 255 255 255 255 255 255 255 255 255 255 255
      255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255
      255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255 255
      255 255 255 255 255 255 255 255 255 255 255 255 255 255 0 0 0 0 0 0 0 0 0 0 0
      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 173 60 3 0</Template>
  – <Pens>
      <Pen Name="Local:1:I.Data" Color="16#00ff_0000" Visible="true" Width="1"
        Type="Analog" Style="0" Marker="0" Min="0.0" Max="100.0" />
    </Pens>
  </Trend>
```

L5K TREND Example

```
TREND trend1 (SamplePeriod := 10,
              NumberOfCaptures := 1,
              CaptureSizeType := Samples,
              CaptureSize := 60000,
              StartTriggerType := No Trigger,
              StopTriggerType := No Trigger,
              TrendxVersion := 5.2)
Template :=
[208,207,17,224,161,177,26,225,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
62,0,3,0,254,255,9,0,6,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,
0,0,0,0,16,0,0,2,0,0,0,1,0,0,0,254,255,255,255,0,0,0,0,0,0,0,0,
255,255,255,255,255,255,....
PEN Local:1:I.CHA_Status (Color := 16#00ff_0000,
                                 Visible := 1,
                                 Width := 1,
                                 Type := Analog,
                                 Style := 0,
                                 Marker := 0,
                                 Min := 0.0,
                                 Max := 100.0)
END_PEN
PEN Local:1:I.CHB_Status (Color := 16#0000_ff00,
                                 Visible := 1,
                                 Width := 1,
                                 Type := Analog,
                                 Style := 0,
                                 Marker := 0,
                                 Min := 0.0,
                                 Max := 100.0)
END_PEN
END_TREND
```

Define a watch list component

Introduction

This chapter explains the overall structure of the watch list component.

Quick watch list component

The quick watch list component defines a collection of tags that you need to monitor on the fly or for a period of time. A quick watch list is optional. You can have multiple watch lists; each watch list can have multiple tags.

L5X QuickWatchList structure

```
<QuickWatchLists>
      <QuickWatchList [QuickWatchListAttributes]>
            <WatchTag [WatchTagAttributes] />>
      </QuickWatchList>
</QuickWatchLists>
```

L5K QUICK_WATCH structure

```
QUICK_WATCH [(Quick_Watch_Attributes)]
      WATCH_TAG [(Watch_Tag_Attributes)] ;
END_QUICK_WATCH
```

Quick Watch elements

L5X Item	L5K Item	Description
QuickWatchLists	N/A	The element that holds quick watch lists.
QuickWatchList	QUICK_WATCH	A quick watch list that holds watch tags.
WatchTag	WATCH_TAG	An individual watch tag within a watch list.

Quick Watch List attributes

Attribute	Description
Name	Specify the name of the quick watch list.

Watch tag attributes

Attribute	Description
Specifier	Specify the tag or part of a tag to watch.

Attribute	Description
Scope	Specify the name of program, equipment phase, or Add-On Instruction that contains the watch tag. For L5X, the value is empty if the tag is controller scope. For L5K, the attribute is omitted if the tag is controller scope.

Examples

L5X Quick watch lists example

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<RSLogix5000Content ...>
    <Controller ...>
     ...
        <Trends>
            ...
        </Trends>
        <QuickWatchLists>
            <QuickWatchList Name="NamedQuickWatch_1">
                    <WatchTag Specifier="MyDint" Scope="" />
                    <WatchTag Specifier="MySint" Scope="My_Program" />
                    <WatchTag Specifier="MyAOI" Scope="My_Program" />
                    <WatchTag Specifier="MyAOI.MyString" Scope="My_Program" />
            </QuickWatchList>
            <QuickWatchList Name="NamedQuickWatch_2">
                    <WatchTag Specifier="MyDint" Scope="" />
                    <WatchTag Specifier="MySint" Scope="My_Program" />
                    <WatchTag Specifier="MyAOI" Scope="My_Program" />
                    <WatchTag Specifier="MyAOI.MyString" Scope="My_Program" />
             </QuickWatchList>
        </QuickWatchLists>
    </Controller>
</RSLogix5000Content>
```

L5K QUICK_WATCH example

```
QUICK_WATCH (Name := My_Quick_Watch_2)
       WATCH_TAG (Specifier := MyDint);
       WATCH_TAG (Specifier := MySint, Scope := My_Program);
       WATCH_TAG (Specifier := MyAOI, Scope := My_Program);
       WATCH_TAG (Specifier := MyAOI.MyString, Scope :=
MyProgram);
END_QUICK_WATCH

QUICK_WATCH (Name := My_Quick_Watch_1)
       WATCH_TAG (Specifier := MyDint);
       WATCH_TAG (Specifier := MySint, Scope := My_Program);
       WATCH_TAG (Specifier := MyAOI, Scope := My_Program);
       WATCH_TAG (Specifier := MyAOI.MyString, Scope :=
MyProgram);
END_QUICK_WATCH
```

Define controller configuration objects

Introduction

This chapter explains how to enter project and configuration information in a complete import/export file.

Controller objects

The config component defines controller objects.

L5X config structure

```
<CommPorts>
      <SerialPort [SerialPort_Attributes]>
            <ASCII [ASCII_Attributes]/>
            <DF1 [DF1_Attributes]/>
      </SerialPort>
</CommPorts>
<CST [CST_Attributes]/>
<WallClockTime [WallClockTime_Attributes]/>
```

L5K CONFIG structure

```
CONFIG <object_name> [(Object_Attributes)]
END_CONFIG
```

Object elements

L5X Item	L5K Item	Description
N/A	*object_name*	The name of the controller config object. In L5X, each controller config object is specified with an element specific to that object.

Controller objects are optional. There can be only one of each controller object in an import/export file. Controller objects appear at the end of the import/export file.

Config attributes

The attributes depend on the type on the object. Some objects do not have any attributes.

Object	Attribute	Description
ASCII	XONXOFFEnable	Specify whether to regulate the flow of incoming data. Type **0** to disable XON/XOFF; type **1** to enable XON/XOFF.
	DeleteMode	Specify the delete mode. Type **0** for Ignore; type **1** for CRT; or type **2** for Printer.
	EchoMode	Specify whether to echo data back to the device from which it was sent. Type **0** to disable; type **1** to enable.
	TerminationChars	Specify the characters that designate the end of a line.
	AppendChars	Specify the characters to append to the end of a line.
	BufferSize	Specify the maximum size of the data array (1…65535 bytes) to send and receive.

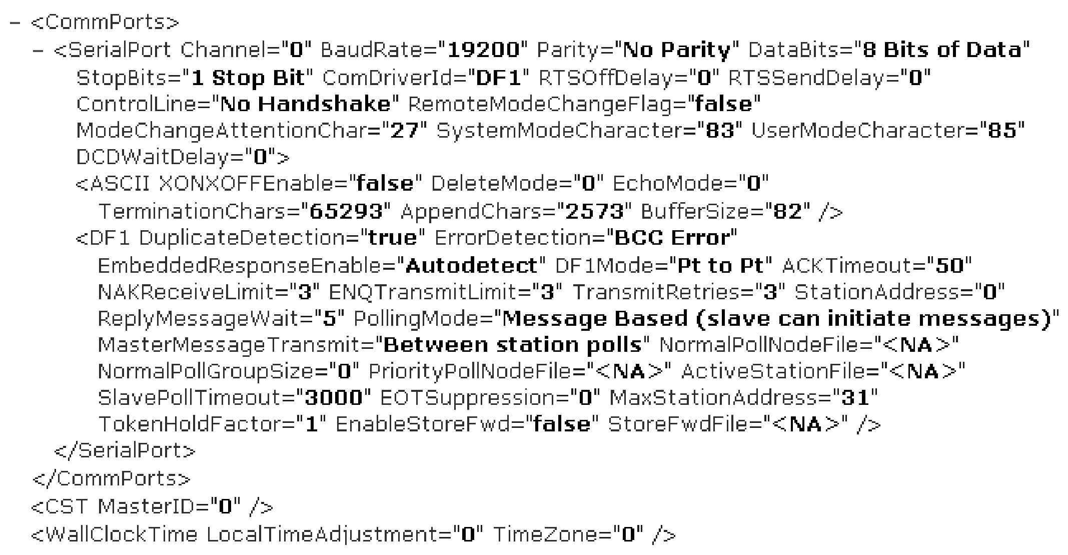
Object	**Attribute**	**Description**
CST	SystemTimeMasterIDn (L5K) MasterID (L5X)	Specify whether the controller is the coordinated system time master. Type **16#0000** if the controller is not the CST master; type **16#0001** if the controller is the CST master.
DF1	DuplicateDetection	Specify whether to enable duplicate message detection, which ignores duplicate messages. Type **0** to disable; type **1** to enable.
	ErrorDetection	Specify the error detection method. Type **BCC Error** or **CRC Error**.
	EnbeddedResponseEnable	Specify the response method. Type **0** to autodetect; type **1** to enable.
	DF1Mode	Specify the DF1 mode. Type **Pt to Pt**, **Master**, or **Slave**.
	ACKTimeout	Specify the time to wait for an acknowledgment to a message transmission. Type an increment of 20 ms (0…32767).
	NAKReceiveLimit	Specify the number of NAKS (0…127) the controller can receive in response to a message before stopping transmission.
	ENQTransmit	Specify the number of inquiries (0…127) the controller sends after an ACK timeout.
	TransmitRetries	Specify the number of attempted retries (0…127) without getting an acknowledgment before the message is deemed undeliverable.
	StationAddress	Specify the current station link address (0…254).
	ReplyMessageWait	Specify the time the master waits after receiving an acknowledgment to a master-initiated message before polling the slave for a response. Type an increment of 20 ms (0…65535).
	PollingMode	Specify the polling mode. Type one of these: • 1 for Message Based (slave can initiate messages) • 2 for Message Based (slave cannot initiate messages) • 3 for Standard (multiple message transfer for node scan) • 4 for Standard (single message transfer per node scan)
	MasterMessageTransmit	Specify when the master transmits. Type **0** to transmit between station polls; type **1** to transmit in poll sequence.
	NormalPollNodeFile	Specify the tag name of the structure that contains the normal poll node list, or type **<NA>**. The tag must specify Class = Standard.
	NormalPollGroupSize	Specify the total number (0…255) of active stations polled from the poll list.
	PriorityPollNodeFile	Specify the tag name of the structure that contains the priority poll node list, or type **<NA>**. The tag must specify Class = Standard.
DF1	ActiveStationFile	Specify the tag name of the structure that contains the status (active or non-active) of each node, or type **<NA>**. The tag must specify Class = Standard.
	SlavePollTimeout	Specify the amount of time the master waits for an acknowledgment to a message sent to a slave. Type an increment of 20 ms (0…65535).
	EOTSuppression	Specify whether to enable EOT suppression. Type **0** to disable; type **1** to enable.
	MaxStationAddress	Specify the maximum station address (0…31).
	TokenHoldFactor	Specify the token hold factor (1…4).
	EnableStoreFwd	For DF1 radio modem, specify whether to enable the store and forward feature. Type **0** to disable; type **1** to enable.
	StoreFwdFile	Specify the INT tag that holds the store and forward table.
SerialPort	Channel (L5X only)	Specify the serial port.
	BaudRate	Specify the communication rate for the serial port. Type **110, 300 600, 1200, 2400, 4800, 9600, 19200, or 38400**.
	Parity	Specify the parity setting for the serial port. Parity provides additional message-packet error detection. Type **None Parity**, **Even Parity**, or **Odd Parity**.

Object	Attribute	Description
	DataBits	Specify the number of bits per message packet. Type **7 Data Bits** or **8 Data Bits**.
	StopBits	Specify the number of stop bits to the device with which the controller is communicating. Type **1 Stop Bit** or **2 Stop Bit**.
	ComDriverId	Specify the type of serial driver. Type **DF1**.
	PendingComDriverId	L5K only. Specify type of serial driver. Type **DF1**.
	RTSOffDelay	Specify a time delay to make sure the modem successfully transmits the entire message. Type an increment of 20 ms (0…32767). Normally leave at zero.
	RTSSendDelay	Specify a time delay to let the modem prepare to transmit a message. Type an increment of 20 ms (0…32767).
	ControlLine	Specify the mode in which the serial driver operates. Type **No Handshake**, **Full Duplex**, **Half Duplex without Continuous Carrier**, or **Half Duplex with Continuous Carrier**.
	PendingControlLine	L5K only. Specify the mode in which the serial driver operates. Type **No Handshake**, **Full Duplex**, **Half Duplex without Continuous Carrie**r, or **Half Duplex with Continuous Carrier**.
	RemoteModeChangeFlag	Specify whether there is a remote change. Type **0** or **1**.
	PendingRemoteModeChangeFlag	L5K only. Specify whether there is a remote change. Type **0** or **1**.
	ModeChangeAttentionChar	Specify the mode change attention character.
	PendingModeChangeAttentionChar	L5K only. Specify the mode change attention character.
SerialPort	SystemModeCharacter	Specify the system mode character.
	PendingSystemModeCharacter	L5K only. Specify the system mode character.
	UserModeCharacter	Specify the user mode character.
	PendingSystemModeCharacter	L5K only. Specify the user mode character.
Serial Port (cont)	DCDWaitDelay	For DF1 radio modem, specify the delay in seconds (0…255). Specify this value if ControlLine is Half-Duplex and ContinuousCarrier is disabled.
WallClockTime	LocalTimeAdjustment	Specify any local time adjustment.
	TimeZone	Specify the time zone.
Internet Protocol	ConfigType	Specify the IP configuration type. Values include **Manual**, **BOOTP**, or **DHCP**.
	IPAddress	Specify the IP Address.
	SubnetMask	Specify the Subnet Mask.
	Gateway	Specify the Gateway.
	PrimaryDNS	Specify the Primary DNS.
	SecondaryDNS	Specify the Secondary DNS.
	DomainName	Specify the Domain Name.
	HostName	Specify the Host Name.
Ethernet Port	Port	This is the Ethernet Port number being configured. (L5X only)
	PortEnabled	Specifies if the port is Enabled or Disabled.
	AutoNegotiateEnabled	Specifies if Auto Negotiate is Enabled or Disabled.
	InterfaceSpeed	Specifies the Interface Speed in Mbps. Valid values are 10 or 100.

Object	Attribute	Description
	DuplexMode	Specifies the Duplex Mode. Valid values are Half or Full.
Ethernet Network	SupervisorModeEnabled	Specify if the ring supervisor mode of the controller is Enabled.
	SupervisorPrecedence	Specifies the Supervisor Precedence. A numerically higher value indicates higher precedence. Values are in the range of 0...255.
	BeaconInterval	Specifies the Beacon Interval for the ring. Values are in the range of 100...100000 usec.
	BeaconTimeout	Specifies the Beacon Timeout for the ring. Values are in the range of 200...500000 usec.
	VLANID	Specifies the Ring Protocol VLAN ID of the ring. Values are in the range of 0... 4094

Examples

L5X Config example



```
- <CommPorts>
  - <SerialPort Channel="0" BaudRate="19200" Parity="No Parity" DataBits="8 Bits of Data"
      StopBits="1 Stop Bit" ComDriverId="DF1" RTSOffDelay="0" RTSSendDelay="0"
      ControlLine="No Handshake" RemoteModeChangeFlag="false"
      ModeChangeAttentionChar="27" SystemModeCharacter="83" UserModeCharacter="85"
      DCDWaitDelay="0">
      <ASCII XONXOFFEnable="false" DeleteMode="0" EchoMode="0"
        TerminationChars="65293" AppendChars="2573" BufferSize="82" />
      <DF1 DuplicateDetection="true" ErrorDetection="BCC Error"
        EmbeddedResponseEnable="Autodetect" DF1Mode="Pt to Pt" ACKTimeout="50"
        NAKReceiveLimit="3" ENQTransmitLimit="3" TransmitRetries="3" StationAddress="0"
        ReplyMessageWait="5" PollingMode="Message Based (slave can initiate messages)"
        MasterMessageTransmit="Between station polls" NormalPollNodeFile="<NA>"
        NormalPollGroupSize="0" PriorityPollNodeFile="<NA>" ActiveStationFile="<NA>"
        SlavePollTimeout="3000" EOTSuppression="0" MaxStationAddress="31"
        TokenHoldFactor="1" EnableStoreFwd="false" StoreFwdFile="<NA>" />
    </SerialPort>
  </CommPorts>
  <CST MasterID="0" />
  <WallClockTime LocalTimeAdjustment="0" TimeZone="0" />
```

L5K CONFIG Examples

This example shows a DF1 controller object.

```
CONFIG DF1
       DuplicateDetection := -1,
       ErrorDetection := BCC Error,
       EmbeddedResponseEnable := -1,
       DF1Mode := Pt to Pt,
       ACKTimeout := 50,
       NAKReceiveValue := 3,
       DF1ENQs := 3,
       DF1Retries := 3,
       StationAddress := 0,
       ReplyMessageWait := 50,
       PollingMode := 0,
       MasterMessageTransmit := 0,
       NormalPollNodeFile := NA,
       NormalPollGroupSize := 0,
       PriorityPollNodeFile := NA,
       ActiveStationFile := NA)
END_CONFIG
```

This example shows a SerialPort controller object.

```
CONFIG SerialPort
       (BaudRate := 19200,
       Parity := No Parity,
       DataBits := 8 Bits of Data,
       StopBits := 1 Stop Bit,
       ComDriverId := DF1,
       RTSOffDelay := 0,
       RTSSendDelay := 0,
       ControlLine := No Handshake,
       RemoteModeChangeFlag := 0,
       ModeChangeAttentionChar := 27,
       SystemModeCharacter := 83,
       UserModeCharacter := 85)
END_CONFIG
```

Define custom properties

Introduction

This chapter explains how to define custom properties in a controller project.

Custom properties can be used to store any additional information that should persist with the project. This information is imported with the project, downloaded to the controller, uploaded from the controller, and exported with the project. Custom properties can be added to most XML elements in the L5X format.   For example, you can add it to the controller, data types, data type members, modules, add-on instructions, tags, programs, routines, rungs, sheets, various instructions, various collections, ST lines, trends, and so on. However, you cannot add custom properties to custom properties. Custom properties are compatible only with the L5X format.

Custom property data is well-formed XML limited to chunks of 65000 bytes. To associate more thank 65K of data on a single parent object, break it into multiple sections using the extension attribute. This optional attribute is a free-form string, so you can organize custom properties information in any way you need.

Custom properties data

The following sections describe custom properties data.

Custom properties structure

Custom Properties should be the first child xml element under the parent element.

```
<ParentXmlObject … >
      <CustomProperties>
            <Provider ID="YourCompanyName" Ext="Part 1" >
                  <YourData YourAttrib="Your Value" />
                  <YourOtherData Attrib2="2" >
                        <YourChildElement Attrib3="3" />
                  </YourOtherData>
            </Provider>
            <Provider ID="YourCompanyName" Ext="Part 2" >
                  <![CDATA[ Your custom property data wrapped 
in CData ]]>
            </Provider>
            <Provider ID="ToolMakerX" >
                  <ToolMakerData >Custom property data from a 
tool you are using</ToolMakerData>
            </Provider>
      </CustomProperties>
      … (the rest of the ParentObject’s child elements) …
</ParentXmlObject >
```

Custom properties elements

L5X item	Description
CustomProperties	The collection of Provider elements.
Provider	Unique element that wraps the user’s custom property XML. The XML between this beginning and end element must be well-formed.

Custom properties attributes

Attribute	Description
ID	The provider attribute which identifies the owner of this custom property data. This is a free-form string. It could identify your company, or it might come from a third party (OEM) component or tool that you are using.
Ext	(Optional) This extension attribute flags custom property data when you need to break it into multiple Provider sections. This is a free-form string. An attribute with an empty string is the same as not having the attribute.

Example

The following example demonstrates adding custom properties for a tag:

```
<Tag Name="MyTag" TagType="Base" DataType="DINT"
Radix="Decimal" Constant="false" ExternalAccess="Read/Write">
      <CustomProperties>
            <Provider ID="CompanyX" >
                  <CompanXTextData > Your Xml data as a Text
Node </CompanXTextData>
            </Provider>
      </CustomProperties>
      <Data Format="L5K">
            <![CDATA[42]]>
      </Data>
      <Data Format="Decorated">
            <DataValue DataType="DINT" Radix="Decimal"
Value="42"/>
      </Data>
</Tag>
```

Structure Tags and Comments in an Import/Export File

Introduction

This chapter explains how to structure the import/export file by using commas (in a CSV text file) or tabs (in a TXT Unicode text file) to separate values in the file.

Place information in a .CSV or .TXT file

The structured import/export file contains these components for comments and other information.

Item	Identifies
Remark	Comment within the file.
TAG	Tag.
RCOMMENT	Rung comment.
TEXTBOX	Text box comment.

Internal file comments

Enter comments to document import files. The import process ignores these comments. Place comments anywhere in an import/export file, except in names and descriptions. Enter comments by starting the line (record) with REMARK and a comma.

Specify a tag record

Each tag record defines a tag within a controller project. A tag record includes this information.

Item	Identifies
Type	The type of tag. TAG tag ALIAS alias tag COMMENT tag operand component
Scope	The part of the project that owns the tag. • If no scope is specified, the scope is controller. • If a scope is specified, it identifies the program or equipment phase.
Name	Name of the tag
Description	Description of the tag (optional)
Datatype	Datatype of the tag - use any valid datatype name

Item	Identifies
Specifier	Optional • An alias, specifies base tag. • A tag comment, specifies the tag name and member or bit.
Attributes	The attributes of the tag, as exported in the L5K format. Define how the tag can be used and how it appears. Attributes do not include tag values.

TAG type record

Each TAG record defines a tag within a controller project.

TAG Structure with Commas

```
TAG,"Scope","Name","Description","Datatype","Specifier","At
tributes"
```

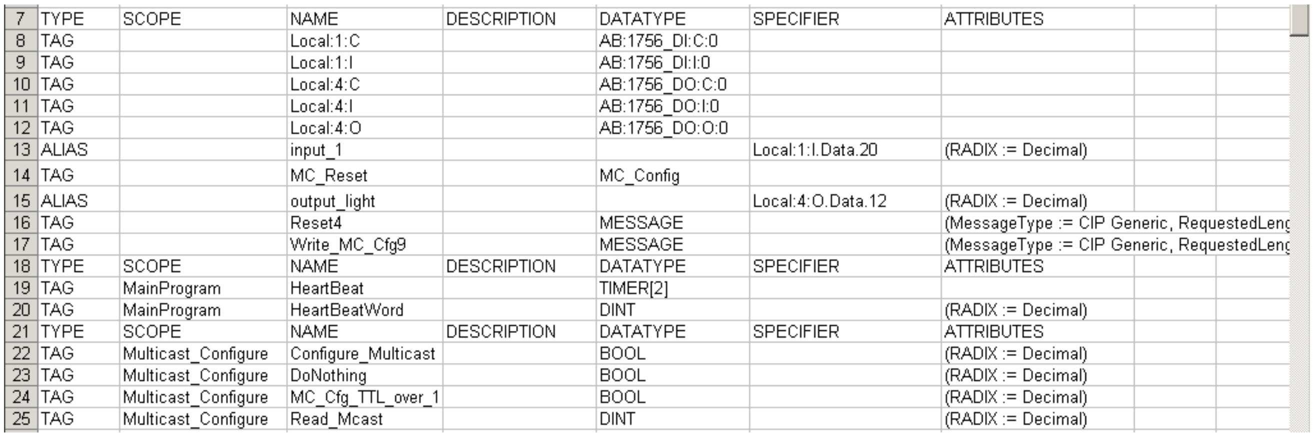
TAG Structure with Tabs

```
TAG,"Scope"  "Name"  "Description"  "Datatype"  "Specifier"
"Attributes"
```

Specify tag dimensions on the Datatype.

To specify:	Type:
1 dimension	[a]
2 dimensions	[a,b]
3 dimensions	[a,b,c]

This example shows TAG records in a CSV format.



7	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES
8	TAG		Local:1:C		AB:1756_DI:C:0		
9	TAG		Local:1:I		AB:1756_DI:I:0		
10	TAG		Local:4:C		AB:1756_DO:C:0		
11	TAG		Local:4:I		AB:1756_DO:I:0		
12	TAG		Local:4:O		AB:1756_DO:O:0		
13	ALIAS		input_1			Local:1:I.Data.20	(RADIX := Decimal)
14	TAG		MC_Reset		MC_Config		
15	ALIAS		output_light			Local:4:O.Data.12	(RADIX := Decimal)
16	TAG		Reset4		MESSAGE		(MessageType := CIP Generic, RequestedLeng
17	TAG		Write_MC_Cfg9		MESSAGE		(MessageType := CIP Generic, RequestedLeng
18	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES
19	TAG	MainProgram	HeartBeat		TIMER[2]		
20	TAG	MainProgram	HeartBeatWord		DINT		(RADIX := Decimal)
21	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES
22	TAG	Multicast_Configure	Configure_Multicast		BOOL		(RADIX := Decimal)
23	TAG	Multicast_Configure	DoNothing		BOOL		(RADIX := Decimal)
24	TAG	Multicast_Configure	MC_Cfg_TTL_over_1		BOOL		(RADIX := Decimal)
25	TAG	Multicast_Configure	Read_Mcast		DINT		(RADIX := Decimal)

ALIAS type record

Each ALIAS record defines an alias within a controller project.

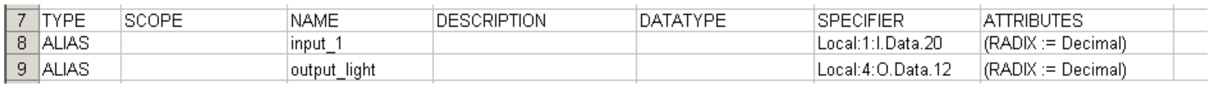
ALIAS Structure with Commas

```
ALIAS,"Scope","Name","Description","Datatype","Specifier","
Attributes"
```

ALIAS Structure with Tabs

```
ALIAS  "Scope"  "Name"  "Description"  "Datatype"
"Specifier"  "Attributes"
```

This example shows ALIAS records in a CSV format.



7	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES
8	ALIAS		input_1			Local:1:I.Data.20	(RADIX := Decimal)
9	ALIAS		output_light			Local:4:O.Data.12	(RADIX := Decimal)

COMMENT type record

Each COMMENT record defines a comment about a component of a tag, such as a bit member, structure member, or an array element.

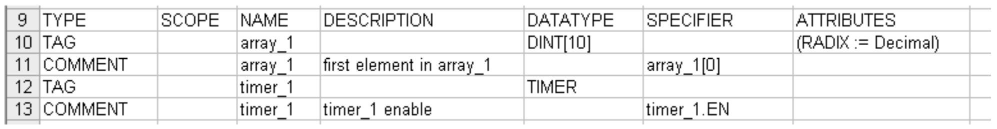
COMMENT Structure with Commas

```
COMMENT,"Scope","Name","Description","Datatype","Specifier"
,"Attributes"
```

COMMENT Structure with Tabs

```
COMMENT  "Scope"  "Name"  "Description","Datatype"
"Specifier"  "Attributes"
```

This example shows COMMENT records in a CSV format.



9	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES
10	TAG		array_1		DINT[10]		(RADIX := Decimal)
11	COMMENT		array_1	first element in array_1		array_1[0]	
12	TAG		timer_1		TIMER		
13	COMMENT		timer_1	timer_1 enable		timer_1.EN	

Specify a comment record

Each comment record defines a rung comment or text box in the controller project. This is different than the comment type that defines a comment about a tag component. A comment record includes this information.

Item	Identifies
Type	The type of comment. RCOMMENT ladder rung comment TEXTBOX function block or sequential function chart comment
Scope	The part of the project that owns the comment. A program or equipment phase must be specified.
Routine	Name of the routine.
Comment	Text of the comment.

Item	Identifies
Owning Element	For RCOMMENT entries, neutral text for the last instruction on the rung that owns the comment. If there is no element on the rung, the Owning Element is a semi-colon (;). By default, the Owning Element is used to match the comment to a rung on import. For a TEXTBOX entry of an attached text box, neutral text identifies the element attached to the the text box. The Owning Element contains the backing tag name and the full specifier of the element, including the absolute location of the element. Owning Element. For a TEXTBOX entry of a free-floating text box, this entry is blank.
Location	For RCOMMENT entries, the rung number of comment. The rung number in the Location column is used to match the comment to a rung if the Owning Element is blank for that comment or if you override the import default by selecting Match all RLL rung comments by rung number only. For TEXTBOX entries, the absolute location of free-floating text boxes or the relative location from the owning element of attached text boxes. For absolute locations, the location contains both the sheet number and the X and Y coordinates of the text box. For relative locations, the location contains only the X and Y coordinates.

An RCOMMENT record follows this format.

RCOMMENT Structure with Commas

```
RCOMMENT,"Scope","Routine","Comment","Owning Element","Location"
```

RCOMMENT Structure with Tabs

```
RCOMMENT    "Scope"    "Routine"    "Comment"    "Owning Element"    "Location"
```

A TESTBOX record follows this format.

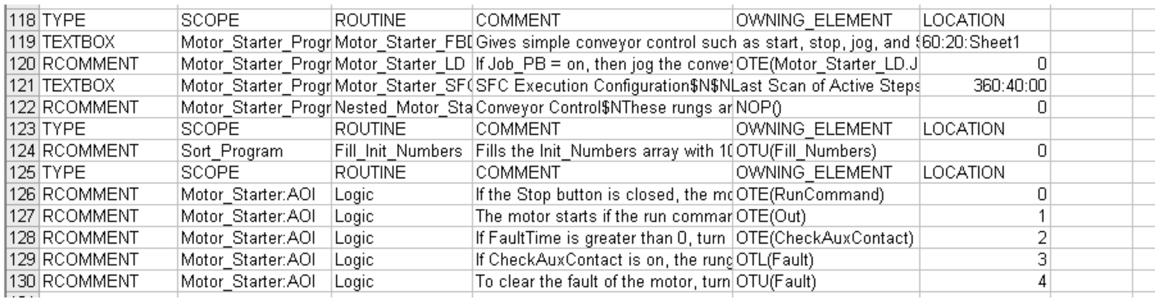
TEXTBOX Structure with Commas

```
TEXBOX,"Scope","Routine","Comment","Owning Element","Location"
```

TEXTBOX Structure with Tabs

```
TEXTBOX    "Scope"    "Routine"    "Comment"    "Owning Element"    "Location"
```

This example shows comment records in a CSV format.



118	TYPE	SCOPE	ROUTINE	COMMENT	OWNING_ELEMENT	LOCATION
119	TEXTBOX	Motor_Starter_Progr	Motor_Starter_FBD	Gives simple conveyor control such as start, stop, jog, and		60:20:Sheet1
120	RCOMMENT	Motor_Starter_Progr	Motor_Starter_LD	If Job_PB = on, then jog the convey	OTE(Motor_Starter_LD.J	0
121	TEXTBOX	Motor_Starter_Progr	Motor_Starter_SF(	SFC Execution Configuration$N$NLast Scan of Active Steps		360:40:00
122	RCOMMENT	Motor_Starter_Progr	Nested_Motor_Sta	Conveyor Control$NThese rungs ar	NOP()	0
123	TYPE	SCOPE	ROUTINE	COMMENT	OWNING_ELEMENT	LOCATION
124	RCOMMENT	Sort_Program	Fill_Init_Numbers	Fills the Init_Numbers array with 1(	OTU(Fill_Numbers)	0
125	TYPE	SCOPE	ROUTINE	COMMENT	OWNING_ELEMENT	LOCATION
126	RCOMMENT	Motor_Starter:AOI	Logic	If the Stop button is closed, the mc	OTE(RunCommand)	0
127	RCOMMENT	Motor_Starter:AOI	Logic	The motor starts if the run commar	OTE(Out)	1
128	RCOMMENT	Motor_Starter:AOI	Logic	If FaultTime is greater than 0, turn	OTE(CheckAuxContact)	2
129	RCOMMENT	Motor_Starter:AOI	Logic	If CheckAuxContact is on, the rung	OTL(Fault)	3
130	RCOMMENT	Motor_Starter:AOI	Logic	To clear the fault of the motor, turn	OTU(Fault)	4

Specify an alarm message record

An alarm tag can have several alarm message strings for different alarm conditions in different languages. An alarm message record includes this information.

Item	Identifies
Type	The alarm message and its associated language as: ALMMSG:*language* Languages: **EN-US** (United States English), **DE** (Germany German), **ES** (Spain Spanish), **FR** (France French), **IT** (Italian), **PT** (Brazil Portuguese), **JA** (Japanese), **KO** (Korean), **ZH** (Chinese)
Scope	The part of the project that owns the comment. A program or equipment phase must be specified.
Name	Name of the associated alarm tag.
Description	Text of the alarm message.
Datatype	The type of alarm. Specify **ALARM_DIGITAL** or **ALARM_ANALOG**.
Specifier	Specify the type of alarm. **Specify:** **For:** AM Digital alarm HH High-high analog alarm H High analog alarm L Low analog alarm LL Low-low analog alarm POS Rate-of-change positive analog alarm NEG Rate-of change negative analog alarm

An ALMMSG record follows this format.

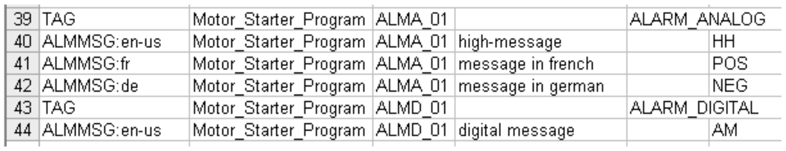
ALMMSG Structure with Commas

```
    ALMMS:language,"Scope","Name","Description","Datatype","
Specifier"
```

ALMMSG Structure with Tabs

```
        ALMMSG:language  "Scope"  "Name"  "Description"
"Datatype"  "Specifier"
```

This example shows alarm message records in a CSV format.

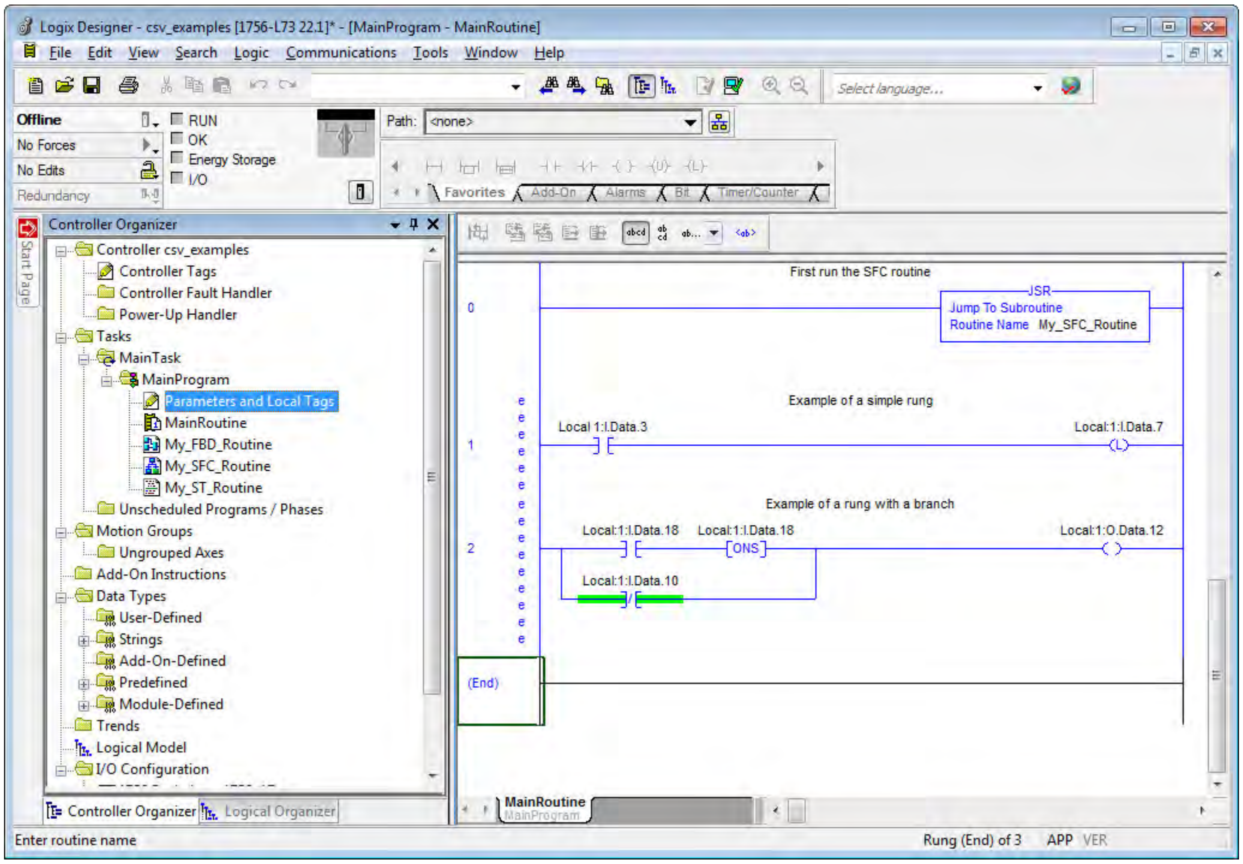


39	TAG	Motor_Starter_Program	ALMA_01		ALARM_ANALOG	
40	ALMMSG:en-us	Motor_Starter_Program	ALMA_01	high-message		HH
41	ALMMSG:fr	Motor_Starter_Program	ALMA_01	message in french		POS
42	ALMMSG:de	Motor_Starter_Program	ALMA_01	message in german		NEG
43	TAG	Motor_Starter_Program	ALMD_01		ALARM_DIGITAL	
44	ALMMSG:en-us	Motor_Starter_Program	ALMD_01	digital message		AM

Examples

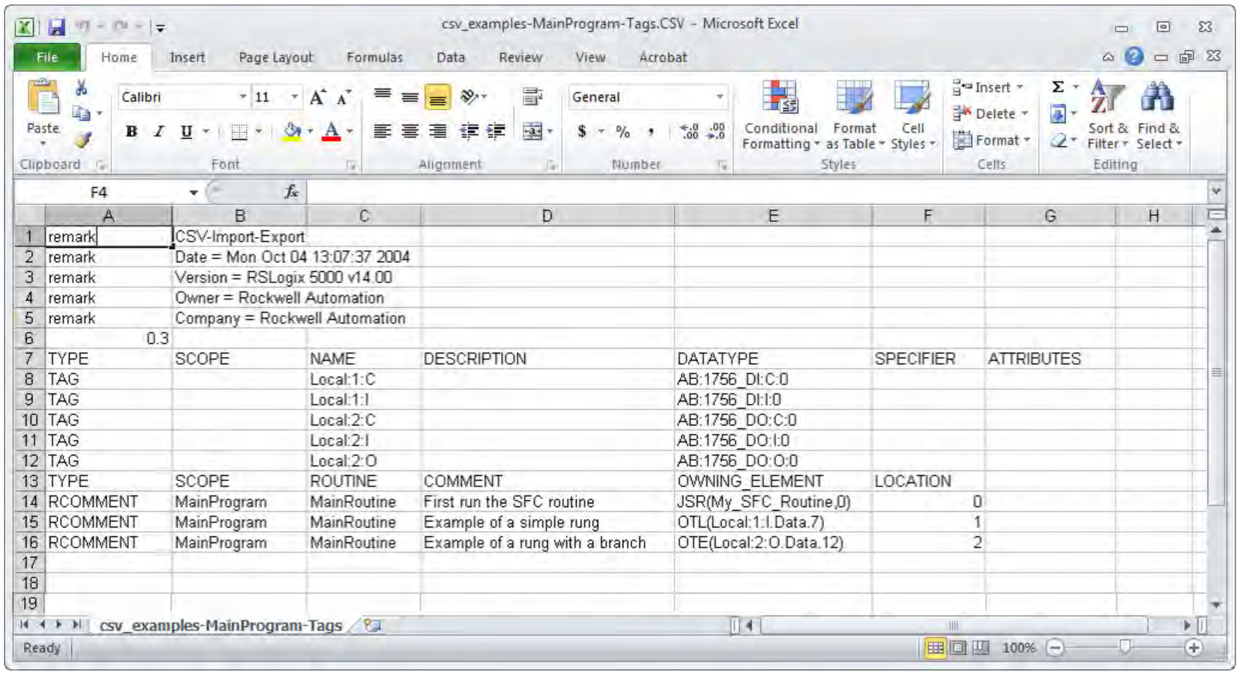
Example .CSV file

These examples use this ladder file.



Export all tags and comments

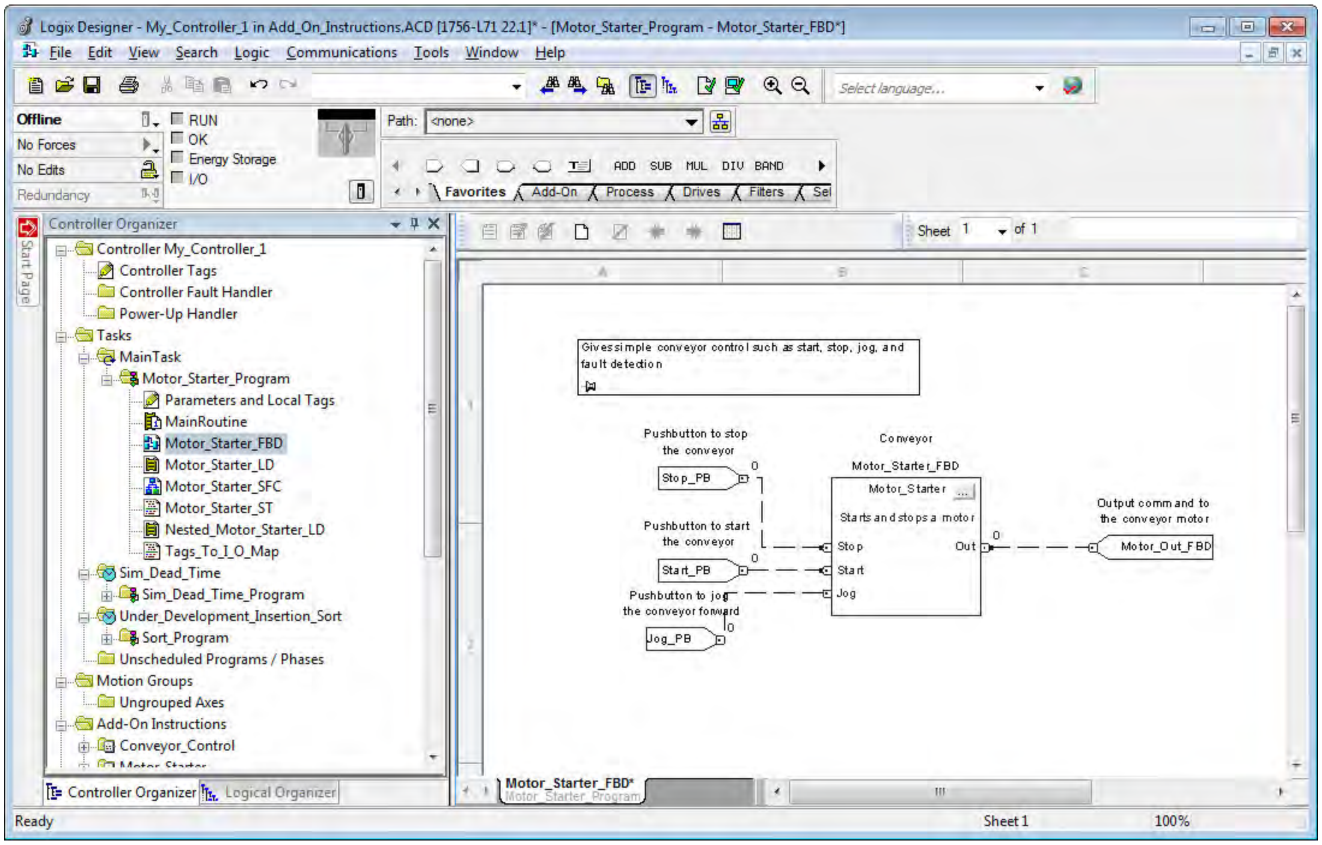
An export of all tags and comments results in this .CSV file.



	A	B	C	D	E	F	G	H
1	remark	CSV-Import-Export						
2	remark	Date = Mon Oct 04 13:07:37 2004						
3	remark	Version = RSLogix 5000 v14.00						
4	remark	Owner = Rockwell Automation						
5	remark	Company = Rockwell Automation						
6	0.3							
7	TYPE	SCOPE	NAME	DESCRIPTION	DATATYPE	SPECIFIER	ATTRIBUTES	
8	TAG		Local:1:C		AB:1756_DI:C:0			
9	TAG		Local:1:I		AB:1756_DI:I:0			
10	TAG		Local:2:C		AB:1756_DO:C:0			
11	TAG		Local:2:I		AB:1756_DO:I:0			
12	TAG		Local:2:O		AB:1756_DO:O:0			
13	TYPE	SCOPE	ROUTINE	COMMENT	OWNING_ELEMENT	LOCATION		
14	RCOMMENT	MainProgram	MainRoutine	First run the SFC routine	JSR(My_SFC_Routine,0)	0		
15	RCOMMENT	MainProgram	MainRoutine	Example of a simple rung	OTL(Local:1:I.Data.7)	1		
16	RCOMMENT	MainProgram	MainRoutine	Example of a rung with a branch	OTE(Local:2:O.Data.12)	2		
17								
18								
19								

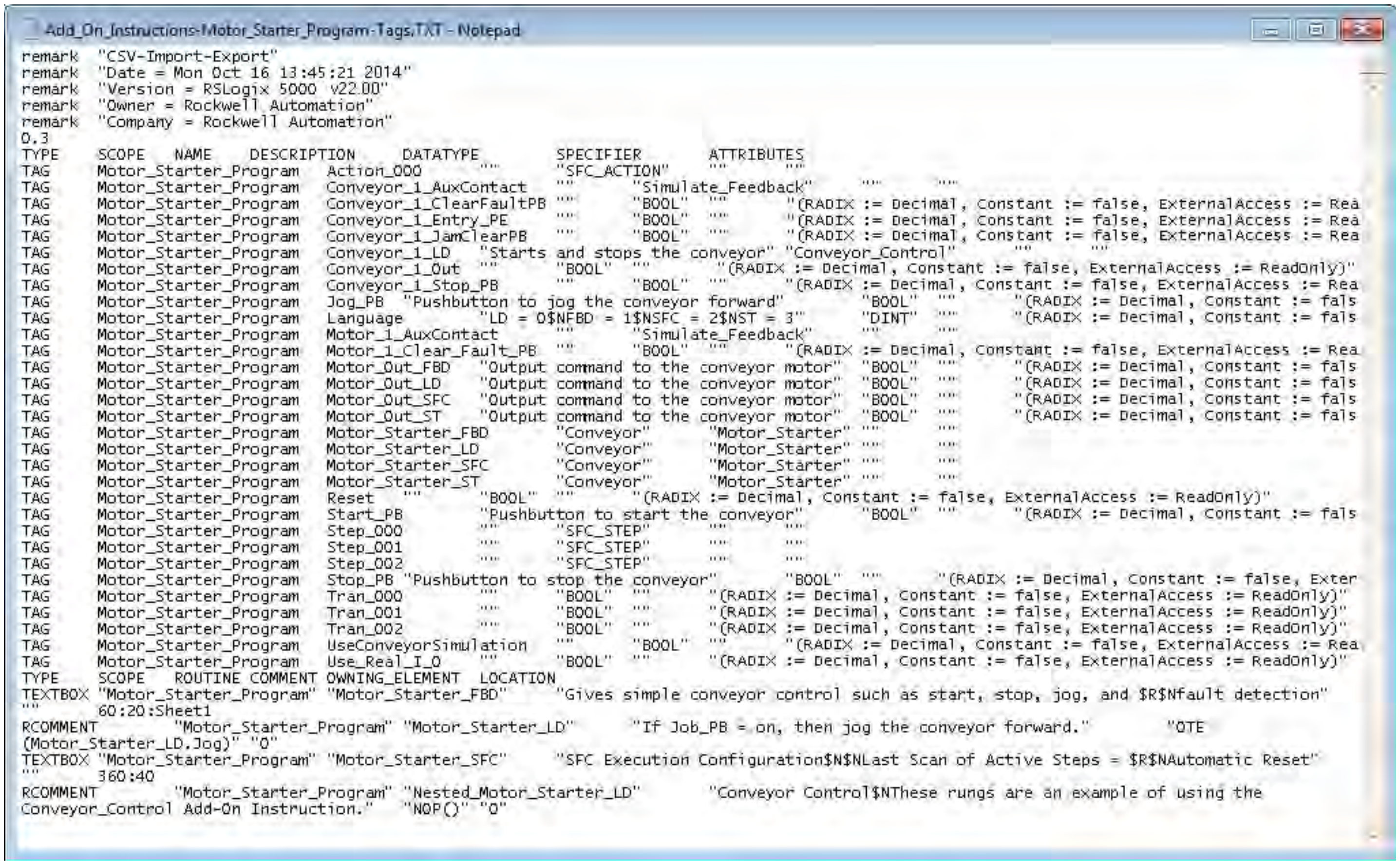
Example .TXT file

These examples use the Motor_Starter_Program program file and exports the program parameters and local tags.



Export program tags and comments

An export of the Motor_Starter_Prorgam program tags and comments results in this .TXT file.


Add_On_Instructions-Motor_Starter_Program-Tags.TXT - Notepad

```
remark  "CSV-Import-Export"
remark  "Date = Mon Oct 16 13:45:21 2014"
remark  "Version = RSLogix 5000 v22.00"
remark  "Owner = Rockwell Automation"
remark  "Company = Rockwell Automation"
0.3
TYPE    SCOPE   NAME    DESCRIPTION     DATATYPE        SPECIFIER       ATTRIBUTES
TAG     Motor_Starter_Program   Action_000      ""      "SFC_ACTION"    ""      ""
TAG     Motor_Starter_Program   Conveyor_1_AuxContact   ""      "Simulate_Feedback"     ""      ""
TAG     Motor_Starter_Program   Conveyor_1_ClearFaultPB ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Conveyor_1_Entry_PE     ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Conveyor_1_JamClearPB   ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Conveyor_1_LD   "Starts and stops the conveyor" "Conveyor_Control"      ""      ""
TAG     Motor_Starter_Program   Conveyor_1_Out  ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TAG     Motor_Starter_Program   Conveyor_1_Stop_PB      ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Jog_PB  "Pushbutton to jog the conveyor forward"        "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Language        "LD = 0$NFBD = 1$NSFC = 2$NST = 3"      "DINT"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Motor_1_AuxContact      ""      "Simulate_Feedback"     ""      ""
TAG     Motor_Starter_Program   Motor_1_Clear_Fault_PB  ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Motor_Out_FBD   "Output command to the conveyor motor"  "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Motor_Out_LD    "Output command to the conveyor motor"  "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Motor_Out_SFC   "Output command to the conveyor motor"  "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Motor_Out_ST    "Output command to the conveyor motor"  "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Motor_Starter_FBD       "Conveyor"      "Motor_Starter" ""      ""
TAG     Motor_Starter_Program   Motor_Starter_LD        "Conveyor"      "Motor_Starter" ""      ""
TAG     Motor_Starter_Program   Motor_Starter_SFC       "Conveyor"      "Motor_Starter" ""      ""
TAG     Motor_Starter_Program   Motor_Starter_ST        "Conveyor"      "Motor_Starter" ""      ""
TAG     Motor_Starter_Program   Reset   ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TAG     Motor_Starter_Program   Start_PB        "Pushbutton to start the conveyor"      "BOOL"  ""      "(RADIX := Decimal, Constant := fals
TAG     Motor_Starter_Program   Step_000        ""      "SFC_STEP"      ""      ""
TAG     Motor_Starter_Program   Step_001        ""      "SFC_STEP"      ""      ""
TAG     Motor_Starter_Program   Step_002        ""      "SFC_STEP"      ""      ""
TAG     Motor_Starter_Program   Stop_PB "Pushbutton to stop the conveyor"       "BOOL"  ""      "(RADIX := Decimal, Constant := false, Exter
TAG     Motor_Starter_Program   Tran_000        ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TAG     Motor_Starter_Program   Tran_001        ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TAG     Motor_Starter_Program   Tran_002        ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TAG     Motor_Starter_Program   UseConveyorSimulation   ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := Rea
TAG     Motor_Starter_Program   Use_Real_I_O    ""      "BOOL"  ""      "(RADIX := Decimal, Constant := false, ExternalAccess := ReadOnly)"
TYPE    SCOPE   ROUTINE COMMENT OWNING_ELEMENT  LOCATION
TEXTBOX "Motor_Starter_Program" "Motor_Starter_FBD"     "Gives simple conveyor control such as start, stop, jog, and $R$Nfault detection"
""      60:20:Sheet1
RCOMMENT        "Motor_Starter_Program" "Motor_Starter_LD"      "If Job_PB = on, then jog the conveyor forward."        "OTE
(Motor_Starter_LD.Jog)" "0"
TEXTBOX "Motor_Starter_Program" "Motor_Starter_SFC"     "SFC Execution Configuration$N$NLast Scan of Active Steps = $R$NAutomatic Reset"
""      360:40
RCOMMENT        "Motor_Starter_Program" "Nested_Motor_Starter_LD"       "Conveyor Control$NThese rungs are an example of using the
Conveyor_Control Add-On Instruction."   "NOP()" "0"
```

Considerations for using Microsoft Excel to edit a .CSV file

Introduction

This appendix describes how using Windows or Excel to edit a .CSV file can affect the file.

Important:	To edit the .CSV file, it is recommended that you use a database program tool, such as Access®, or a raw text editor. Many other desktop tools, such as Windows or Excel, might change the structure of the .CSV file and cause an import of the file to fail.

Recommendations

To use Microsoft Excel to edit your .CSV tag file:

- Use single quotes instead of double quotes within descriptions and comments.
- Do not create descriptions or comments that consist only of numbers, have leading zeros, or have a leading symbol that Microsoft Excel treats specially. For example, do not create descriptions, such as:

  002
  +2
  =2
  -2
  .0
- Do not create descriptions or comments that start with a +, -, or = symbol. If you add text after the symbol, Excel displays #NAME? in the cell.

Logix Designer data transformations

When Logix Designer application exports tags, it performs these conversions.

Original Content	Content in .CSV File After Export
′	$′
"	$Q
newline	NL
tab	$T
$	$$

Microsoft Excel Data Transformation

When you open the exported .CSV file in Excel, Excel makes these conversions.

Original Content	Content in .CSV File After Export	Content After Opening in Excel	Content After Saving from Excel	Details
.0	".0"	0	0	Logix Designer addresses this as the specifier for a tag. If you enter this as an entire comment, you lose any preceding period (.). If you enter any text before or after this, Excel maintains the content.
=2	"=2"	2	2	If you enter this as an entire comment, you lose any preceding equal sign (=). If you enter any text before or after this, Excel maintains the content.
+2	"+2"	2	2	If you enter this as an entire comment, you lose any preceding plus sign (+). If you enter any text before or after this, Excel maintains the content.
002	"002"	2	2	If you enter this as an entire comment, you lose any preceding zeros. If you enter any text before or after this, Excel maintains the content.
test string	"test string"	test string	test string	Excel puts quotes around cell contents only if there is an embedded comma. Logix Designer always places double quotes around text. But Logix Designer still can handle the description without quotes.
"test string"	"$"test string$""	$test string$""	"$test string$""""""	Excel and Logix Designer alter content when it includes a dollar sign ($).
has "quoted text" within string	"has $"quoted text$" within string"	has $quoted text$" within string"	"has $quoted text $"" within string""""	Excel and Logix Designer alter content when it includes a dollar sign ($).
this has ‘embedded’ text	this has $’embedded$’ text	this has $’embedded$’ text	this has $’embedded$’ text	Single quotes work in both software packages.
+text	"+text"	#NAME?	#NAME?	Do not start a description or comment with a plus sign (+).
-text	"-text"	#NAME?	#NAME?	Do not start a description or comment with a minus sign (-).
=text	"=text"	#NAME?	#NAME?	Do not start a description or comment with an equal sign (=).

Import/Export revision history

Introduction

This appendix contains a history of enhancements made to the import/export feature since L5K version 1.1, major revision 1, and minor revision 1 that was included with Logix Designer, version 8.0.

These releases of the import/export feature L5K version correspond to these releases of Logix Designer and the Logix Designer application.

RSLogix 5000 /Logix Designer Version	Import/Export L5K Version
30.xx	2.21
29.xx	2.20
28.xx	2.19
27.xx	2.18
26.xx	2.17
24.XX	2.15
23.xx	2.14
21.xx	2.12
20.xx	2.11
19.xx	2.10
18.xx	2.9
17.xx	2.8
16.xx	2.7
15.xx	2.6
13.xx	2.4
12.xx	2.3
11.xx	2.2
10.xx	2.1
9.00	2.0
5.02	1.2
8.xx, 7.xx, 6.xx, 2.xx	1.1
1.23, 1.21	1.0
1.11, 1.10	0.4

Backward compatibility

The import/export feature supports backward compatibility for import operations. Therefore, the application can import .L5K or .L5X files that are generated by a previous version of the programming software. In some cases, an older .L5K file might not correctly import into a newer version of the application. The revision history in this appendix lists any conditions when backward compatibility for an import operation does not work as expected.

The import/export feature **does not** support backward compatibility for export operations. Therefore, older versions of the application cannot read .L5K or .L5X files that are created with newer versions of the application. In some cases, a .L5K or .L5X file created with a newer version of the application may import with warnings into an older version of the application. In these cases, attributes on components may be set to default values during import.

Each version of the application exports .L5K files with a specific import/export L5K version number. The application imports any .L5K file with the same major revision number and the same or lower minor revision number. The major L5K revision number increments when there are conditions such that the application cannot support backward compatibility for L5K import operations. The minor L5K revision number increments whenever there is a change in the file, such as a new module, an attribute is added, or the set of options for an attribute is changed, that does not affect backward compatibility for L5K import operations.

.L5X files use the XML open standard format. L5X files do not have a revision number associated with them.

Important: Use caution when copying and pasting components between different versions of the application. The Logix Designer only supports pasting to the same version or newer version of the application. Pasting to a prior version of RSLogix 5000 software is not supported. When pasting to a prior version, the paste action may succeed, but the results may not be what you expect.

Import/Export version 2.21 Logix Designer application version 30

Version 2.21 of the Import/Export feature that is included with the Logix Designer application, version 30, includes the following major enhancements:

- Added the TrackingGroups attribute for routines, Add-On Instructions, and tags.
- Added encryption elements and attributes for routines and Add-On Instructions.

Import/Export version 2.20 Logix Designer application version 29

Version 2.20 of the Import/Export feature that is included with the Logix Designer application, version 29, includes the following major enhancement:

- Added the EtherNetIPMode controller attribute.

Import/Export version 2.19 Logix Designer application version 28

Version 2.19 of the Import/Export feature that is included with the Logix Designer application, version 28, includes these major enhancements:

- Added Equipment Sequence functionality.
- Added the Primary Action Set controller security attribute.
- Added the Permission Set controller attribute.

Import/Export version 2.18 Logix Designer application version 27

Version 2.18 of the Import/Export feature that is included with the Logix Designer application, version 27, includes these major enhancements:

- Added the custom properties functionality.
- Added the DownloadCustomProperties controller attribute.
- Added the HMI Button Control (HMIBC) instruction.

Import/Export version 2.17 Logix Designer application version 26

Version 2.17, major revision 2, minor revision 17, of the Import/Export feature that is included with the Logix Designer application, does not include any major enhancements.

Import/Export version 2.15 Logix Designer application version 24

Version 2.15, major revision 2, minor revision 15, of the Import/Export feature that is included with the Logix Designer application, version 24 includes these major enhancements:

- Removed support for the 1789-L60 controller.
- Added the ParameterConnections controller element with the EndPoint1 and EndPoint2 attributes.
- Added the SafetyEnabled and NATActualAddress module attributes.
- Added the SignatureID, SignatureTimestamp, SafetySignatureID Encoded Add-On Instruction attributes.
- Added the Sequencing tag attribute.
- Added the Alternate1UpdateMultiplier and Alternate2UpdateMultiplier motion group tag attributes.
- Added the AxisUpdateSchedule axis tag attribute.
- Added the UseAsFolder program attribute.
- Added the ChildPrograms program element with the child_program_name attribute.

There were no feature changes for the Import/Export feature for version 2.14, major revision 2, minor revision 14, included with the Logix Designer application, version 23.

Import/Export version 2.12 Logix Designer application version 21

Version 2.12, major revision 2, minor revision 12, of the Import/Export feature included with Logix Designer application, version 21 includes these major enhancements:

- Removed support for the following controllers: 1756-L61, 1756-L61S, 1756-L62, 1756-L62S, 1756-L63, 1756-L63S, 1756-L64, 1756-L65, 1768-L43, 1768-L43S, 1768-L45, 1768-L45S, 1769-L23E-QBF1, 1769-L23E-QBFC1, 1769-L23-QBFC1, 1769-L31, 1769-L32C, 1769-L32E, 1769-L35CR, 1769-L35E
- Added the PassThroughConfiguration controller attribute.
- Added Engineering Unit, State0, State1, Max, and Min attributes to datatype and tag components and Add-On Instructions parameters and local tags.
- Added new attributes for analog alarm tags: HHOperShelve, HOperShelve, LOperShelve, LLOperShelve, ROCPosOperShelve, ROCNegOperShelve, ProgUnshelveAll, HHOperUnshelve, HOperUnshelve, LOperUnshelve, LLOperUnshelve, HHMinDurationEnable, HMinDurationEnable, LMinDurationEnable, LLMinDurationEnable, ROCPosOperUnshelve, ROCNegOperUnshelve, ShelveDuration, MaxShelveDuration.
- Added new attributes for digital alarm tags: OperShelve, ProgUnshelve, OperUnshelve, ShelveDuration, MaxShelveDuration

Import/Export version 2.11 Logix Designer version 20

Version 2.11, major revision 2, minor revision 11, of the import/export feature included with Logix Designer, version 20 includes these major enhancements:

- Additional controllers supported.
- SecurityAuthorityID, SecurityAuthorityURI, ChangesToDetect, and Trusted Slots attributes added to the controller component.
- SignatureRunModeProtect attribute added to the safety controller system.
- ShutdownParentOnFault, DrivesADCMode, DrivesADCEnabled, and UserDefinedCatalogNumber added to the module component.
- ConfigScript sub section added to the L5K and L5X formats of the module component.
- Priority, InputConnectionType, OutputRedundantOwner, InputProductionTrigger, ConnectionPath, InputTagSuffix, and OutputTagSuffix attributes added to the module connection component.
- LargePackageUsage attributed added for message tags.
- MasterInputConfigurationBits and MasterPositionFilterBandwidth attributes added for coordinate system tags.

- AdditionalBusCapacitance and InterpolatedPositionConfiguration attributes added for axis tags.
- Internet Protocol, Ethernet Ports, and Ethernet Network controller configuration objects added for controllers that have embedded Ethernet ports in them.

Import/Export version 2.10 Logix Designer version 19

Version 2.10 (major revision 2, minor revision 10) of the import/export feature included with Logix Designer, version 19 includes these major enhancements:

- Procedures for configuring source-protected components in encrypted or clear text format.
- ControlLogix 1756-L73 and 1756-L75 controllers added to the list of processor types.

Import/Export version 2.8 Logix Designer version 18

Version 2.8, major revision 2, minor revision 9, of the import/export feature included with Logix Designer, version 18 includes these major enhancements:

- Addition of ControlLogix 1756-L73 and 1756-L75 controller types and Compact GuardLogix®1768-L43S and 1768-L45S controller types.
- Addition of CanUseRPIFromController attribute to the Controller component.
- Addition of the WatchList element to a Controller declaration.
- Addition of TagType and AliasFor parameters to the L5X format of the Add-On Instruction definition
- Addition of safety abilities to Add-On Instructions.
- Addition of the External Access and Constant attributes to Tag components.
- Addition of new attributes to axis tags,

This version of import/export also supports the AXIS_CIP_DRIVE tag. For information, see the Integrated Motion on the Ethernet/IP Network Configuration and Startup User Manual, publication MOTION-UM003**.**

- Addition of MinimumRPI, MaximumRPI, and DefaulRPI attributes to ta produced Tag component.
- Addition of attributes to support unicast communication for I/O modules on EtherNet/IP networks:

  - Unicast attribute added to the Connection element of the Module component.
  - Unicast attribute added to the SafetyProducedTag component.
  - UnicastPermitted attribute added to the SafetyConsumedTag component.

Import/Export version 2.8 Logix Designer version 17

Version 2.8, major revision 2, minor revision 8, of the import/export feature included with Logix Designer, version 17 includes these major enhancements:

- 1756-L63S GuardLogix® safety controller and safety relay ladder instructions.
- 1756-L65, 1768-L45, 1769-L23E-QB1, 1769-L23E-QBFC1, 1769-L23-QBFC1 controllers.
- A tag *IncludeConnectionStatus* attribute is no longer exported.
- The L5X format for rung export has been modified such that rung UIDs are no longer included in the export format.

Import/Export version 2.7 Logix Designer version 16

Version 2.7, major revision 2, minor revision 7, of the import/export feature included with Logix Designer, version 16 includes these major enhancements:

- 1756-L61S and 1756-L62S GuardLogix safety controllers and safety relay ladder instructions.
- 1756-L64 ControlLogix controller.
- Updated CONTROLLER example.
- Add-On Instructions.
- Alarms
  - New alarm instructions: ALMA, ALMD.
  - Digital and analog alarm tags.
- New instructions
  - Motion instructions: MCT, MCTP.
  - Safety instructions: DIN, RIN, ESTOP, ENPEN, LC, FPMS, ROUT, THRS.
- Addition of ShareUnusedTimeSlice and InhibitAutomaticFirmwareUpdate attributes to the CONTROLLER component.

- Addition of UserDefinedVendor, UserDefinedProductType, userDefinedProductCode, UserDefinedMajor, and UserDefinedMinor attributes to the MODULE component.
- Addition of LINT data type.
- Addition of Unicast and UnicastPermitted attributes to the TAG component.
- Additional attributes and valid values for existing attributes to AXIS tags.
- Additional attributes for COORDINATE_SYSTEM tags.
- Source protected routines and Add-On-Instructions appear as encrypted data in export files. In previous releases, source protected data was not exported at all.
- Addition of SynchronizeRedundancyDataAfterExecution attribute to the PROGRAM component.
- Additional CONFIG attributes.
- New export TXT format for rungs and logic comments that uses tabs to separate values. This format is similar to the CSV format that uses commas to separate values.

  The CSV and TXT formats also include text box comments from function block and sequential function chart logic.

Import/Export version 2.6 Logix Designer version 15

Version 2.6, major revision 2, minor revision 6, of the import/export feature included with Logix Designer, version 15 includes these major enhancements:

- Support for the 1769-L32C, 1769-L32CR CompactLogix and 1768-L43 CompactLogix controllers.

  This release also removed support for the 1756-L1 CompactLogix, 1794-L33 FlexLogix, 1769-L20 CompactLogix, 1769-L30 CompactLogix, and PowerFlex 700 S controllers.
- Equipment Phase program type and its relay ladder and structured text instructions.
- ControlLogix and SoftLogix controllers now support 100 programs per task.
- Information about when an imported file modifies a project so that you cannot go online and access a previously downloaded controller.
- Additional values for the Mode attribute of a MODULE component.
- New SERCOS IDN Read and SERCOS IDN Write message types.
- New motion AXIS_GENERIC_DRIVE type.

- Removal of the DescriptionWidth parameter from the STEP, TRANSITION, and STOP components in SFC logic.
- Addition of an Attributes column to the CSV format for exported tags.

Import/Export version 2.4 Logix Designer version 13

Version 2.4, major revision 2, minor revision 4, of the import/export feature included with Logix Designer, version 13 includes these major enhancements:

- Support for new controllers.
- ExtendedProp section to MODULE data.
- Support for new TAG attributes.

  Attributes can be in any order in an import/export file. The order shown in this document is the order the attributes export.
- Support for a TREND object in the import/export .L5K file.
- New MCSV instruction in ladder logic (chapter 4) and structured text.
- Online editing support for structured text and sequential function chart logic.
- Updated CSV format now includes rung comments.
- New L5X format for partial import/export of ladder rungs, tags, and trends.

Import/Export version 2.3 Logix Designer version 12

Version 2.3, major revision 2, minor revision 3, of the import/export feature included with Logix Designer, version 12.01 includes these major enhancements:

- The structured text component changed from STX_ROUTINE to ST_ROUTINE. The LanguageType attribute in SFC routines for embedded structured text also changed from STX to ST.
- Support for new controllers.
- Addition of the ControlNetSignature attribute to the MODULE component.
- Addition of the ProgrammaticallySendEventTrigger attribute to the TAG component.
- New COORDINATE_SYSTEM tag.
- Addition of several new attributes to the axis tag types.
- Addition of DisableFlag attribute to the PROGRAM component.
- Addition of EventTrigger and EventTag attributes to the TASK component to support Event tasks.
- New EVENT, IOT, MCCD, MCCM, MCLM, MCS, MCSD, and MCSR instructions in ladder logic and structured text.

- Addition of information regarding the LOGIC block when exporting online function block logic.
- Addition of new modules and their valid CommMethod and ConfigMethod values.

Import/Export version 2.2 Logix Designer version 11

Version 2.2, major revision 2, minor revision 2, of the import/export feature included with Logix Designer, version 11.10 includes these major enhancements:

- Support for the 1756-L63 controller.
- New controller attributes to support sequential function charts.
- Corrected the DATATYPE attributes and added the FamilyType attribute.
- Additional information for the CompatibleModule and KeyMask attributes of the MODULE component.
- Addition of RSNetWorxFileName attribute to the MODULE component.
- Addition of SFC_ACTION, SFC_STEP, and SFC_STOP tag types.
- Addition of 38400 as a supported serial port baud rate.
- Addition of structured text instructions.
- Addition of EOT, SFR, and SFP instructions to relay ladder and structured text.
- Addition of sequential function chart components.
- Addition of an appendix that lists the valid CommMethod and ConfigMethod values for the supported I/O modules.

Beginning with version 2.2, multi-line rung comments with hard returns are no longer exported as one long string in double-quotes. Instead, each line of a multi-line rung comment is on a separate line in the .L5K file with double-quotes around each line. When imported, the multiple quoted strings are concatenated to form the rung comment. This improves the readability of the .L5K text file by using the existing multiple-string capability of the rung comment syntax. Older formats still work on import.

Import/Export version 2.1 Logix Designer version 10

Version 2.1, major revision 2, minor revision 1, of the import/export feature included with Logix Designer, version 10.0 includes these major enhancements:

- Removal of the characters when specifying a controller type.
- Addition of the SecurityCode attribute to the Controller object.
- Enhancements to the Message tag structure. See page 264 on page 266.
- The Program object now includes a Mode attribute.
- Correction to valid values for Watchdog and Rate attributes of the Task object.

- Addition of MaxStationAddress and TokenHoldFactor attributes to the Config DF1 object.
- Addition of new instructions: SIZE, SWPB, LOWER, and UPPER.
- The NumberOfAppendChars of the Config ASCII object is no longer exported. If you have an import/export file with any of these attributes, the file will correctly import into the software. This attributes will be removed when you export the file.

Changes to support MESSAGE tag enhancements

Version 2.1 (major revision 2, minor revision 1) of the import/export feature that is included with Logix Designer 2 programming software, version 10.0 made significant changes to the MESSAGE tag. For reference, this table shows the MESSAGE tag structure of the previous import/export release.

MESSAGE Tag Structure (Version 2.0)

Attribute	Description
Description	Provide information about the tag. Specify Description := "*text*"
Comment	Provide information about a tag component. Specify Comment<*specifier*> := "*text*" Where the *specifier* is: .*bitnumber*for a bit in the tag [*element*]for an array element of the tag .*membername*for a structure member of the tag
MessageType	Type **Block Transfer Read**, **Block Transfer Write**, **CIP Data Table Read**, **CIP Data Table Write, CIP Generic**, **PLC2 Unprotected Read, PLC2 Unprotected Write**, **PLC3 Typed Read**, **PLC3 Typed Write**, **PLC3 Word Range Read**, **PLC3 Word Range Write**, **PLC5 Typed Read**, **PLC5 Typed Write**, **PLC5 Word Range Read**, **PLC5 Word Range Write**, **SLC Typed Read**, or **SLC Typed Write**. Specify MessageType := *text*
RequestedLength	Specify the number of elements in the message instruction (0...32,767). Specify RequestedLength := *value*
ConnectionPath	Specify the connection path to the other device. Specify ConnectionPath := *string*
DF1DHFlag	If the communication method uses DH+, type 1. If the communication method does not use DH+, type 0. Specify DF1DHFlag := *value*
LocalTag	Specify the tag name of the element in the local device. Specify LocalTag := *text*
RemoteElement	Specify the tag name of the element in the remote device. Specify RemoteElement := *value*
DHPlusSourceLink	If the communication method uses DH+, specify the source link (0...65,535). Specify DHPlusSourceLink := *value*
DHPlusDestinationLink	If the communication method uses DH+, specify the destination link (0...65,535). Specify DHPlusDestinationLink := *value*
DHPlusDestinationNode	If the communication method uses DH+, specify the destination node number (0...63 octal). Specify DHPlusDestinationNode := *value*

Attribute	**Description**
DHPlusChannel	If the communication method uses DH+, specify the DH+ channel. Type **A** or **B**. Specify DHPlusChannel := *letter*
CacheConnections	If the message is to cache connections, type **TRUE**. If the message is not to cache connections, type **FALSE**. Specify CacheConnections := *text*
ServiceCode	If the message type is CIP Generic, specify the service code (0...255 hexadecimal). Specify ServiceCode := #16*value*
ObjectType	If the message type is CIP Generic, specify the object type (0...65,535 hexadecimal). Specify ObjectType := *16#value*
TargetObject	If the message type is CIP Generic, specify the target object (0...65,535 decimal). Specify TargetObject := *value*
AttributeNumber	If the message type is CIP Generic, specify the attribute number (0...65,535 hexadecimal). Specify AttributeNumber := *16#value*
DestinationTag	Specify the tag name of the destination element. Specify DestinationTag := *text*

Import/Export version 2.0 Logix Designer version 9

Version 2.0 (major revision 2, minor revision 0) of the import/export feature included with Logix Designer, version 9.0 includes these major enhancements:

- Replaced the AXIS tag with AXIS_CONSUMED, AXIS_SERVO, AXIS_SERVO_DRIVE, and AXIS_VIRTUAL tags.
- For any attribute that you can specify a *not applicable* state, type **<NA>**, rather than NA.
- Revised manual that includes a description and example of the STRING data type.

Important: Version 9 of Logix Designer only supports ControlLogix processors.

Motion changes to support the SERCOS Protocol

Version 2.0, major revision 2, minor revision 0, of the import/export feature included with Logix Designer, version 9.0 includes significant changes to motion-related tags to support the SERCOS protocol.

- CoarseUpdatePeriod and AutoTagUpdate parameters were added to the MOTION_GROUP tag to support SERCOS. For reference, the previous structure is described on page 267 on page 268.
- Earlier versions of the import/export feature supported one AXIS tag. To support SERCOS, the import/export feature replaced AXIS with four axis tags: AXIS_CONSUMED, AXIS_SERVO, AXIS_SERVO_DRIVE, and AXIS_VIRTUAL. The previous AXIS tag is incorporated into these new

tags, but no longer exists as its own tag. For reference, the AXIS structure is described on page 267 on page 268.

If you have a version 8.0 import/export file with AXIS tags that you import into version 9.0 software, after changing the import/export version line to 2.0), the AXIS tags convert to:

If the AXIS type is:	It Converts to:
Unused	AXIS_SERVO
Position only	AXIS_SERVO
Servo	AXIS_SERVO
Consumed	AXIS_CONSUMED
Virtual	AXIS_VIRTUAL

MOTION_GROUP tag structure (version 1.1)

Attribute	Description
Description	Provide information about the tag. Specify Description := "*text*"
Comment	Provide information about a tag component. Specify Comment<*specifier*> := "*text*" Where the *specifier* is: *.bitnumber*for a bit in the tag [*element*]for an array element of the tag *.membername*for a structure member of the tag
GroupType	Specify the type of motion group, such as Independent. Specify GroupType := *text*
CoarseUpdateMultiplier	Specify the coarse update rate (5-320ms). Specify CoarseUpdateMultiplier := *value*
ServoUpdatePeriod	Specify the servo update period in milliseconds (any positive number) Specify ServoUpdatePeriod := *value*
PhaseShift	Specify the phase shift (0-65,535). Specify PhaseShift := *value*
GeneralFaultType	Specify whether an error generates a major fault or a non-major fault. Type **Major Fault** or **Non Major Fault**. Specify GeneralFaultType := *text*

AXIS tag structure (version 1.1)

AXIS tag attributes (version 1.1)

Attribute	Description
Description	Provide information about the tag. Specify Description := "*text*"

Attribute	**Description**
Comment	Provide information about a tag component. Specify Comment<*specifier*> := "*text*" Where the *specifier* is: *.bitnumber*for a bit in the tag [*element*]for an array element of the tag *.membername*for a structure member of the tag
MotionGroup	Type the name of the associated motion group, or type **NA**. Specify MotionGroup := *text*
MotionModule	Type the name of the associated motion module, or type **NA**. Specify MotionModule := *text*
AxisState	Type **Axis-Ready**, **Direct Drive Control**, **Servo Control**, **Axis Faulted**, or **Axis Shutdown**. Specify AxisState := *text*
PositionUnits	Specify the type of units. Specify PositionUnits := *text*
TimeUnits	Type **Seconds** or **Minutes**. Specify TimeUnits := *text*
InstructionSpeedUnits	Type **Percentage** or **Engineering Units**. Specify InstructionSpeedUnits := *text*
InstructionAccelDecelUnits	Type **Percentage** or **Engineering Units**. Specify InstructionAccelDecelUnits := *text*
InstructionMoveProfile	Type **Trapezoidal** or **S-Curve**. Specify InstructionMoveProfile := *text*
InstructionJogProfile	Specify **Trapezoidal** or **S-Curve**. Specify InstructionJogProfile := *text*
ConversionConstant	Specify the conversion constant. Type a real number from 1.0...1.0e9. Specify ConversionConstant := *value*
HomeMode	Type **Passive** or **Active**. Specify HomeMode := *text*
HomeSequenceType	Type **Immediate Home**, **Home To Switch**, **Home To Marker Only**, or **Home To Switch With Marker**. Specify HomeSequenceType := *text*
HomePosition	Specify the home position (any positive number). Specify HomePosition := *value*
HomeSpeed	Specify the home speed (any positive number). Specify HomeSpeed := *value*
HomeReturnSpeed	Specify the home return speed (any positive number). Specify HomeReturnSpeed := *value*
MaximumSpeed	Specify the maximum speed (any positive number). Specify MaximumSpeed := *value*
MaximumAcceleration	Specify the maximum acceleration (any positive number). Specify MaximumAcceleration := *value*
MaximumDeceleration	Specify the maximum deceleration (any positive number). Specify MaximumDeceleration := *value*
ProgrammedStopMode	Type **Fast Stop**, **Fast Shutdown**, or **Hard Shutdown**. Specify ProgrammedStopMode := *text*

Attribute	**Description**
AverageVelocityTimebase	Specify the average velocity timebase (any positive number). Specify AverageVelocityTimebase := *value*
ServoStatusUpdateBits	Specify the servo status update bits. Type a hexadecimal number. Specify ServoStatusUpdateBits := 16#*value*
MotionConfigurationBits	Specify the motion configuration bits. Type a hexadecimal number. Specify MotionConfigurationBits := 16#*value*
AxisType	Type **Unused**, **Position Only**, **Servo**, **Consumed**, or **Virtual**. Specify AxisType := *text*
PositionUnwind	Specify the unwind position (0-65,535). Specify PositionUnwind := *value*
MaximumPositiveTravel	Specify the maximum positive travel (any positive number). Specify MaximumPositiveTravel := *value*
MaximumNegativeTravel	Specify the maximum negative travel (any positive number). Specify MaximumNegativeTravel := *value*
PositionErrorTolerance	Specify the position error tolerance (any positive number). Specify PositionErrorTolerance := *value*
PositionLockTolerance	Specify the position local tolerance (any positive number). Specify PositionLockTolerance := *value*
PositionProportionalGain	Specify position proportional gain (any positive number). Specify PositionProportionalGain := *value*
PositionIntegralGain	Specify the position integral gain (any positive number). Specify PositionIntegralGain := *value*
VelocityFeedforwardGain	Specify the velocity feedforward gain (any positive number). Specify VelocityFeedforwardGain := *value*
AcclerationFeedforwardGain	Specify the acceleration feedforward gain (any positive number). Specify AccelerationFeedforwardGain := *value*
VelocityProportionalGain	Specify the velocity proportional gain (any positive number). Specify VelocityProportionalGain := *value*
VelocityIntegralGain	Specify velocity integral gain (any positive number). Specify VelocityIntegralGain := *value*
OutputFilterBandwidth	Specify output filter bandwidth (any positive number). Specify OutputFilterBandwidth := *value*
OutputScaling	Specify the output scaling (any positive number). Specify OutputScaling := *value*
OutputLimit	Specify the output limit (any positive number). Specify OutputLimit := *value*
OutputOffset	Specify output offset (any positive number). Specify OutputOffset := *value*
FrictionCompensation	Specify friction compensation (any positive number). Specify FrictionCompensation := *value*
SoftOvertravelFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**. Specify SoftOvertravelFaultAction := *text*
PositionErrorFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**. Specify PositionErrorFaultAction := *text*

Attribute	Description
EncoderLossFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**. Specify EncoderLossFaultAction := *text*
EncoderNoiseFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**. Specify EncoderNoiseFaultAction := *text*
DriveFaultAction	Type **Shutdown**, **Disable Drive**, **Stop Motion**, or **Status Only**. Specify DriveFaultAction := *text*
ServoConfigurationBits	Specify the servo configuration bits. Type a hexadecimal number. Specify ServoConfigurationBits := 16#*value*
MotorEncoderTestIncrement	Specify the motor encoder test increment (any positive number). Specify MotorEncoderTestIncrement := *value*
TuningTravelLimit	Specify the tuning travel limit (any positive number). Specify TuningTravelLimit := *value*
TuningSpeed	Specify the tuning speed (any positive number). Specify TuningSpeed := *value*
DampingFactor	Specify the damping factor (any positive number). Specify DampingFactor := *value*
PositionServoBandwidth	Specify position servo bandwidth (any positive number). Specify PositionServoBandwidth := *value*
TuningConfigurationBits	Specify the tuning configuration bits. Type a hexadecimal number. Specify TuningConfigurationBits := 16#*value*

Import/Export version 1.1 Logix Designer version 8

Version 1.1, major revision 1, minor revision 1, of the import/export feature included with Logix Designer, version 8.0 includes these major enhancements:

- Function block instructions and routines.
- ASCII instructions.
- Verification of all instruction attributes and parameters.

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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.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator available at http://www.rockwellautomation.com/locations, or contact your local Rockwell Automation representative.

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.

United States	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.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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.

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