

ControlLogix Enhanced Redundancy System

Catalog Numbers 1756-RM, 1756-RMXT, 1756-RM2, 1756-RM2XT



Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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.



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.

IMPORTANT

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

Allen-Bradley, ControlFLASH, ControlLogix, FactoryTalk, PanelView, PhaseManager, Rockwell Software, Rockwell Automation, RSLinx, RSLogix, RSNetWorx, VersaView, RSView32, Logix5000, ControlLogix-XT, Integrated Architecture, Stratix 8000, PowerFlex, POINT I/O are trademarks of Rockwell Automation, Inc.

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This publication contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the right of this paragraph.

New and Updated Information

This table contains the changes made to this publication revision.

Table 1 - New and Updated Information

Topic	Page
This publication includes the addition of the 1756-RM2/A and 1756-RM2XT modules. 1756-RM2/A or 1756-RM2XT modules can only be used with other 1756-RM2/A or 1756-RM2XT modules. You cannot mix 1756-RM2/A and 1756-RM2XT modules with 1756-RM/A, 1756-RM/B or 1756-RMXT modules.	
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Notes:

This publication provides this information specific to enhanced redundancy systems:

- Design and planning considerations
- Installation procedures
- Configuration procedures
- Maintenance and troubleshooting methods

This publication is designed for use by anyone responsible for planning and implementing a ControlLogix® enhanced redundancy system:

- Application engineers
- Control engineers
- Instrumentation technicians

The contents of this publication are for those who already have an understanding of Logix5000™ control systems, programming techniques, and communication networks.

IMPORTANT The 1756-RM2/A and 1756-RM2XT modules are interference-free with regard to safety functions and can be used in ControlLogix SIL2 applications.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Table 2 - Additional Documentation

Resource	Description
1756 ControlLogix Controllers Specifications Technical Data, publication 1756-TD001	Contains specifications on ControlLogix controllers and redundancy modules.
1715 Redundant I/O Specifications, publication 1715-TD001	Contains specifications on a Redundant I/O system.
1715 Redundant I/O System User Manual, publication 1715-UM001	Contains information on how to install, configure, program, operate and troubleshoot a Redundant I/O system.
ControlLogix Controllers User Manual, publication 1756-UM001	Contains information on how to install, configure, program, and operate a ControlLogix system.
Logix5000 Controllers General Instructions Reference Manual, publication 1756-RM003	Contains information on RSLogix™ 5000 programming instructions.
Logix5000 Controllers Quick Start, publication 1756-QS001 .	Provides detailed information about how to use ControlLogix controllers.
ControlFLASH™ Firmware Upgrade Kit Quick Start, publication 1756-QS105	Contains information on how to upgrade module firmware.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

The following publications provide specific information about communication module connections.

Table 3 - Additional Documentation

Resources	Description
1756 Communication Modules Specifications Technical Data, publication 1756-TD003	Describes Ethernet communication module specifications.
ControlNet Modules in Logix5000 Control Systems User Manual, publication CNET-UM001	Describes ControlNet modules and how to use ControlNet modules with a Logix5000 controller.
EtherNet/IP Modules in Logix5000 Control Systems, publication ENET-UM001	Describes how to use EtherNet/IP communication modules with your Logix5000 controller and communicate with various devices on the Ethernet network.
Ethernet Design Considerations for Control System Networks, publication ENET-S0001	Provides fundamental best-practice guidelines for designing the Ethernet infrastructure for your Supervisory Controls and Data Acquisition (SCADA) and MES (Manufacturing Execution Systems) systems with Rockwell Automation software and hardware products.
EtherNet/IP Embedded Switch Technology Application Guide, publication ENET-AP005	Describes how to configure and implement a device-level ring topology.
EtherNet/IP Socket Interface Application Technique, publication ENET-AT002	Describes the socket interface used to program MSG instructions to communicate between a Logix5000 controller via an EtherNet/IP module and Ethernet devices that do not support the EtherNet/IP application protocol, such as bar code scanners, RFID readers, or other standard Ethernet devices.

You can view or download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation sales representative.

About Enhanced Redundancy Systems

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The ControlLogix Enhanced Redundancy System is a system that provides greater availability because it uses a redundant chassis pair to maintain process operation when events, such as a fault on a controller, occur that stop process operation on nonredundant systems.

The redundant chassis pair includes two synchronized ControlLogix chassis with identically specific components in each. For example, one redundancy module and at least one ControlNet or EtherNet/IP communication module are required.

Controllers are typically used in enhanced redundancy systems, but are not required if your application only requires communication redundancy. Your application operates from a primary chassis, but can switch over to the secondary chassis and components if necessary.

Features of the ControlLogix Enhanced Redundancy System

The software and hardware components required to configure and use a ControlLogix enhanced redundancy system provide these features:

- Redundancy module speeds of up to 1000 Mbps when using a 1756-RM2/A module with another 1756-RM2/A module. Redundancy module speeds up to 100 Mbps when using a 1756-RM/A with another 1756-RM/A module, and a 1756-RM/B module with another 1756-RM/B module.
- Redundant fiber ports for crossloading; no single point of failure of a fiber cable.
- Plug-and-play-style commissioning and configuration that does not require extensive programming.
- ControlNet and EtherNet/IP network options for the redundant chassis pair.
- Easy-to-use, fiber-optic communication cable that connects redundant chassis pairs. Use the same cable for the 1756-RM2/A or 1756-RM/B modules.
- Simple redundant controller configuration by using a checkbox in the Controller Properties dialog box in RSLogix 5000 software.
- A redundancy system ready to accept commands and monitor the redundant system states after basic installation, connection, and powerup.
- Switchovers occur as fast as 20 ms.
- Support for these FactoryTalk® applications for EtherNet communication modules:
 - FactoryTalk Alarms and Events
 - FactoryTalk Batch
 - FactoryTalk PhaseManager™
- Support for CIP Sync technology over an EtherNet/IP network to establish time coordination across the enhanced redundant system.
- Access to remote I/O modules over an EtherNet/IP network.
- Access to 1715 Redundant I/O systems over an EtherNet/IP network.
- 1756-EN2T socket support.

Features Not Supported

- Any motion feature
- Any SIL3 functional safety feature within the redundancy controllers
- Firmware Supervisor
- Event Tasks
- Firmware revision 19.052 for 1756-L7x controller

IMPORTANT For Ethernet modules, signed and unsigned firmware are available. Signed modules provide the assurance that only validated firmware can be upgraded into a module.

Signed and unsigned firmware:

- Both signed and unsigned firmware are available.
- Product is shipped with unsigned firmware. To obtain signed firmware, you must upgrade your product's firmware.
- To obtain signed and unsigned firmware, go to [Get Support Now](#).
- Once signed firmware is installed, subsequent firmware upgrades must be signed also.

There are no functional/feature differences between signed and unsigned communication modules.

Enhanced Redundancy System Components

Communication between a redundant chassis pair that includes matching components makes redundancy possible.

Each chassis in the redundant chassis pair contains these ControlLogix components:

- One ControlLogix power supply - Required
- One ControlLogix redundancy module - Required

Redundancy modules link the redundant chassis pair to monitor events in each of chassis and initiate system responses as required.

- At least one ControlLogix ControlNet or EtherNet/IP communication module - Required
- Up to two controllers - Optional

In addition, redundant chassis are connected to other components outside the redundant chassis pair, for example, remote I/O chassis or human-machine-interfaces (HMIs).

For more information about components you can use in an enhanced redundancy system, see [Chapter 2, Design an Enhanced Redundancy System on page 23](#).

I/O Modules in Enhanced Redundancy Systems

In an enhanced redundancy system, you can use only I/O modules in a remote chassis. You **cannot use I/O modules in the redundant chassis pair**.

This table describes differences in network use for I/O in enhanced redundancy systems.

Remote I/O Module Placement	Available with Enhanced System, Revision 19.052, 19.053, or 20.054	Available with Enhanced System, Revision 16.081 or Earlier
EtherNet/IP I/O network	✓	
1715 Redundant I/O System	✓	
ControlNet network	✓	✓
DeviceNet network ⁽¹⁾	✓	✓
Data Highway Plus ⁽¹⁾	✓	✓
Universal Remote I/O ⁽¹⁾	✓	✓

(1) In an enhanced redundancy system, you can access remote I/O modules on this network only via a ControlNet or EtherNet/IP network bridge.

For more information on using remote and 1715 redundant I/O over an EtherNet network, see [I/O Placement on page 44](#) and the Redundant I/O System User Manual, publication [1715-UM001](#).

Enhanced Redundancy System Operations

Once the redundancy modules in the redundant chassis pair are connected and powered, they determine which chassis is the primary chassis and which is the secondary chassis.

The redundancy modules in both the primary and secondary chassis monitor events that occur in each of the redundant chassis. If certain faults occur in the primary chassis, the redundancy modules execute a **switchover** to the unfaulted, secondary chassis.

System Qualification and Synchronization

When the enhanced redundant system is first started, the redundancy modules run checks on the redundant chassis to determine if the chassis contain the appropriate modules and firmware to establish a redundant system. This stage of checks is referred to as **qualification**.

After the redundancy modules complete qualification, synchronization can take place. **Synchronization** is a state in which the redundancy modules execute these tasks:

- Verify that the connection between redundancy modules is ready to facilitate a switchover
- Verify that the redundant chassis continue to meet qualification requirements
- Synchronize the data between the redundant controllers, also called **crossloading**

This data is crossloaded:

- Updated tag values
- Force values
- Online edits
- Other project information

Synchronization always takes place immediately following qualification. Also, depending on your system configuration, synchronization can take place at the end of each program run within the controller project, or at other intervals that you specify.

Switchovers

During redundant system operation, if certain conditions occur on the primary chassis, primary control is switched to the secondary chassis. These conditions cause a switchover:

- Loss of power
- Major fault on the controller
- Removal or insertion of any module
- Failure of any module
- Damage to a ControlNet cable or tap - This event only causes a switchover if it results in the ControlNet communication module transition to a lonely state, that is, the module does not see any devices on the network.
- Loss of an EtherNet/IP connection - This event only causes a switchover if it results in the EtherNet/IP communication module transition to a lonely state, that is, the module does not see any devices on the network.
- A program-prompted command to switchover
- A command issued via the Redundancy Module Configuration Tool (RMCT)

After a switchover occurs, the new primary controller continues to execute programs beginning with the highest-priority task that had been executing on the previous primary controller.

For more information about how tasks execute after a switchover, see [Crossloads, Synchronization, and Switchovers on page 144](#).

Your application can require some programming considerations and potential changes to accommodate a switchover. For more information on these considerations, see [Chapter 7, Program the Redundant Controller on page 141](#).

IMPORTANT For instructions about how to replace 1756-RM/B redundancy modules with 1756-RM2/A redundancy modules without initiating a switchover, see [Replace 1756-RM/A or 1756-RM/B Redundancy Modules with 1756-RM2/A Redundancy Modules on page 264](#).

IMPORTANT During a switchover of the fiber channels of the 1756-RM2/A module, scan time will encounter a delay of ~10 ms; however, the chassis will remain synched at all times.

HMI Blind Time Reduction on Ethernet During a Switchover

HMI Blind Time is the time during a switchover from primary to secondary, when tag data from the controller is unavailable for reading or writing. HMI Blind Time is associated with visualizing process operations from an HMI; however, it is applicable to any software that uses tag data, such as data loggers, alarming systems, or historians. Reducing HMI Blind Time is important to avoid shutdowns.

Brief communication interruption occurs if the connection between RSLinx® Enterprise software and the redundant chassis pair uses a path exclusively over an EtherNet/IP network and a switchover occurs. After the switchover is complete, communication resumes automatically.

The time between the communication (updating active data) interruption and the restoration (resumes updates) is often referred to as ‘HMI Blind Time.’

Beginning with version 20.054, HMI Blind Time due to switchover has been reduced.

IMPORTANT RSLinx Enterprise software version 5.50.04 (CPR9 SR5) is required beginning with version 20.054.

HMI Blind Time is dependent on several system variables that determine this length of time as follows:

- Quantity and types of tags on scan in RSLinx Enterprise software
- Client screen update rates
- Number of program and controller scope tags in the redundant controller
- Controller loading, which includes the following:
 - Number of tasks and scan rates (assumes no continuous task)
 - Memory usage
 - Null task percentage available
 - Network traffic

Based on testing with Windows Server 2003 software, ‘HMI Blind Time’ was reduced between 40...80%. User results will vary based on the variables listed above.

IMPORTANT RSLinx Enterprise software is part of FactoryTalk Services, which has been releasing a series of Service Releases (SRs) that are backward compatible with any CPR 9 products. The HMI Blind Time feature can be used by existing and new users who are using FactoryTalk View version 5.0 (CPR9) or newer.

Restrictions

There are restrictions that you must consider when using an enhanced redundancy system. Most of these restrictions apply to all enhanced redundancy system revisions. Exceptions are noted:

- The 1756-RM2/A or 1756-RM2XT modules can be used only with other 1756-RM2/A or 1756-RM2XT modules. You cannot mix 1756-RM2/A and 1756-RM2XT modules with 1756-RM/A, 1756-RM/B, or 1756-RMXT modules.
- Please note that firmware revision 19.052 applies to 1756-L6x controllers only and revision 19.053 applies to 1756-L7x controllers only.
- You cannot use standard ControlNet and EtherNet/IP communication modules in enhanced redundancy systems. You must use enhanced communication modules in enhanced redundancy systems. Enhanced communication modules contain a '2' in their catalog number. For example, the 1756-EN2T module.
- The redundant controller program cannot contain these tasks:
 - Event tasks
 - Inhibited tasks

For recommendations and requirements related to programming the redundant controller, see [Program the Redundant Controller](#) on [page 141](#).

- You cannot use the Firmware Supervisor feature available in RSLogix 5000 software in an enhanced redundancy system.
- You cannot use SERCOS Motion or Integrated Motion on EtherNet/IP in a redundant controller program.
- You cannot use consumed Unicast connections in an enhanced redundancy system. If you attempt to use consumed Unicast connections, disqualification occurs and qualification of an unsynchronized redundant chassis pair is not allowed. You can use produced Unicast connections consumed by remote consumers.
- You cannot use a 1756-EWEB module, and any functionality specific to that module, in an enhanced redundancy system.
- You can use a maximum of 2 controllers and 7 ControlNet or EtherNet/IP communication modules in each chassis of a redundant chassis pair.
- In enhanced redundancy systems, **revision 16.081 and earlier only**, EtherNet/IP communication modules **cannot** execute these tasks:
 - Connect to remote I/O over an EtherNet/IP network
 - Connect to 1715 Redundant I/O systems
 - Use Produce/Consume tags
 - Connect to Device-level Ring networks
 - Use CIP Sync technology

You can execute the tasks mentioned above in an enhanced redundancy system, revision 19.052 or later.

Design an Enhanced Redundancy System

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Other Communication Networks	42
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This chapter explains how to use the required and optional components to design an enhanced redundancy system.

Components of an Enhanced Redundancy System

The central components of a ControlLogix enhanced redundancy system are those in the redundant chassis pair. You can connect other system components to the redundant chassis pair. However, the redundant chassis pair, and the components within it, provide redundant communication and control features.

This table lists the components available with enhanced redundancy systems. Please note that some component availability is revision-specific.

Table 4 - Components Available for Use in a Redundant Chassis Pair

Product Type	Cat. No.	Description	Page
Redundancy module	1756-RM2/A	ControlLogix redundancy module This component is available with enhanced redundancy systems, revision 16.057, 16.081, 19.052 or later when using 1756-L6x controllers, and 19.053 or later when using 1756-L7x controllers.	31
	1756-RM2XT	ControlLogix-XT™ redundancy module This component is available with enhanced redundancy systems, revision 16.057, 16.081, 19.052 or later when using 1756-L6x controllers, and 19.053 or later when using 1756-L7x controllers.	
	1756-RM	ControlLogix redundancy module	
	1756-RMXT	ControlLogix-XT redundancy module	
Chassis	1756-A4	ControlLogix 4-slot chassis	28
	1756-A4LXT	ControlLogix-XT™ 4-slot chassis, -25...60 °C (-13...140 °F) This component is available with enhanced redundancy systems, revision 19.052 or later.	
	1756-A5XT	ControlLogix-XT 5-slot chassis	
	1756-A7	ControlLogix 7-slot chassis	
	1756-A7XT	ControlLogix-XT 7-slot chassis, -25...70 °C (-13...158 °F)	
	1756-A7LXT	ControlLogix-XT 7-slot chassis, -25...60 °C (-13...140 °F)	
	1756-A10	ControlLogix 10-slot chassis	
	1756-A13	ControlLogix 13-slot chassis	
Communication modules	1756-CN2/B	ControlLogix ControlNet bridge module	32
	1756-CN2R/B	ControlLogix redundant media ControlNet bridge module	
	1756-CN2RXT	ControlLogix-XT ControlNet bridge module	
	1756-EN2T	ControlLogix EtherNet/IP bridge module	
	1756-EN2F	ControlLogix EtherNet/IP fiber bridge module. This component is available with enhanced redundancy systems, revision 20.054 or later.	
	1756-EN2TR	ControlLogix EtherNet/IP 2-port module This component is available with enhanced redundancy systems, revision 19.052 or later.	
	1756-EN2TXT	ControlLogix-XT EtherNet/IP bridge module	

Table 4 - Components Available for Use in a Redundant Chassis Pair

Product Type	Cat. No.	Description	Page
Controllers	1756-L61, 1756-L62, 1756-L63, 1756-L64	ControlLogix controllers	29
	1756-L63XT	ControlLogix-XT controller	
	1756-L65	ControlLogix controller This component is available with enhanced redundancy systems, revision 19.052 or later.	
	1756-L72, 1756-L73, 1756-L74, 1756-L75	ControlLogix controllers This component is available with enhanced redundancy systems, revision 19.053 or later.	
	1756-L71	ControlLogix controller This component is available with enhanced redundancy systems, revision 20.054 or later.	
	1756-L73XT	ControlLogix-XT controller, revision 19.053 or later	
Power supplies	1756-PA72, 1756-PA75	ControlLogix AC power supplies	34
	1756-PB72, 1756-PB75, 1756-PC75, 1756-PH75	ControlLogix DC power supplies	
	1756-PAXT, 1756-PBXT	ControlLogix-XT AC power supply	
	1756-PA75R	ControlLogix AC redundant power supply	
	1756-PB75R	ControlLogix DC redundant power supply	
	1756-CPR	ControlLogix redundant power supply cable	
	1756-PSCA2	ControlLogix chassis adapter module	

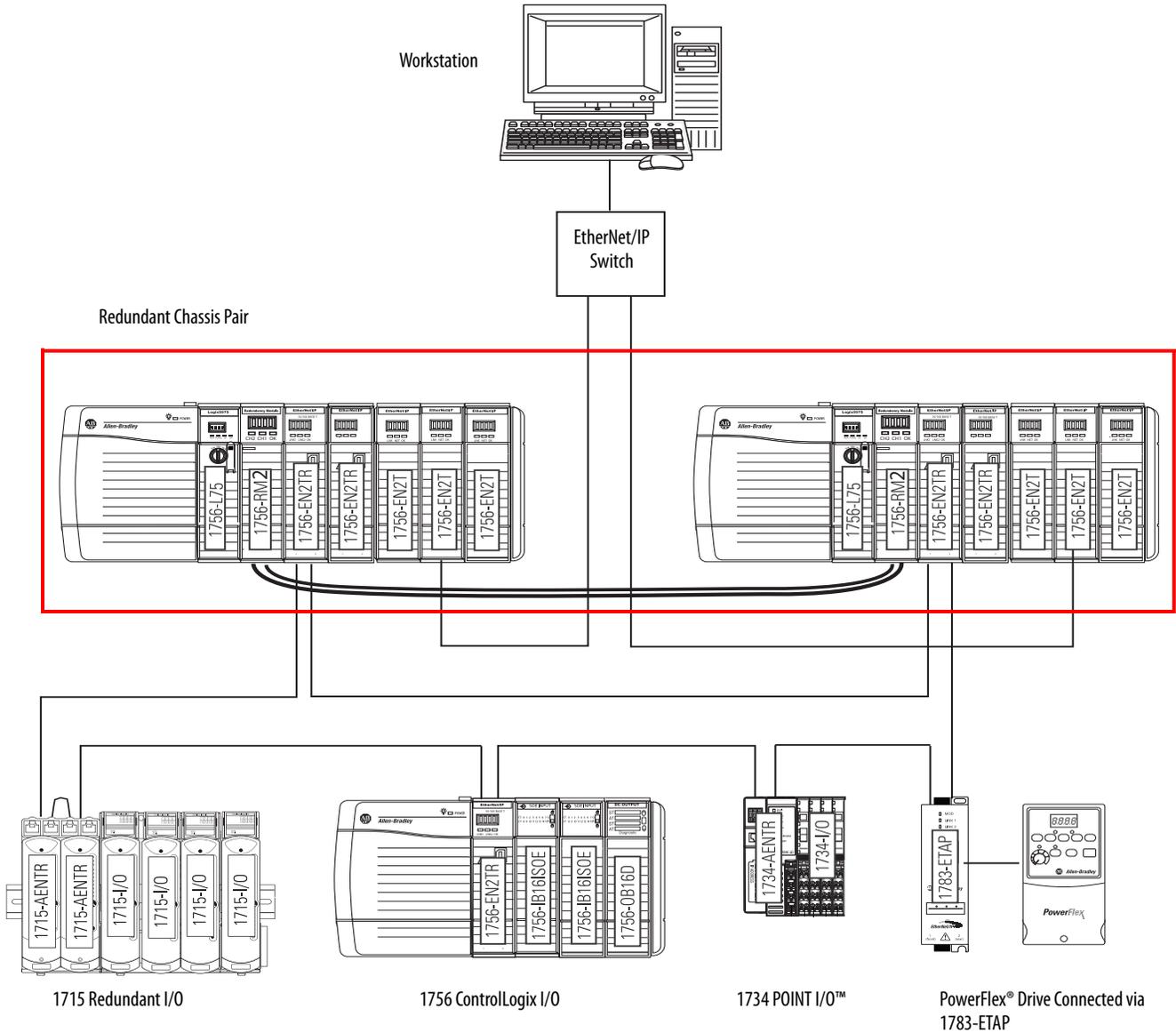
IMPORTANT There are module series level, firmware revision, and software version requirements for enhanced redundancy systems.

For more information on these series level, firmware revision, and version requirements, see the current release notes at:

<http://rockwellautomation.com/literature>.

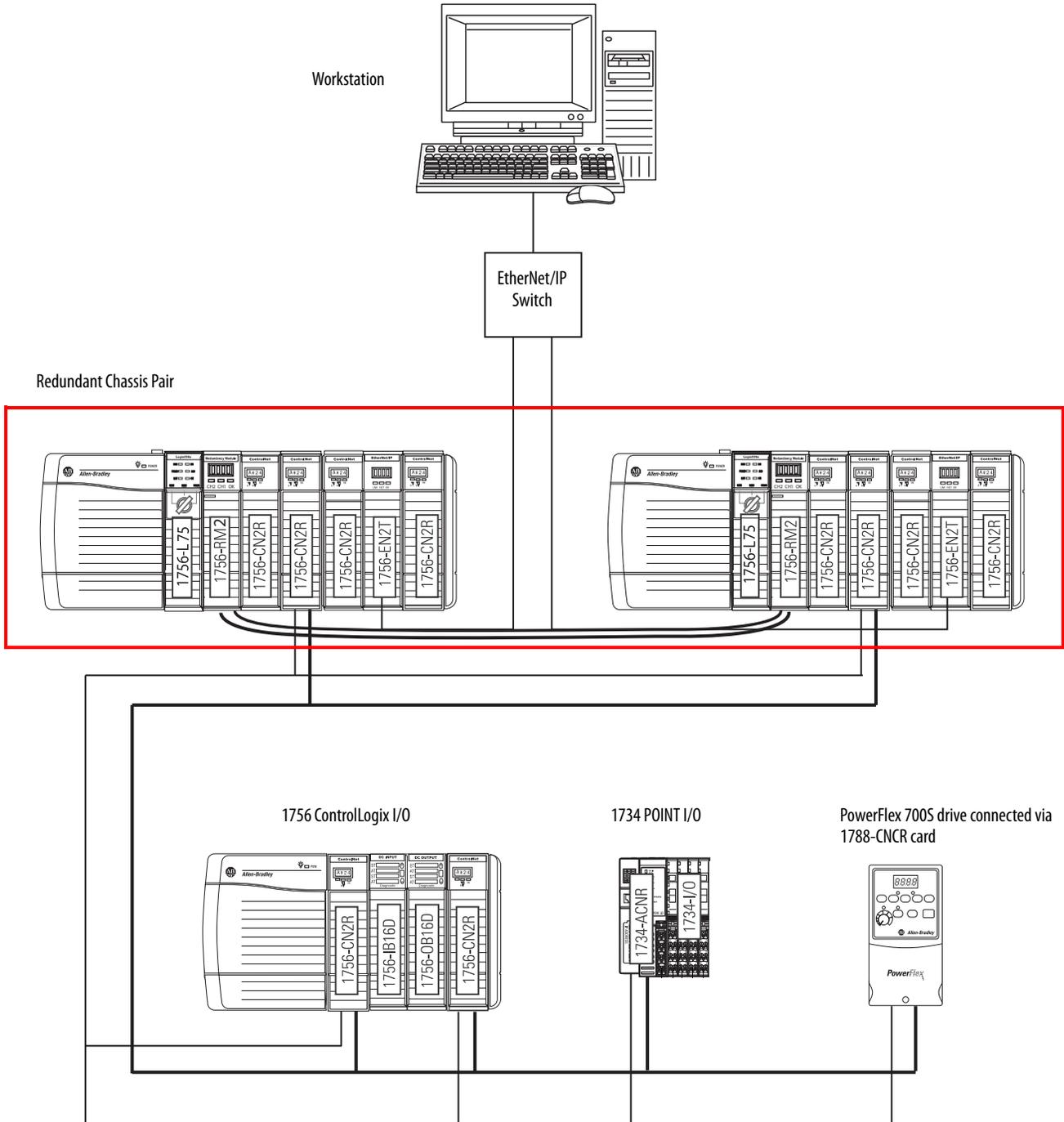
This graphic shows an example ControlLogix enhanced redundancy system, revision 19.053 or later, that uses EtherNet/IP networks.

Figure 1 - Example ControlLogix Enhanced Redundancy System, Revision 19.053 or later, Using an EtherNet/IP Network



This graphic shows an example ControlLogix enhanced redundancy system, revision 19.053 or later, that uses ControlNet networks.

Figure 2 - Example ControlLogix Enhanced Redundancy System, Revision 19.053 or later, Using a ControlNet Network



Redundant Chassis

You can use any ControlLogix or ControlLogix-XT chassis in a redundant chassis pair as long as the two chassis used are the same size. For example, if the primary chassis in your redundant chassis pair uses a 1756-A4 chassis, the secondary chassis must use a 1756-A4 chassis.

You can use the **1756-A4LXT chassis** with the enhanced redundancy system, **revision 19.052 or later**. For a list of the ControlLogix chassis available for use in an enhanced redundancy system, see [Table 4 on page 24](#).

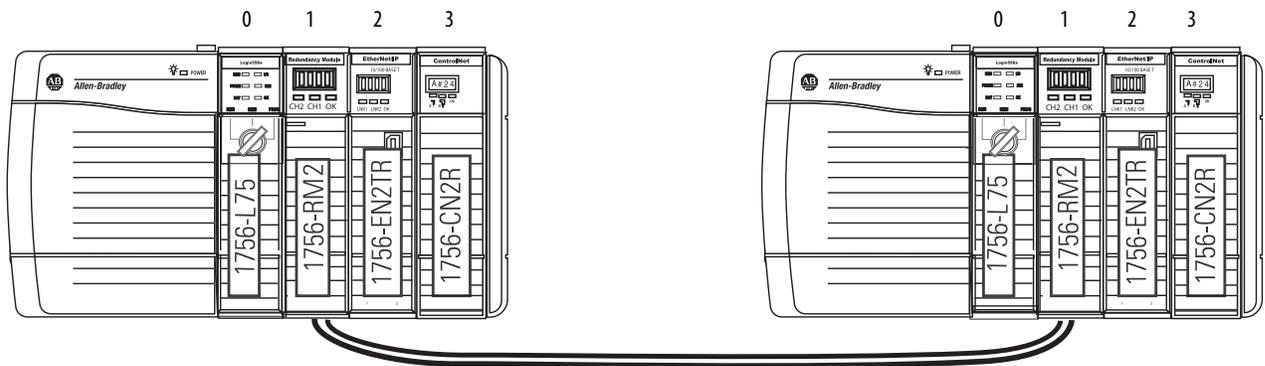
TIP When using 1756-L7x controllers in your system, you must use revision 19.053 or later.

Redundant Chassis Configuration Requirements

These configuration parameters must match for the components in a redundant chassis pair during normal system operation:

- Module type
- Chassis size
- Slot placement
- Firmware revision
- Series level. See [page 32](#).

Figure 3 - Example of Redundant Chassis Pair



Controllers in Redundant Chassis

Remember these points when placing controllers in the redundant chassis pair:

- Controllers are typically included, but not required, in enhanced redundancy systems.
- The differences between controller types are described in this table.

Table 5 - Controller Features

Feature	1756-L7x Controllers	1756-L6x Controllers
Clock support and backup used for memory retention at powerdown	Energy Storage Module (ESM)	Battery
Communication ports (built-in)	USB	Serial
Connections, controller	500	250
Logix CPU (processor)	Dual-core	Single-core
Memory, nonvolatile	Secure Digital (SD) card	CompactFlash card
Status display and status indicators	Scrolling status display and four status indicators	6 status indicators
Unconnected buffer defaults	20 (40, max)	10 (40, max)

- You can place up to two controllers in the same chassis. When you use two controllers in the same chassis, they must be of the same product family.

For example, you cannot place a 1756-L6x controller and a 1756-L7x controller in the same chassis.

IMPORTANT When using a ControlLogix enhanced redundancy system, revision 16.081 or earlier, you cannot use two 1756-L64 controllers in the same chassis. You can, however, use a 1756-L64 controller in the same chassis as a 1756-L61, 1756-L62, or 1756-L63 controller.

- You can use different catalog numbers from the same product family in the same chassis. For example, you can use two 1756-L6x controllers in a chassis.
- Each controller must have enough data memory to store twice the amount of tag data associated with a redundant controller project.

- Each controller must have enough I/O memory to store twice the amount of I/O memory used. To check the I/O memory used and available, access the Memory tab of the Controller Properties dialog box in RSLogix 5000 software.

For more information about data and I/O memory, see [Knowledgebase Answer ID 28972](#).

- When you use the redundancy system update (RSU) feature to update an enhanced redundancy system while the system continues operation, the updated secondary controllers must provide the same or greater memory than the primary controllers.

A secondary controller provides greater memory than the primary controller if it is a higher catalog number, for example, a 1756-L63 primary controller and a 1756-L65 secondary controller.

This table describes the secondary controllers to which you can upgrade, based on the primary controller used, when using RSU.

Table 6 - Controller Compatibility

Primary Controller	Compatible Secondary Controller
1756-L61	1756-L61, 1756-L62, 1756-L63, 1756-L64, 1756-L65
1756-L62	1756-L62, 1756-L63, 1756-L64, 1756-L65
1756-L63	1756-L63, 1756-L64, 1756-L65
1756-L64	1756-L64, 1756-L65
1756-L65	1756-L65
1756-L71	1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75
1756-L72	1756-L72, 1756-L73, 1756-L74, 1756-L75
1756-L73	1756-L73, 1756-L74, 1756-L75
1756-L74	1756-L74, 1756-L75
1756-L75	1756-L75

Differences in controller types between chassis can exist only during the system upgrade process. When you complete the system upgrade, the controllers in the redundant chassis pair **must match** for the system to synchronize.

For more information on using RSU, see [Appendix C, Upgrade from a Standard Redundancy System or to Another Enhanced Redundancy System on page 239](#).

- In an enhanced redundancy system, revision 19.052 or later, the 1756-L65 controller’s performance differs from that of the 1756-L64 controller. Some controller operations can take slightly longer for the 1756-L65 controller to complete.

For example, in some applications the 1756-L65 controller can experience longer scan times than the 1756-L64 controller.

Plan for Controller Connections

Consider these conditions when planning controller connection use:

- **1756-L6x controllers** provide **250 total connections**.
- **1756-L7x controllers** provide **500 total connections**.

If you use the redundant controller at, or very near the connection limits, you can experience difficulty synchronizing your chassis.

Redundancy Modules in Redundant Chassis

Two redundancy modules, one in each chassis of the redundant chassis pair, jointly supervise the control system operating states and transitions, establishing the framework for system redundancy. This bridge between chassis facilitates the exchange of control data and synchronization of operations.

The redundancy modules let you commission the redundant system in a plug-and-play manner without any programming. You connect a redundancy module pair with the default configuration in the redundant chassis pair and set up the redundant system.

You can establish redundancy between chassis in either of these manners:

- Inserting a redundancy module pair into two powered chassis that contain redundancy-compliant components and redundancy-enabled application programs, and then connecting the redundancy modules.
- Inserting and connecting the redundancy modules in two chassis and then inserting redundancy-compliant components into each chassis.

IMPORTANT You are not required to develop any programming to migrate from a nonredundant to an enhanced redundancy system if your application meets these conditions:

- Your application meets the points listed in [Restrictions on page 22](#).
- The controller properties in your RSLogix 5000 software project has Redundancy enabled.

Once the redundant chassis pair contains all desired components, including controllers configured for redundancy, and are powered, no further tasks are required in the redundancy modules to activate system redundancy. The redundancy modules automatically determine the operational state of each of the chassis pair and are ready to accept commands and provide system monitoring.

Communication Modules in Redundant Chassis

Remember these points when placing ControlLogix ControlNet and EtherNet/IP communication modules in the redundant chassis pair:

- You must use enhanced communication modules in enhanced redundancy systems. Enhanced communication modules contain a '2' in their catalog number. For example, the 1756-EN2T module.

Standard ControlNet and EtherNet/IP communication modules are not supported.

- You can use the **1756-EN2TR module** only with an enhanced redundancy system, **revision 19.052** or later.
- You can use any combination of up to seven enhanced communication modules in each redundant chassis.
- If you use a ControlNet network in your redundant chassis pair, you must have two ControlNet communication modules outside the redundant chassis pair. When assigning node address numbers, assign the lowest node number address to a ControlNet communication module outside the redundant chassis pair.

For more information, see [Use at Least Four ControlNet Network Nodes on page 38](#) through [Assign Lowest Node Numbers to Remote ControlNet Modules on page 39](#).

- You cannot use Series A ControlNet communication modules in a redundancy system.
- The Series for EtherNet/IP communication modules is not required to match in a partnered set. However, if your application requires a feature specific to a module series level, you must use the same series level for each module in a partnered set.

For example, only the 1756-EN2T/C communication module only offers the double-data rate (DDR) feature. You must use 1756-EN2T/C modules in each chassis of the redundant chassis pair to use DDR.

- **Do not use the USB ports** of communication modules to access the redundant system network while the system is running, that is, online. Using the USB ports while online can result in a loss of communication after a switchover.

For a list of the ControlLogix communication modules available for use in an enhanced redundancy system, see [Table 4 on page 24](#).

Plan for Communication Module Connections

A CIP connection is a point-to-point communication mechanism used to transfer data between a producer and a consumer. These are examples of CIP connections:

- Logix5000 controller message transfer to Logix5000 controller
- I/O or produced tag
- Program upload
- RSLinx DDE/OPC client
- PanelView™ polling of a Logix5000 controller

ControlLogix **ControlNet communication modules** provide 131 total CIP connections. Consider these points when using CIP connections with ControlLogix ControlNet communication modules:

- Three of the 131 CIP connections are reserved for redundancy. The three redundant-system CIP connections always appear to be in use, even when no connections are open.
- You can use the remaining 128 CIP connections in any manner that your application requires, such as the examples listed above.

ControlLogix **EtherNet/IP communication modules** provide 259 total CIP connections. Consider these points when using CIP connections with ControlLogix EtherNet/IP communication modules:

- Three of the 259 CIP connections are reserved for redundancy.
- You can use the remaining 256 connections in any manner that your application requires, such as the examples listed above.

Power Supplies and Redundant Power Supplies in Enhanced Redundancy Systems

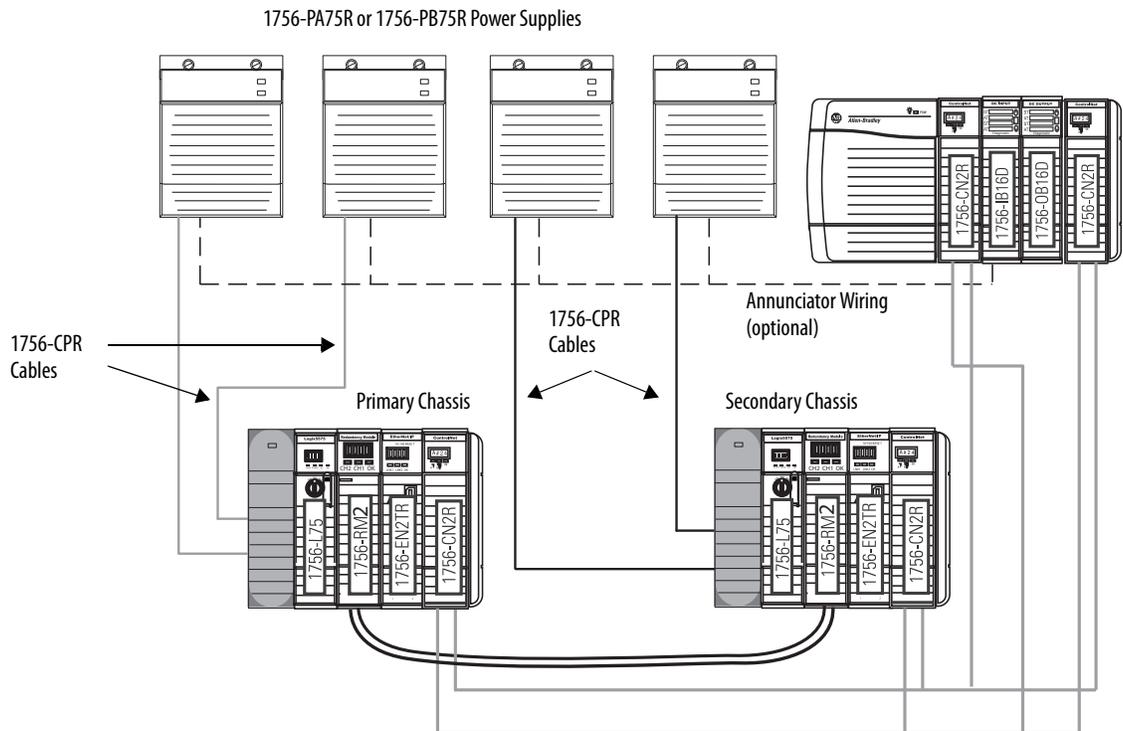
You can use any of the standard or redundant power supplies listed in [Components Available for Use in a Redundant Chassis Pair on page 24](#) in an enhanced redundancy system.

Redundant Power Supplies

Typically, enhanced redundancy systems use standard power supplies. You can choose to use redundant power supplies to maintain power to a ControlLogix chassis in the event that one of the supplies loses power. Use these hardware components to connect redundant power supplies:

- Two redundant power supplies for each chassis
- One 1756-PSCA chassis adapter module for each redundant chassis
- Two 1756-CPR cables for each redundant chassis to connect the power supplies to the 1756-PSCA adapter
- Optional, user-supplied annunciator wiring to connect the power supplies to remote input modules

Figure 4 - Redundant Power Supplies with Redundant Chassis



For more information about redundant power supplies, see the ControlLogix Selection Guide, publication [1756-SG001](#).

EtherNet/IP Networks with Redundant Systems

The use of EtherNet/IP networks in an enhanced redundancy system is primarily dependent on your system revision.

IMPORTANT A remote chassis can be accessed over an EtherNet/IP network using any EtherNet/IP module that works in a nonredundant chassis with no additional firmware requirement with the following exception. If the remote chassis contains a controller consuming a tag produced in the RCP, it can only consume the tag with the required firmware revisions listed in [Table 7](#).

Table 7 - EtherNet/IP Communication Modules in Remote Chassis Minimum Firmware Requirements

EtherNet/IP Communication Module in Remote Chassis	Minimum Firmware Revision
1756-EN2F	4.003
1756-EN2T	4.002
1756-EN2TR	
1756-EN3TR	
1756-ENBT	6.001
1768-ENBT	4.001
1769-L2x	19.011
1769-L3xE	
1788-ENBT	3.001

For more information on using an EtherNet/IP network in your enhanced redundancy system, see [Chapter 5, Configure the ControlNet Network on page 93](#).

EtherNet/IP Network Features in an Enhanced Redundancy System, Revision 19.052 or Later

In an enhanced redundancy system, revision 19.052 or later, you **can execute these tasks** on an EtherNet/IP network:

- Use 1756-EN2TR modules
- Connect to remote I/O modules
- Connect to 1715 Redundant I/O systems
- Use produce/consume tags
- Connect to a Device-level Ring networks
- Use CIP Sync technology

The rest of the topics in this section apply to all enhanced redundancy systems.

IP Address Swapping

EtherNet/IP communication modules can use IP address swapping to swap IP addresses during a switchover. You must use this feature to use Ethernet I/O connections.

For more information on IP address swapping, see [Chapter 5, Configure the ControlNet Network on page 93](#).

Unicast Functionality

Enhanced redundancy systems support unicast produced tags. Unicast consumed tags are **not supported** in enhanced redundancy systems. Unicast I/O is not supported in a redundancy system.

Possible Communication Delays on EtherNet/IP Networks

Brief communication delays can occur for certain connection types if the connection between a component and the redundant chassis pair uses a path exclusively over an EtherNet/IP network and a switchover occurs. After the switchover is complete, communication resumes automatically.

These connection types can experience the communication delay when the switchover occurs:

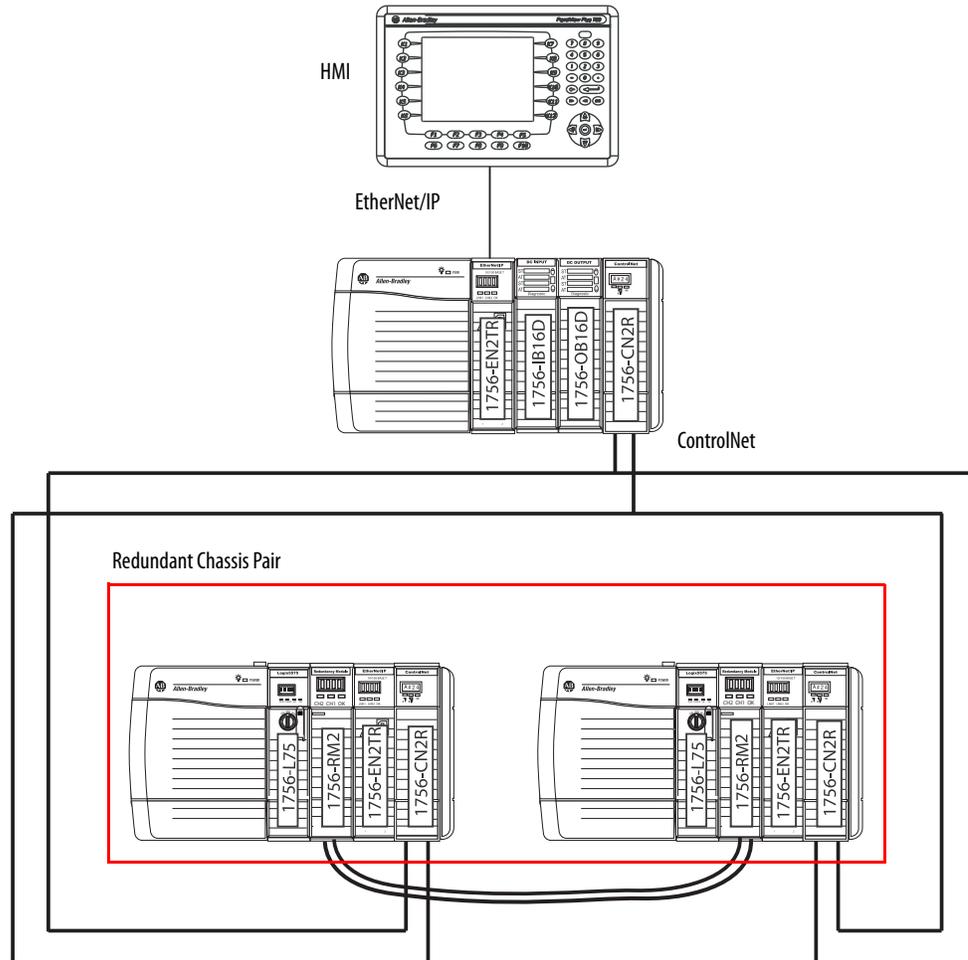
- HMI to redundant chassis pair
- FactoryTalk Batch server to redundant chassis pair
- FactoryTalk Alarms and Events Service to redundant chassis pair

Bridge from an EtherNet/IP network to a ControlNet network if you must maintain the connection between the component and a redundant chassis pair in the event of a switchover.

See [HMI Blind Time Reduction on Ethernet During a Switchover on page 21](#).

This example graphic shows the recommended method to connect an HMI to a redundant chassis pair if connection drops are a concern in your application. In this graphic, the remote chassis contains I/O modules in addition to the EtherNet/IP and ControlNet communication modules. The I/O modules are not required and included here for example purposes only.

Figure 5 - Configuration Used to Eliminate Communication Delays on Switchover



ControlNet Networks with Redundant Systems

ControlNet networks are used to connect redundant control chassis to remote I/O and to other devices in the system.

IMPORTANT A remote chassis can be accessed over a ControlNet network using any ControlNet module that works in a nonredundant chassis with no additional firmware requirement.

ControlNet Network Requirements

If you use a ControlNet network in your enhanced redundancy system, you must take these considerations into account when using ControlNet networks in your enhanced redundancy system:

- [Use at Least Four ControlNet Network Nodes](#)
- [Assign Lowest Node Numbers to Remote ControlNet Modules](#)
- [Set Partnered ControlNet Module Switches to the Same Address](#)
- [Reserve Consecutive Node Addresses for Partner Modules](#)

Use at Least Four ControlNet Network Nodes

With redundant systems, at least four ControlNet network nodes are required. This is because two or more ControlNet nodes must be used in addition to the two ControlNet modules used in the redundant chassis. One of the two nodes outside of the redundant chassis must be at a lower node address than the ControlNet modules in the redundant chassis.

If your ControlNet uses less than four nodes, in the event of a switchover, connections can be dropped and outputs connected to that node can change state during the switchover.

You can include these ControlNet modules in addition to redundant ControlNet nodes:

- ControlNet bridge modules in remote chassis
- Any other ControlNet devices on the ControlNet network
- A workstation running RSLinx Classic communication software that is connected via a ControlNet network

Assign Lowest Node Numbers to Remote ControlNet Modules

Do not assign the lowest ControlNet node addresses to ControlNet modules in the redundant chassis pair.

If you assign the lowest ControlNet node addresses to ControlNet modules in the redundant chassis pair, you can experience these system behaviors:

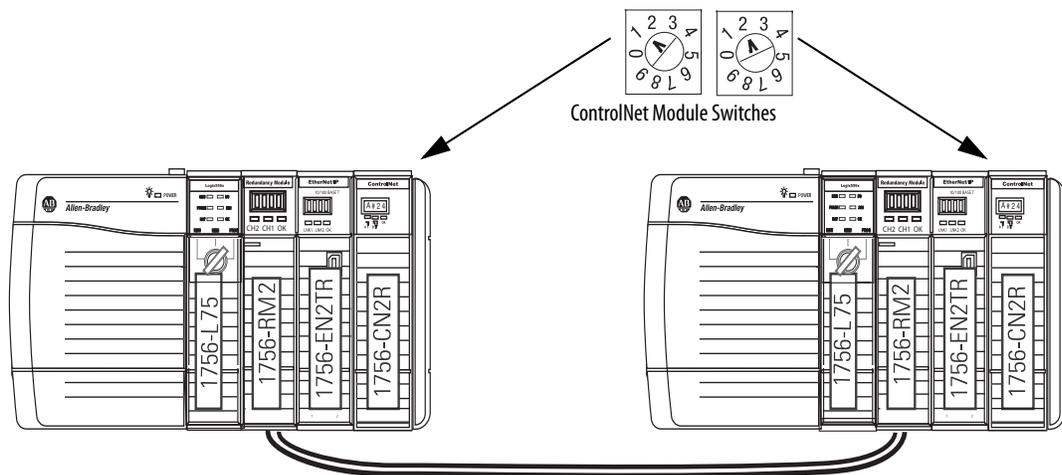
- Upon a switchover, you can lose communication with I/O modules, produced tags, and consumed tags.
- Removing a ControlNet module from the redundant chassis can result in lost communication with I/O modules, produced tags, and consumed tags.
- If the entire system loses power, you can be required to cycle power to the primary chassis to restore communication.

Set Partnered ControlNet Module Switches to the Same Address

Where ControlNet modules are used as partners in a redundant chassis pair, you must set the node address switches to the same node address. The primary ControlNet modules can be at even or odd node addresses.

For example, if partnered ControlNet modules are assigned to nodes 12 and 13 of the ControlNet network, set the node address switches of the modules to the same address of 12.

Figure 6 - Example of Switch Address for Partnered ControlNet Modules



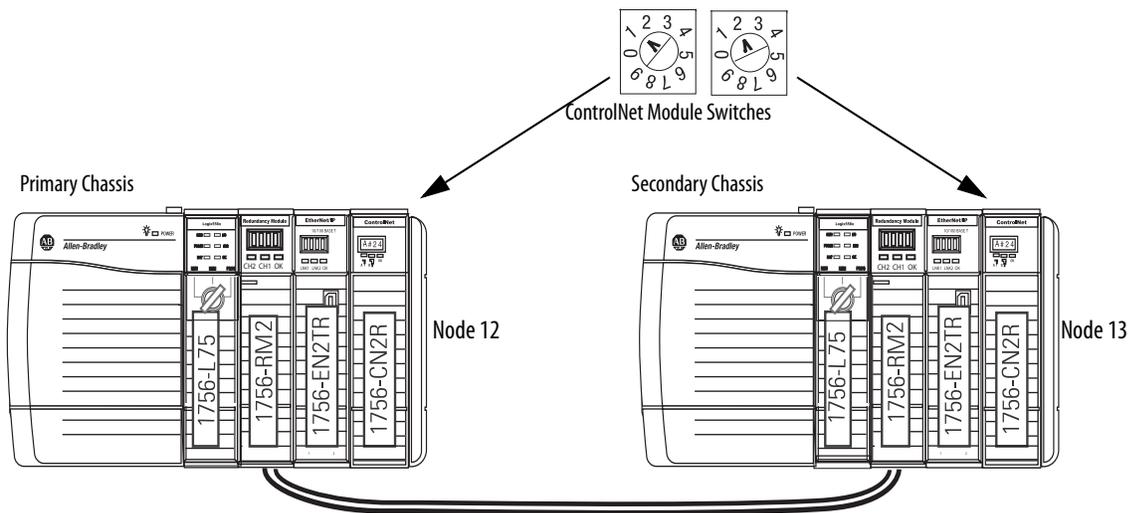
Reserve Consecutive Node Addresses for Partner Modules

Where ControlNet modules are used as partners in redundant chassis, plan consecutive node numbers for those partnered modules. Plan for consecutive node addresses because the redundant system automatically assigns the consecutive node address to the secondary ControlNet module.

For example, partnered ControlNet modules with address switches set at 12 are assigned ControlNet node numbers 12 and 13 by the system.

TIP The primary chassis always assumes the lower of the two node addresses.

Figure 7 - Example of Redundant ControlNet Modules at Consecutive Addresses

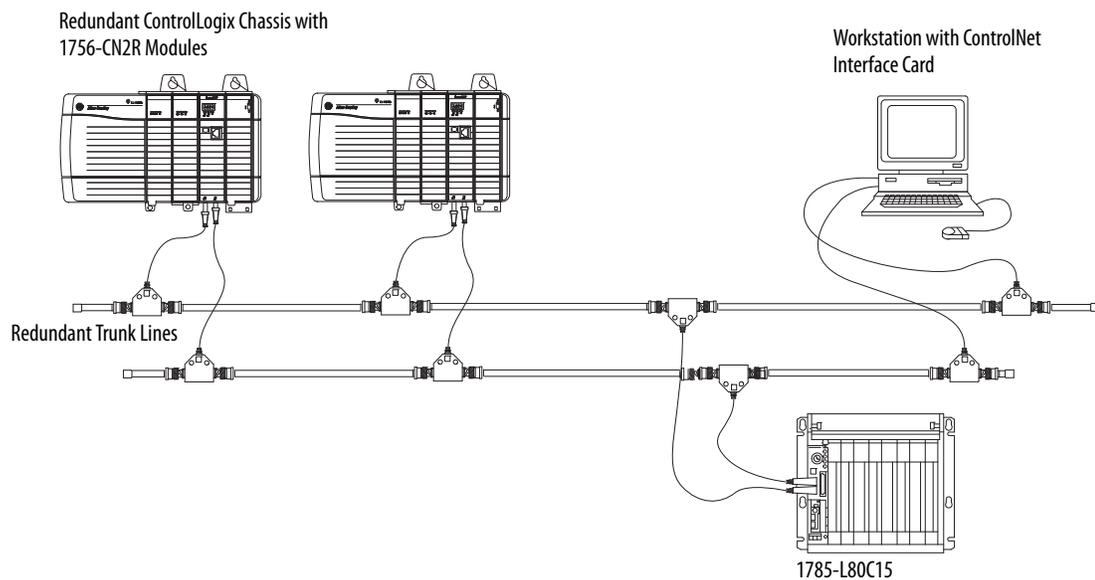


Redundant ControlNet Media

The use of redundant ControlNet media helps to prevent a loss of communication if a trunkline or tap is severed or disconnected. A system that uses redundant ControlNet media uses these components:

- 1756-CN2R/B communication modules in each redundant chassis
- ControlNet modules designed for redundant media at each ControlNet node on the network
- Redundant trunk cabling
- Redundant tap connections for each ControlNet module connected

Figure 8 - Redundant ControlNet Media with Redundant ControlLogix Chassis



Other Communication Networks

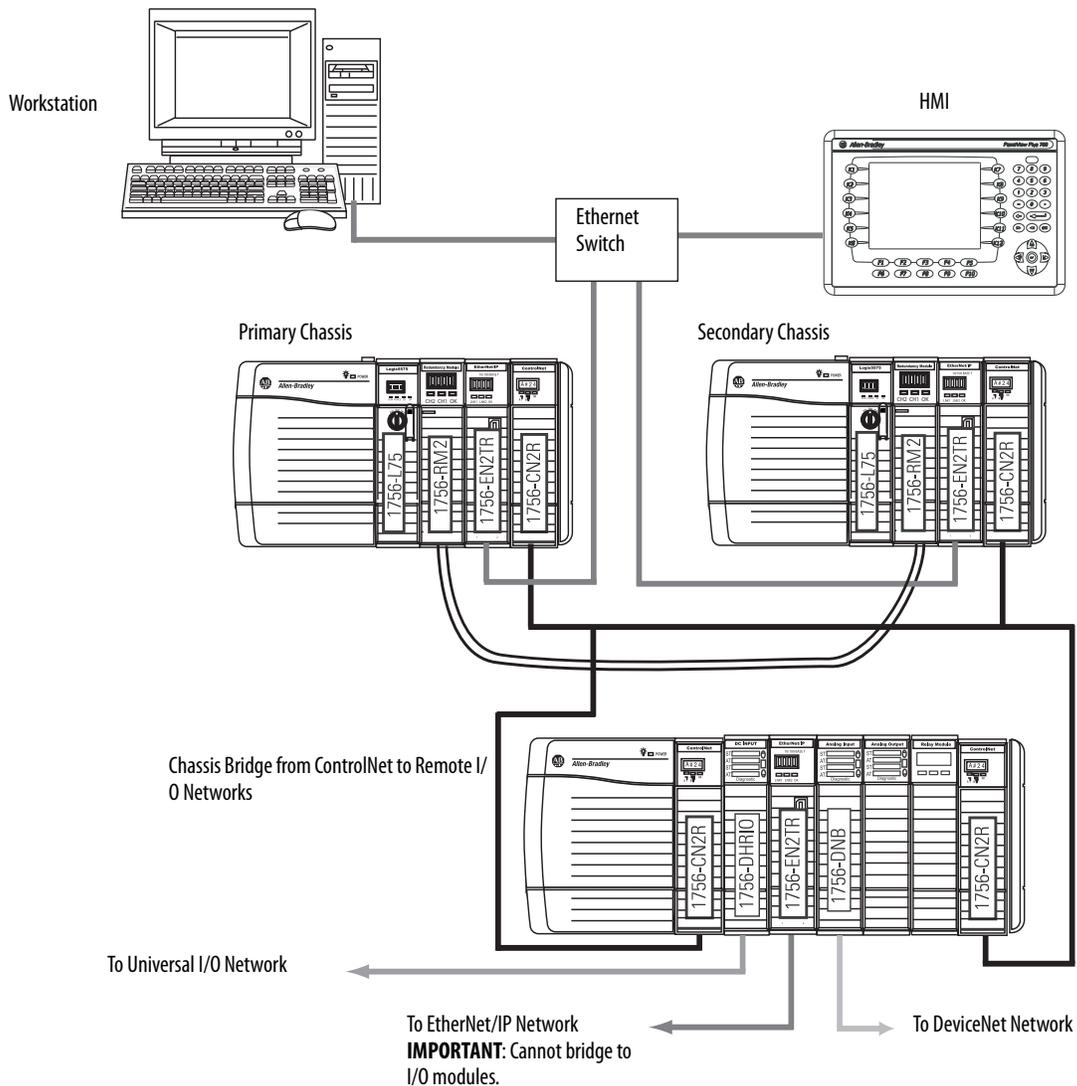
You can use only EtherNet/IP and ControlNet networks, and corresponding modules, in enhanced redundancy systems.

IMPORTANT

Do not use the redundant chassis to bridge between networks. Bridging through the redundant chassis to the same or different networks, or routing messages through redundant chassis is not supported.

You can bridge to other communication networks outside of the redundant chassis. For example, you can bridge to a Universal Remote I/O network via a remote chassis.

Figure 9 - Example of Bridging to Remote I/O on Various Networks



You can bridge these networks via a remote chassis:

- ControlNet
- DeviceNet
- EtherNet/IP
- Universal Remote I/O
- Data Highway Plus

This table indicates what system components can be used with each network connected to a redundant system.

Table 8 - Communication Networks Available For Use with Enhanced Redundancy Systems

Network	Connection to Redundant System	Component	
		I/O	HMI
ControlNet	Directly to redundant chassis	Yes	Yes
	Via a bridge	No	Yes
DeviceNet	Via a bridge	Yes	Yes
EtherNet/IP	Directly to redundant chassis	Yes - Enhanced Redundancy System, Revision 19.052 or later	Yes ⁽¹⁾
	Via a bridge	No	Yes
Universal Remote I/O	Via a bridge	Yes	Yes
Data Highway Plus	Via a bridge	Yes	Yes

(1) To avoid a brief loss of communication with the redundant chassis pair in the event of a switchover, we recommend that you connect the HMI to the redundant chassis pair via a bridge from an EtherNet/IP network to a ControlNet network. For more information see [Possible Communication Delays on EtherNet/IP Networks on page 36](#).

I/O Placement

In an enhanced redundancy system, you can place I/O modules in these locations:

- Same ControlNet network as redundant controllers and communication modules
- Same EtherNet/IP network as redundant controllers and communication modules
- DeviceNet network connected via a bridge
- Universal Remote I/O network connected via a bridge

IMPORTANT You **cannot** install I/O modules in the redundant chassis pair. You can only install I/O modules in remote locations accessed over the networks in this list. You can connect to remote I/O modules over an EtherNet/IP network in an enhanced redundancy system, **revision 19.052 or later**.

1715 Redundant I/O Systems

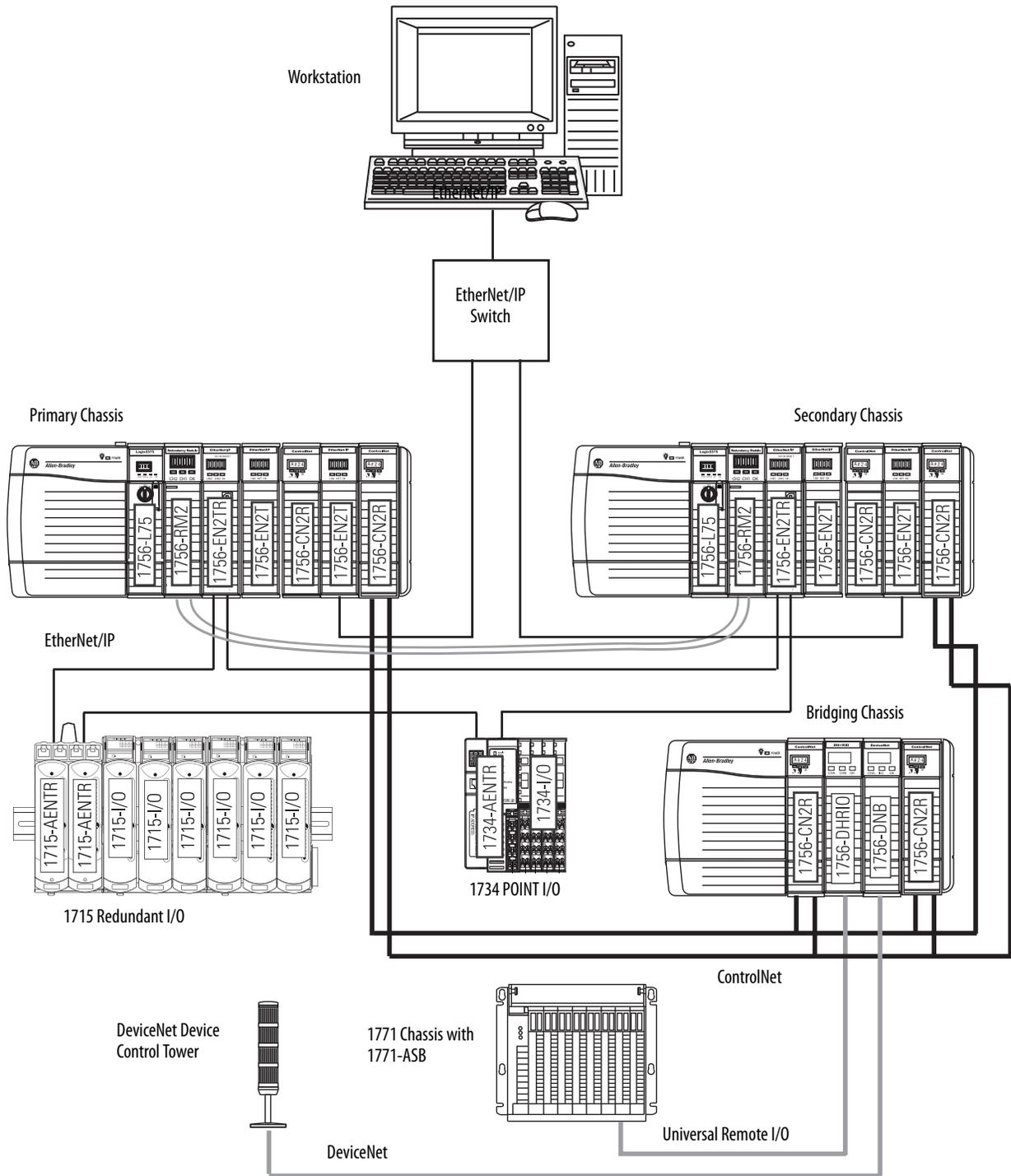
Beginning with the enhanced redundancy system, revision 19.052 or later, you can connect to 1715 Redundant I/O systems over an EtherNet/IP network.

The 1715 Redundant I/O system lets a controller communicate to a remote, redundant I/O chassis over an EtherNet/IP network. The 1715 Redundant I/O system provides high availability and redundancy for critical processes by using a redundant adapter pair and multiple I/O modules that have diagnostics and are easily replaceable.

The 1715 Redundant I/O system consists of a single, two-slot, adapter base unit that houses a redundant adapter module pair. The adapter base unit is connected to up to 8, three-slot, I/O base units, that can hold up to 24 fully-configurable digital and analog I/O modules. You can configure a 1715 Redundant I/O system in a Ring or Star topology.

Each 1715 Redundant I/O system uses a single IP address as the primary IP address for all communication. The redundant adapter module pair consists of two active modules, a primary adapter module and its partner, a secondary module.

Figure 10 - Example of I/O Placement Options



Using HMI

Depending on the network used to connect the redundant system to HMIs, plan for certain placement and configuration requirements. You can connect an HMI to a primary chassis over either of these networks:

- EtherNet/IP
- ControlNet

HMI Connected via an EtherNet/IP Network

This table describes redundant system considerations specific to the HMI being used on the EtherNet/IP network.

Type of HMI Used	Considerations						
PanelView Standard terminal	Same as a nonredundant system.						
<ul style="list-style-type: none"> • PanelView Plus terminal • VersaView® industrial computer running a Windows CE operating system 	<ul style="list-style-type: none"> • Use RSLinx Enterprise software, version 5.0 or later. • Set aside connections for each PanelView Plus or VersaView CE terminal as indicated in this table. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>In this module</th> <th>Reserve</th> </tr> </thead> <tbody> <tr> <td>Controller</td> <td>5 connections</td> </tr> <tr> <td>1756-EN2T</td> <td>5 connections</td> </tr> </tbody> </table>	In this module	Reserve	Controller	5 connections	1756-EN2T	5 connections
In this module	Reserve						
Controller	5 connections						
1756-EN2T	5 connections						
FactoryTalk View Supervisory Edition software with RSLinx Enterprise software	<ul style="list-style-type: none"> • Use RSLinx Enterprise communication software, version 5.0 or later. • Keep the HMI and both redundant chassis on the same subnet. • Configure the network to use IP swapping. 						
<ul style="list-style-type: none"> • FactoryTalk View Supervisory Edition software with RSLinx Classic software, version 2.52 or later • RSView®32 software • Any other HMI client software that uses RSLinx Classic software, version 2.52 or later 	Limit the number of RSLinx servers that a controller uses to 1...3 servers, where the use of 1 server is ideal.						

HMI connected to a redundant chassis pair exclusively over an EtherNet/IP network can briefly drop the connection when a switchover occurs. The connection is re-established, however, after the switchover is complete.

HMI Connected via a ControlNet Network

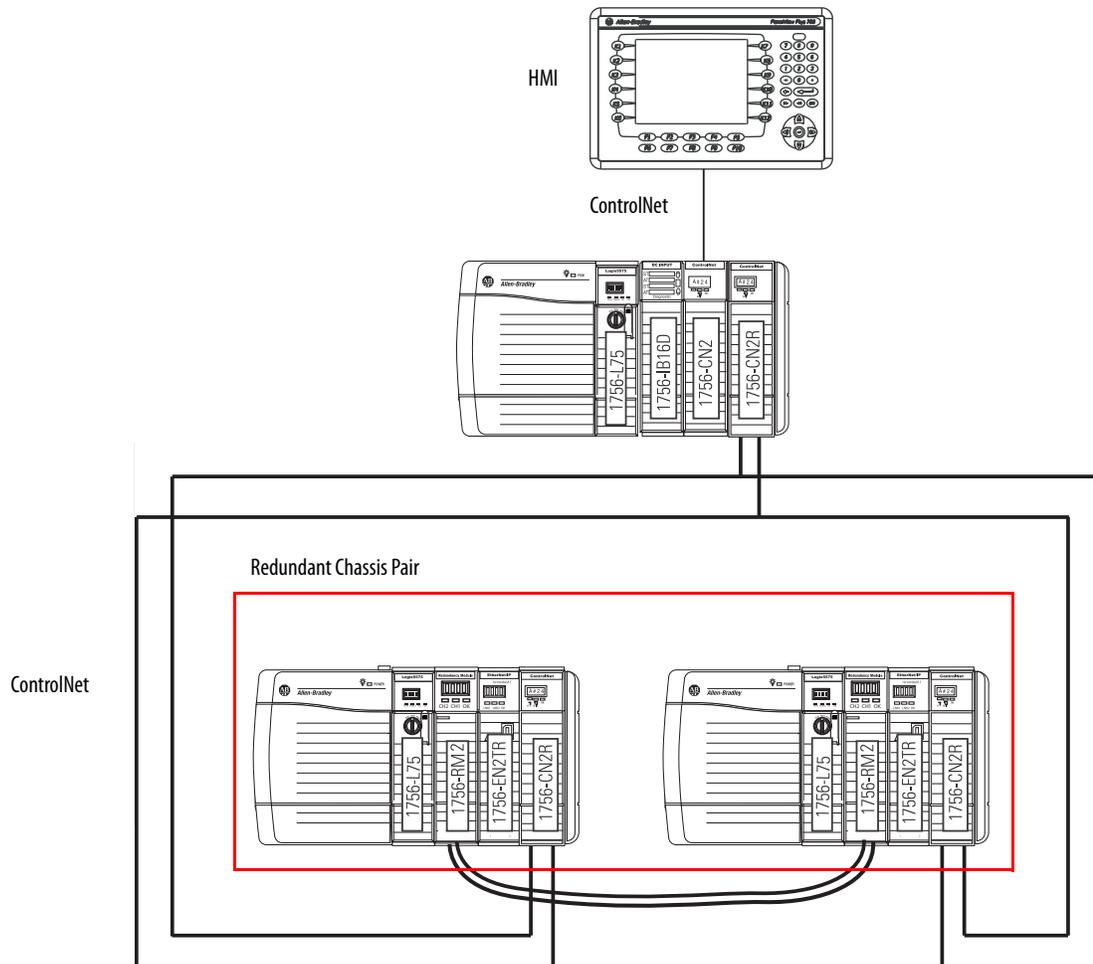
This table describes redundant system considerations specific to the HMI being used on the ControlNet network.

Type of HMI Used	Considerations						
<ul style="list-style-type: none"> • PanelView Standard terminal • PanelView 1000e or PanelView 1400e terminal 	<ul style="list-style-type: none"> • If your HMI communicates via unscheduled communication, use four terminals per controller. • If your HMI does not communicate via unscheduled communication, use the number of terminals required for your application. 						
<ul style="list-style-type: none"> • PanelView Plus terminal • VersaView industrial computer running a Windows CE operating system 	<p>Set aside connections for each PanelView Plus or VersaView CE terminal.</p> <table border="1"> <thead> <tr> <th>In this module</th> <th>Reserve</th> </tr> </thead> <tbody> <tr> <td>Controller</td> <td>5 connections</td> </tr> <tr> <td>1756-CN2/B, 1756-CN2R/B</td> <td>5 connections</td> </tr> </tbody> </table>	In this module	Reserve	Controller	5 connections	1756-CN2/B, 1756-CN2R/B	5 connections
In this module	Reserve						
Controller	5 connections						
1756-CN2/B, 1756-CN2R/B	5 connections						
<ul style="list-style-type: none"> • FactoryTalk View Supervisory Edition software with RSLinx Classic software, version 2.52 or later • RSView32 software • Any other HMI client software that uses RSLinx Classic software, version 2.52 or later 	<p>Limit the number of RSLinx servers that a controller uses to 1 (ideal) to 3 (maximum).</p>						

HMI connected to a primary chassis exclusively over a ControlNet network or bridge from an EtherNet/IP network to a ControlNet network maintains its connections during a switchover.

[Connection from HMI Over a ControlNet Network](#) shows an example of connecting an HMI to a primary controller over a ControlNet network.

Figure 11 - Connection from HMI Over a ControlNet Network



For an example of how to connect an HMI to a redundant chasis pair over a path that bridges from an EtherNet/IP network to a ControlNet network, see [Configuration Used to Eliminate Communication Delays on Switchover on page 37](#).

Firmware Requirements

If you are using an enhanced redundancy system, use only enhanced redundancy system firmware. These are the enhanced redundancy system firmware-revision bundles:

- 16.054Enh
- 16.080Enh
- 16.081Enh
- 16.081_kit1
- 19.052Enh
- 19.053Enh
- 19.053_kit1
- 20.054
- 20.054_kit1

To download the most recent enhanced redundancy system firmware bundle, go to <http://www.rockwellautomation/support.com>.

Software Requirements

These sections describe required and optional software for use with your enhanced redundancy system.

Required Software

This software is required to use all enhanced redundancy system revisions:

- RSLogix 5000 software.
- RSLinx Classic communication software.
- Redundancy Module Configuration Tool (RMCT) - This utility is installed when you install RSLinx Classic communication software.

For the most current software versions, go to <http://www.rockwellautomation/support.com>.

Optional Software

Software in addition to that listed as required software can be needed depending on your enhanced redundancy system program, configuration, and components. Optional software you might need is listed in this table.

If using	Then use this software
ControlNet network	RSNetWorx™ for ControlNet™
EtherNet/IP network	RSNetWorx™ for EtherNet/IP
Alarms	FactoryTalk Alarms and Events
Batches or recipes	FactoryTalk Batch
HMI ⁽¹⁾	<ul style="list-style-type: none"> • FactoryTalk View Site Edition • RSLinx Enterprise software • RSVIEW32
Various FactoryTalk services	FactoryTalk Services Platform

(1) See [Using HMI](#) on [page 46](#) for additional information.

Install the Enhanced Redundancy System

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Before You Begin

Complete these tasks before you install the enhanced redundancy system:

- Verify that you have the components required to install your system.
- Read and understand the safety and environmental considerations explained in each component's installation instruction publication.
- Order a 1756-RMC x fiber-optic communication cable if you do not have one.
- If you choose to make your own fiber-optic cable for lengths not supported by 1756-RMC x catalog numbers, refer to [Fiber-optic Cable on page 67](#).

Enhanced Redundancy System Quick Start

Refer to these Quick Start steps when setting up your system for the first time.

1. Install/update the workstation software and firmware bundle. (Refer to [Step 1: Install the Software on page 53](#).)

Software applications needed include:

- RSLogix 5000 software
- RSLinx Classic communication software
- Redundancy Module Configuration Tool (RMCT). See [Install the Software on page 53](#)

IMPORTANT If RSLinx Classic software is already on your system, make sure to shut it down before installing/upgrading software.

2. To begin the hardware installation, determine the location of your modules in the system's chassis. Plug in the communication modules, controller and redundancy modules into the chassis, matching partners slot for slot. See [Step 2: Install the Hardware on page 54](#).

Install the following:

- The first chassis and power supply, see [page 54](#).
- The first chassis communication modules, see [page 56](#).
 - a. Determine the IP address for your Ethernet communication modules.

Each Ethernet communication module will have the same IP address. Be sure to reserve the next Ethernet IP address in series for the secondary controller to use in the case of a switchover. (For example, 192.105.1.5 and 192.105.1.6.)

- b. Set both Ethernet communication modules to the same IP address. (This rule also applies to ControlNet networks.) See [Configure the EtherNet/IP Network on page 77](#).

- The first chassis controller, see [page 56](#).
 - The first chassis redundancy module, see [page 57](#).
 - The second chassis, power supply, communication modules, controller and redundancy module. See [page 63](#).
3. Plug in the fiber-optic communication cable to connect the redundancy modules in both chassis. See [Step 3: Connect the Redundancy Modules via a Fiber-optic Cable on page 63](#).
 4. Upgrade the redundant chassis firmware. See [Step 4: Update Redundant Chassis Firmware on page 67](#).
 - Update the firmware to the modules in the first chassis.
 - Apply power to the first chassis.
 - Launch ControlFLASH software and upgrade the firmware.
 - Upgrade the redundancy module's firmware and verify that the status is PRIM.
 - Update all remaining modules in the chassis using ControlFLASH software.
 - Power off the first chassis.
 - Power on the second chassis.
 - Follow the same update process as the first chassis.
 - Power off the second chassis.
 5. Designate the primary chassis. See [Step 5: Designate the Primary and Secondary Chassis on page 71](#).
 - Verify power is removed from both chassis.
 - Apply power to the chassis you want designated as the primary. Wait for the status indicator to display PRIM.
 - Apply power to the chassis you want designated as the secondary.

Install an Enhanced Redundancy System

The following steps detail the installation process for an enhanced redundancy system. They also explain how to install the redundant modules. These steps include the following.

1. Installing the software
2. Installing the hardware
3. Connecting the fiber-optic communication cable to the redundancy modules
4. Updating the firmware
5. Designating a primary and secondary chassis

Step 1: Install the Software

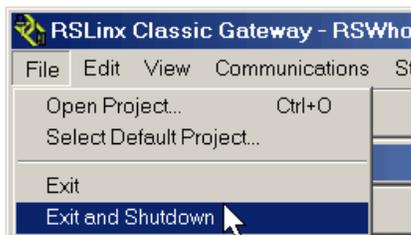
These steps detail the installation process for an enhanced redundancy system.

Before you download and update software for use with your redundant system, use one of these methods to fully shutdown RSLinx Classic software:

- Right-click the RSLinx Classic icon in the notification area of the screen and choose Shutdown RSLinx Classic.



- With RSLinx Classic software open, from the File menu choose Exit and Shutdown.



Install the Software

Obtain and install the software required for your redundant system configuration and application. This includes the latest redundancy firmware version bundle with the RMCT. For more information on required software versions for redundant system configuration, see [Software Requirements on page 49](#).

Use the installation instructions or release notes provided with each software version for installation procedures and requirements.

IMPORTANT When using the 1756-RM2/A or 1756-RM2XT module, you must use version 8.01.05 or later of the RMCT.

TIP When the redundancy module firmware is upgraded, the RMCT is updated.

The RMCT automatically uses the version that is compatible with the redundancy module firmware revision installed.

Add the EDS Files

Some modules have the EDS files already installed. However, if needed, obtain EDS files for modules in your system from the Rockwell Automation Support website at: <http://www.rockwellautomation.com/resources/eds/>.

Once you have downloaded the required EDS file, launch the EDS Hardware Configuration Tool by choosing Start > Programs > Rockwell Software® > RSLinx Tools > EDS Hardware Installation Tool.

The tool then prompts you to Add or Remove EDS files.

Step 2: Install the Hardware

Follow these steps to set up and install your system's hardware components.

Install the First Chassis and its Components

When you install an enhanced redundancy system, install one chassis, and its necessary components, at a time.

Module Placement and Partnering

Each pair of controllers and communication modules must be comprised of compatible partner modules. Two modules in the same slot are considered as compatible partners only if they contain compatible hardware and firmware and other rules that can be enforced by the module itself. The compatibility status (Compatible or Incompatible) is determined by either the module in the primary chassis or its partner in the secondary chassis.

The redundancy module pair must occupy the same slots in their respective chassis. The redundancy module pair does not consider the chassis pair to be partnered if the redundancy modules are placed in different slots, even if the partners of other modules are present in the same slot.

The redundancy module prevents certain redundancy operations, such as Qualification, if incompatible modules reside in the redundant-control chassis pair.

IMPORTANT For best performance, place the redundancy module in the chassis as close as possible to the controller.

Complete these tasks to install the first chassis in the redundant chassis pair:

- [Install the Chassis and Power Supply](#)
- [Install the Communication Modules](#)
- [Install a Controller](#)
- [Install the Redundancy Module](#)

TIP Do not apply power to the system until both chassis and their components are installed.

Then follow the steps described in [Step 4: Update Redundant Chassis Firmware on page 67](#) to determine when to power each chassis.

Install the Chassis and Power Supply

Use the installation information provided with the chassis and power supply, or redundant power supplies, to install them in an enhanced redundancy system.

Table 9 - Installation Information for ControlLogix Chassis and Power Supplies

Product Type	Cat. No.	Publication
Chassis and power supplies	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17, 1756-A4LXT, 1756-A5XT, 1756-A7LXT, 1756-A7XT, 1756-PA72, 1756-PB72, 1756-PA75, 1756-PB75, 1756-PC75, 1756-PH75, 1756-PAXT, 1756-PBXT, 1756-PA75R, 1756-PB75R, 1756-PSCA2	ControlLogix Chassis and Power Supplies Installation Instructions, publication 1756-IN005

For more information on using chassis and power supplies in an enhanced redundancy system, see [Components of an Enhanced Redundancy System on page 24](#).

Install the Communication Modules

Use the installation information provided with the communication modules to install them in an enhanced redundancy system.

Table 10 - Communication Module Installation

Product Type	Cat. No.	Publication
ControlNet communication modules	1756-CN2/B	ControlNet Modules Installation Instructions, publication CNET-IN005
	1756-CN2R/B	
	1756-CN2RXT	
EtherNet/IP communication modules	1756-EN2T	EtherNet/IP Modules Installation Instructions, publication ENET-IN002
	1756-EN2TR	
	1756-EN2F	
	1756-EN2TXT	

For more information on using communication modules in an enhanced redundancy system, see [Communication Modules in Redundant Chassis on page 32](#).

Install a Controller

Use the installation information in the ControlLogix System User Manual, publication [1756-UM001](#), to complete the following for your controller:

- Installation in an enhanced redundancy system
- Determination of compatibility for planned primary and secondary controllers in the redundant chassis, see [Table 6 on page 30](#)

IMPORTANT The ControlLogix-XT controllers function in the same way as the traditional controllers. The ControlLogix-XT products include control and communication system components that are conformally coated for extended protection in harsh, corrosive environments:

- When used with FLEX I/O-XT™ products, the ControlLogix-XT system can withstand temperature ranges from -20...70 °C (-4...158 °F).
- When used independently, the ControlLogix-XT system can withstand temperature ranges from -25...70 °C (-13...158 °F).

For more information on using controllers in an enhanced redundancy system, see [Controllers in Redundant Chassis on page 29](#).

Install the Redundancy Module

You must install one redundancy module in each chassis planned for your system. Available modules are as follows:

- 1756-RM2/A
- 1756-RM2XT
- 1756-RM/A
- 1756-RM/B
- 1756-RMXT

IMPORTANT Do not connect the primary redundancy module to the secondary redundancy module until all other components used in the redundant chassis pair are installed.

IMPORTANT Keep the redundancy module as close as possible to the controller module.

IMPORTANT 1756-RM2/A or 1756-RM2XT modules can only be used with other 1756-RM2/A or 1756-RM2XT modules. You cannot mix 1756-RM2/A and 1756-RM2XT modules with 1756-RM/A, 1756-RM/B, or 1756-RMXT modules.

Installation Requirements

Before you install the module, be sure to note the following:

- Understand redundant systems and redundant media
- Verify that the planned modules for each redundant chassis of the pair are identical - including firmware revisions
- Verify that your enhanced redundancy firmware revision is compatible with your planned redundant chassis modules
- The 1756-RM/B module offers a higher level of performance than a 1756-RM/A module. Both modules can coexist in a redundant system, but the highest system performance is achieved when the 1756-RM/B modules are used together when used in conjunction with a 1756-L7x controller.
- The 1756-RM2/A module, when used in conjunction with a 1756-L7x controller, offers higher crossload speeds than the 1756-RM/B module.

Environment and Enclosure



ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, Rockwell Automation publication [1770-4.1](#), for additional installation requirements
 - NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosure
-

Prevent Electrostatic Discharge



ATTENTION: This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
 - Wear an approved grounding wrist strap.
 - Do not touch connectors or pins on component boards.
 - Do not touch circuit components inside the equipment.
 - Use a static-safe workstation, if available.
 - Store the equipment in appropriate static-safe packaging when not in use.
-

Removal and Insertion Under Power (RIUP)



WARNING: When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

European Hazardous Location Approval

The following applies when the product bears the Ex Marking.

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in Zone 2 potentially explosive atmospheres, given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.



ATTENTION: This equipment is not resistant to sunlight or other sources of UV radiation.



WARNING:

- This equipment must be installed in an enclosure providing at least IP54 protection when applied in Zone 2 environments.
 - This equipment shall be used within its specified ratings defined by Rockwell Automation.
 - This equipment must be used only with ATEX certified Rockwell Automation backplanes.
 - Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
-

Safety-related Programmable Electronic Systems



ATTENTION: Personnel responsible for the application of safety-related programmable electronic systems (PES) shall be aware of the safety requirements in the application of the system and shall be trained in using the system.

Optical Ports



ATTENTION: Under certain conditions, viewing the optical port may expose the eye to hazard. When viewed under some conditions, the optical port may expose the eye beyond the maximum permissible-exposure recommendations.

Small Form-factor Pluggable



WARNING: When you insert or remove the small form-factor pluggable (SFP) optical transceiver while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.
Be sure that power is removed or the area is nonhazardous before proceeding.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations.	Informations sur l'utilisation de cet équipement en environnements dangereux.
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>	<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>
<div style="display: flex; align-items: center;">  <div> <p>AVERTISSEMENT: EXPLOSION HAZARD</p> <ul style="list-style-type: none"> Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. Substitution of components may impair suitability for Class I, Division 2. If this product contains batteries, they must only be changed in an area known to be nonhazardous. </div> </div>	<div style="display: flex; align-items: center;">  <div> <p>AVERTISSEMENT: RISQUE D'EXPLOSION –</p> <ul style="list-style-type: none"> Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. S'assurer que l'environnement est classé non dangereux avant de changer les piles. </div> </div>

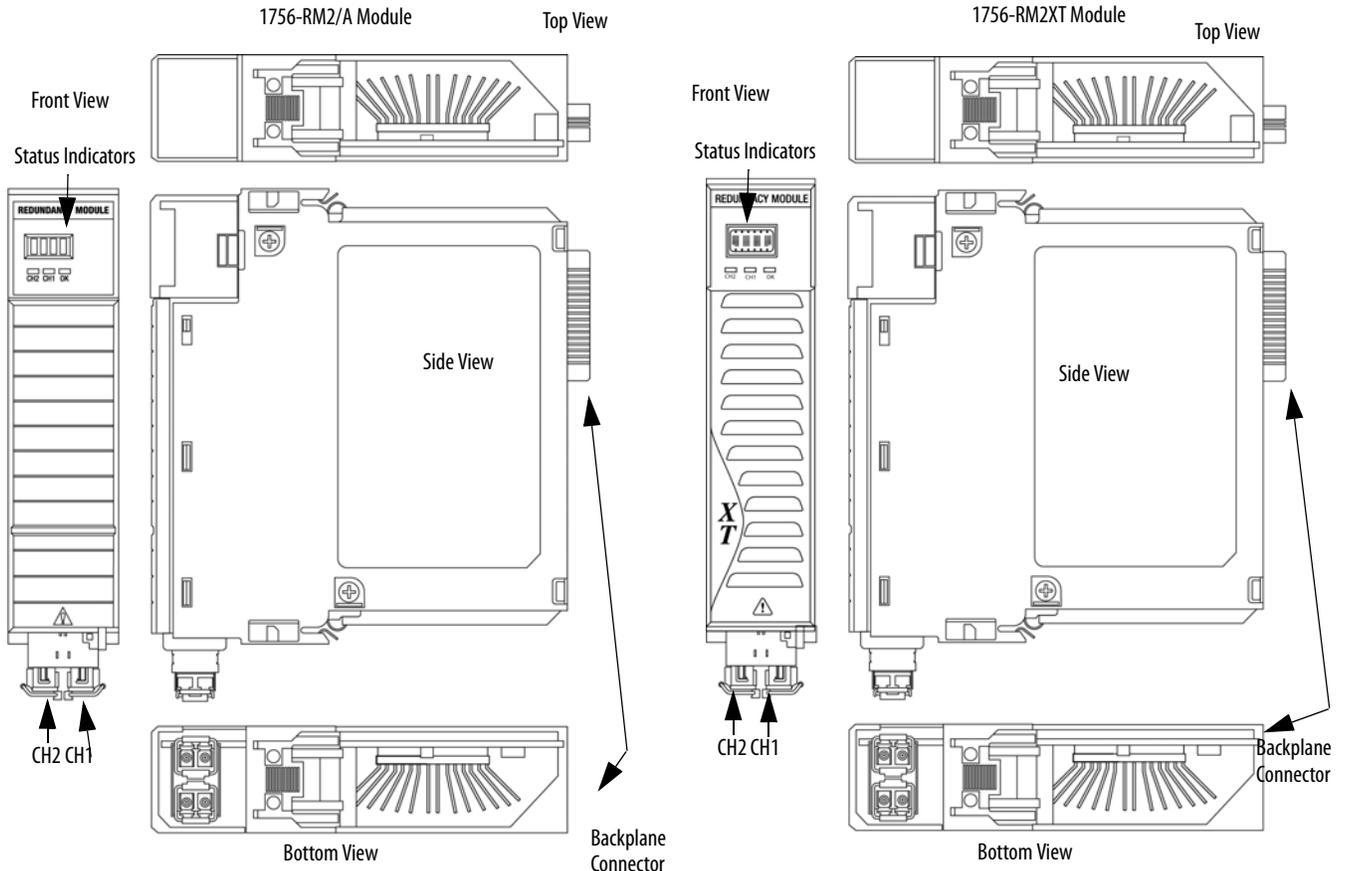
Laser Radiation Ports



ATTENTION: Class 1 laser product. Laser radiation is present when the system is open and interlocks bypassed. Only trained and qualified personnel are allowed to install, replace, or service this equipment.

A redundant system is comprised of two ControlLogix redundancy modules working together that supervise the operating states and state transitions that establish the basic framework for redundancy operations. The redundant pairs provide a bridge between chassis pairs that let other modules exchange control data and synchronize their operations. This illustration identifies the external features of the module.

Figure 12 - 1756-RM2/A or 1756-RM2XT Modules

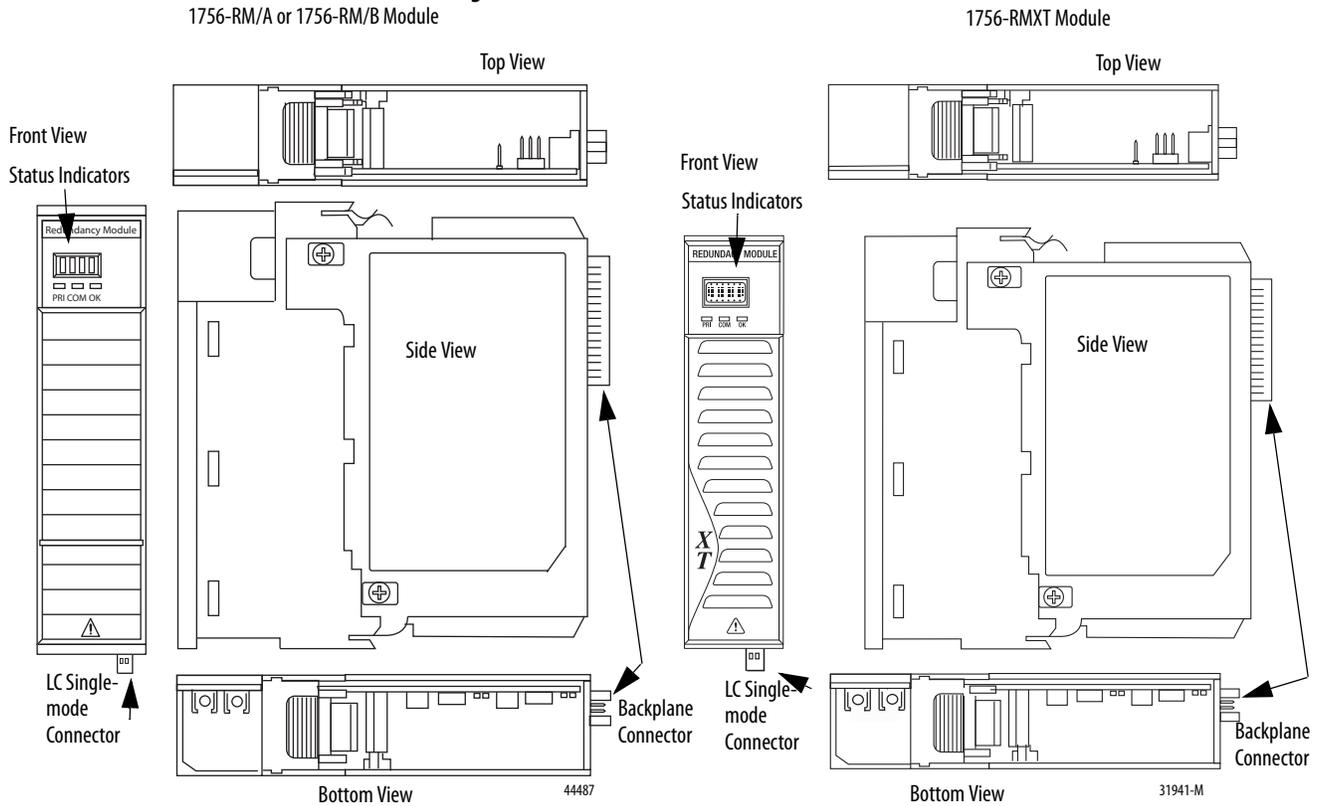


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NOTE: SFP transceivers are pre-installed in the redundant fiber ports

Figure 13 - 1756-RM/A or RM/B and 1756-RMXT Modules



To install the redundancy module, follow these steps.

1. Align the circuit board with top and bottom guides in the chassis.
2. Slide the module into the chassis, making sure the module backplane connector properly connects to the chassis backplane.

The module is properly installed when it is flush with other installed modules.

IMPORTANT To remove the module, push on the locking clips at the top and bottom of each module and slide the module out of the chassis.

IMPORTANT If you are adding redundancy to an already operational ControlLogix system, shut off your process to install the redundancy module. The first chassis you install the redundancy module into and turn on, becomes the primary chassis.

You can also have to do the following:

- Use RSNetWorx software to configure keeper information in the secondary ControlNet communication module if the master keeper for ControlNet communication is in the primary chassis
 - Enable redundancy in RSLogix 5000 software and remove any I/O modules from the chassis
-

This completes the installation of the first chassis and its components. **Chassis power must remain off.**

Install the Second Chassis

Once the first chassis and its components are installed, you can install the second chassis of the redundant chassis pair.

Complete these tasks as described in the [Install the First Chassis and its Components](#) section to install the second chassis:

- [Install the Redundancy Module](#)
- [Install the Communication Modules](#)
- [Install a Controller](#)
- [Install the Redundancy Module](#)

IMPORTANT The components used in the first and second chassis must match exactly for the system to synchronize.

Step 3: Connect the Redundancy Modules via a Fiber-optic Cable

Once the **first and second chassis and their components are installed**, you connect the redundancy modules via the 1756-RMC x fiber-optic communication cable. The cable is not included with the redundancy module. Before installation, order this fiber-optic communication cable separately.

Redundancy cables available from Rockwell Automation include the following.

Table 11 - Fiber-optic Cable Length

Fiber Cable Cat. No.	Length
1756-RMC1	1 m (3.28 ft)
1756-RMC3	3 m (9.84 ft)
1756-RMC10	10 m (32.81 ft)

The cable connection is made at the bottom of the module in a downward orientation. There is enough space between the transmit and receive connectors so you can use the LC connector coupler. Using this coupler keeps the fiber-optic cable from bending so you can connect and disconnect the cable without removing the module from the chassis.



ATTENTION: Consider these points when connecting the fiber-optic cable:

- The redundancy module communication cable contains optical fibers. Avoid making sharp bends in the cable. Install the cable in a location where it will not be cut, run over, abraded, or otherwise damaged.
 - The redundancy module contains a single-mode transmitter. Connecting this module to a multi-mode port will damage any multi-mode devices.
 - Under certain conditions, viewing the optical port can expose the eye to hazard. When viewed under some conditions, the optical port can expose the eye beyond the maximum permissible-exposure recommendations.
 - Media redundancy is achieved by installing modules with redundant ports and installing a redundant fiber cable system. If a cable failure occurs, or cable is degraded, the system uses the redundant network.
 - When using a redundant system, route the two trunk cables (A and B) so that damage to one cable will not damage the other cable. This reduces both cables being damaged at the same time.
 - Redundant cabling can tolerate one or more faults on a single channel. If a fault were to occur on both channels, the network operation would be unpredictable.
-

Connect the Fiber-optic Communication Cable to Redundant Channels

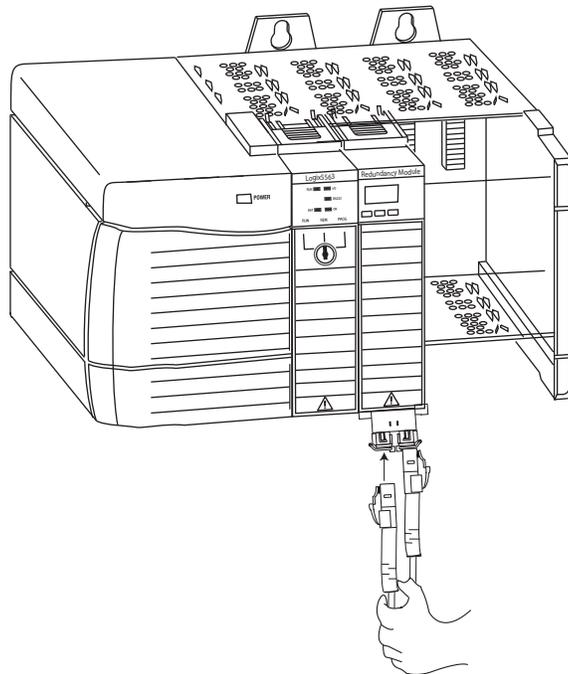
Follow this procedure to install the communication cable to redundant channels for the 1756-RM2/A module.

IMPORTANT The redundancy module communication cable contains optical fibers. Avoid making sharp bends in the cable. Install the cable in a location where it will not be cut, run over, abraded, or otherwise damaged.

1. Remove the black protective plug on the first redundancy module in the redundant chassis pair.
2. Remove the protective caps from the cable.
3. Plug the cable connectors into the first redundancy module.

The ends must be inserted opposite each other.

4. If redundant fiber crossload cable is required, install the second fiber cable into the remaining port.
5. The first end of the fiber cable should plug into the CH1 port on the first chassis and the matching end should plug into the matching CH1 port on the second chassis.



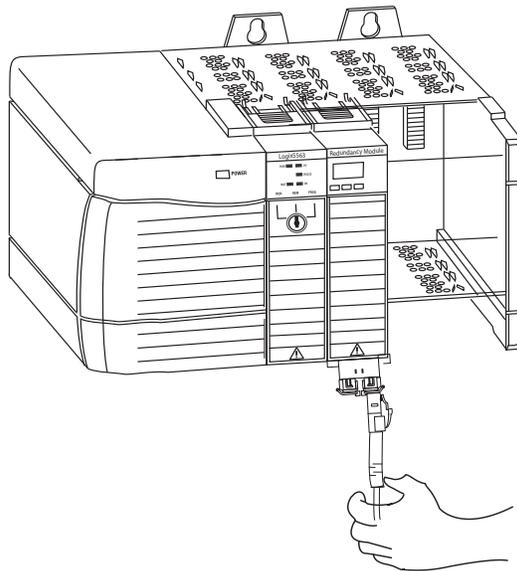
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Connect the Fiber-optic Communication Cable to Single Channels

Follow this procedure to install the communication cable.

IMPORTANT The redundancy module communication cable contains optical fibers. Avoid making sharp bends in the cable. Install the cable in a location where it will not be cut, run over, abraded, or otherwise damaged.

1. Remove the black protective plug on the first redundancy module in the redundant chassis pair.
2. Remove the protective caps from the cable.
3. Plug the cable connector into the first redundancy module.
4. Plug the remaining cable-connector end to the second redundancy module.



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Fiber-optic Cable

If you choose to make your own fiber-optic cables, consider the following:

- Fiber-optic Communication Cable Specifications

Attribute	1756-RM2/A	1756-RM2XT	1756-RM/A or 1756-RM/B	1756-RMXT
Temperature, operating	0...60 °C (32...140 °F)	-25...70 °C (-13...158 °F)	0...60 °C (32...140 °F)	-25...70 °C (-13...158 °F)
Connector type	LC-type (fiber-optic)			
Cable type	8.5/125 micron single-mode fiber-optic cable			
Channels	1 (transmit and receive fiber)			
Length, max	10 km (10,000 m, 10936.13 yd)		4 km (4000 m, 4,374.45 yd) ⁽¹⁾	
Transmission	1000 Mbps		Less than or equal to 100 Mbps	
Wavelength	1310 nm		1300 nm	
SFP transceiver	Transceiver Rockwell PN-91972 Connector/cable: LC duplex connector, 1000BASE-LX-compliant		—	

(1) Longer distances are supported based on the systems' optical power budget. See the [Optical Power Budget Ranges on page 67](#).

- Determine Optical Power Budget

You can determine the maximum optical-power budget in decibels (dB) for a fiber-optic link by computing the difference between the minimum transmitter-output optical power (dBm avg) and the lowest receiver sensitivity (dBm avg).

The optical-power budget provides the necessary optical-signal range to establish a working fiber-optic link. You must account for the cable lengths and the corresponding link penalties. All penalties that affect the link performance must be accounted for within the link optical power budget.

Table 12 - Optical Power Budget Ranges

Transmitter	Min	Typical	Max	Unit
Output optical power	-15	—	-8	dBm
Wavelength	1261	—	1360	nm
Receiver	Min	Typical	Max	Unit
Receiver sensitivity	—	-38	-3	dBm avg
Receiver overload	-8	—	—	dbm avg
Input operating wavelength	1261	—	1580	nm

Step 4: Update Redundant Chassis Firmware

Use ControlFLASH software to upgrade the firmware of each module in each chassis.

IMPORTANT Apply power **ONLY** to the chassis containing modules on which you are upgrading firmware.

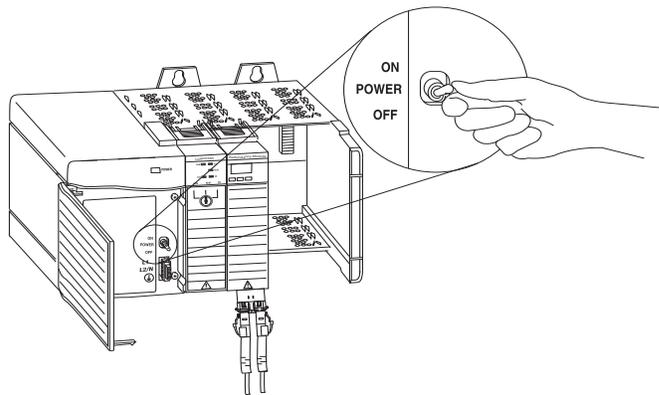
Upgrade firmware on only one module at a time.

IMPORTANT Redundancy module firmware contained in the enhanced redundancy system firmware bundle is designed for use with the 1756-RM, 1756-RM2/A, 1756-RMXT, and 1756-RM2XT redundancy modules.

Upgrade the Firmware in the First Chassis

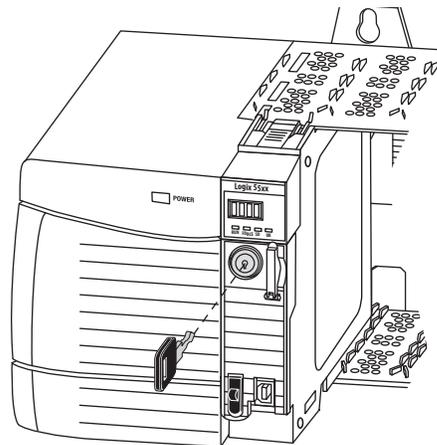
Complete these steps to upgrade the firmware in the first chassis.

1. Apply power to the chassis.

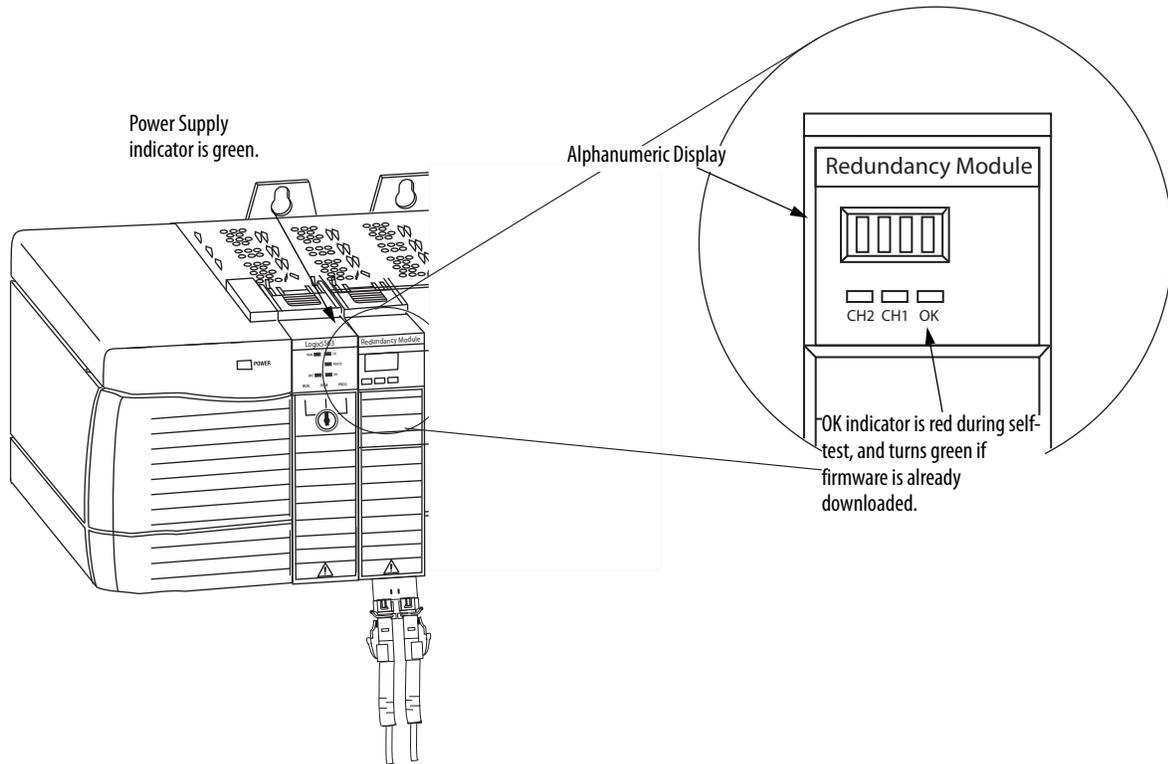


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2. Set the mode switch on the controller to REM.



3. Wait for the redundancy module to complete its start-up scroll messages. Check Module and status indicators. Wait 45 seconds before you begin updating the 1756-RM firmware. During this time, the redundancy module conducts internal operations to prepare for an update.

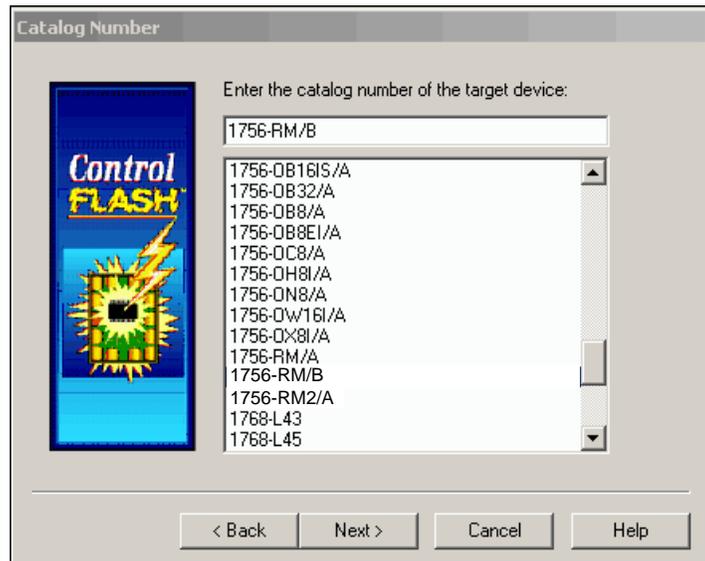


TIP If it is a new module, wait until APPLICATION UPDATE REQUIRED is displayed. The status indicator flashes red.

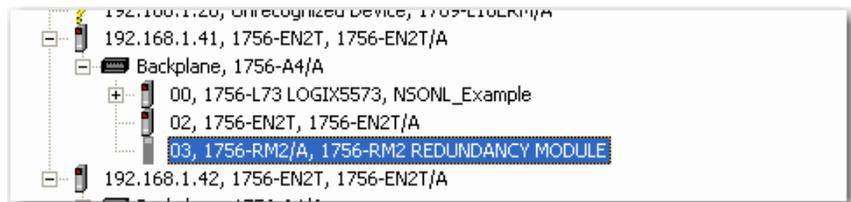
4. Launch ControlFLASH software and click Next to begin the update process.

5. Select the module's catalog number (upgrade the redundancy module first) and click Next.

IMPORTANT The 1756-RM2/A module uses different firmware than the 1756-RM and 1756-RMXT modules.



6. Expand the network driver to locate the redundancy module or module you are upgrading.



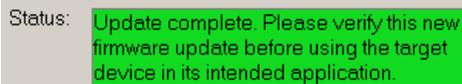
7. Select the module and click OK.
8. Select the firmware revision you want to update to and click Next.
9. Click Finish.

A confirmation dialog box appears.

10. Click Yes.

IMPORTANT This can take a few minutes. The system can look like it is not doing anything, but it is.

When the update is complete, the Update Status dialog box appears and indicates that the update has successfully completed.



Status: Update complete. Please verify this new firmware update before using the target device in its intended application.

-
11. Click OK.
 12. Verify that the redundancy module status displays PRIM, indicating a successful upgrade.
 13. Complete steps [4...12](#) for each module in the chassis.

IMPORTANT Power off the first chassis after you have verified a successful update of each module.

Upgrade the Firmware in the Second Chassis

Complete these steps to update the firmware for the modules in the second chassis.

1. Apply power to the second chassis.
2. Complete steps [3...12](#) in section [Upgrade the Firmware in the First Chassis](#) beginning on [page 68](#) for the modules in the second chassis.
3. Power off the second chassis after you have verified the successful upgrade of each module.

Step 5: Designate the Primary and Secondary Chassis

Power on the chassis you want to designate as the primary chassis first. After you have applied power, qualify the system so that all module pairs are at compatible firmware-revision levels.

IMPORTANT Do not apply power to the chassis until you have read the instructions for designating the primary chassis. Applying power to the chassis is crucial to designating the primary and secondary chassis.

Do not attempt to designate a primary chassis before loading in an application image.

Before you designate the primary chassis and qualify the system, make sure you have the latest firmware installed.

See [Step 4: Update Redundant Chassis Firmware on page 67](#).

Complete these steps to designate the primary and secondary chassis of a redundant pair.

1. Verify that power is removed from both chassis.
2. Apply power to the chassis you want to designate as the primary chassis and wait for the module's status indicators to display **PRIM**.
3. Apply power to the chassis you want to designate as the secondary chassis.
4. Verify primary and secondary chassis designations by viewing the module status display and the PRI indicator.

See [Status Indicators on page 227](#) for specific redundancy module display information.

IMPORTANT If both modules have power applied to them simultaneously, the module with the lowest IP address is designated as the primary chassis and displays PRIM on the module's four-character display. In addition, the PRI status indicator on the primary redundancy module is green. The secondary chassis displays either DISQ or SYNC, depending on the state of the secondary chassis. In addition, the PRI status light on the secondary redundancy module is not illuminated.

After Designation

When you first apply power to the designated primary and secondary chassis, compatibility checks are carried-out between the redundant chassis. Then, because the default Auto-Synchronization parameter is set at Always, qualification begins.

TIP While the qualification occurs, the module status display transitions from DISQ (disqualified) to QFNG (qualifying) to SYNC (synchronized). The qualification s completes in 1...3 minutes and then module status display indicates the qualification status.

Use this table as a reference when interpreting the qualification status of the modules displayed on the module status display.

Table 13 - Qualification Status Interpretation

Module Status Display	Interpretation
QFNG	Qualification processes are in progress.
SYNC	SYNC displays after qualification processes are complete. This indicates that chassis configuration and the firmware revision levels are compatible and that the secondary chassis is ready to assume control in the event of a major fault in the primary chassis.
DISQ...QFNG...DISQ	If DISQ continues to display after about three minutes, one of these anomalies exists: <ul style="list-style-type: none"> • Incorrect chassis configuration. That is, incompatible hardware is used. • Incompatible firmware revisions are used between the primary and secondary modules. • Keeper parameters between ControlNet module partners are not the same. • The partnered ControlNet modules are not set to the same node address. • The Auto-Synchronization parameter within the Redundancy Module Configuration Tool is set to Never.

Conversion from a Nonredundant to a Redundant System

You can upgrade the standalone chassis to a redundant chassis pair, by inserting a redundancy module in the standalone chassis and setting up an identical chassis with compatible modules (including the redundancy module) in the same slot as the standalone chassis.

If the partnered chassis, containing nonredundant modules or nonredundancy compliant firmware, is designated as the secondary chassis, it will stop functioning.

For detail information, see [Convert from a Nonredundant System on page 265](#).

Qualification Status via the RMCT

To view the qualification attempt, access the Synchronization or Synchronization Status tabs of the RMCT. These tabs provide information about qualification attempts and redundant chassis compatibility.

For more information about using the RMCT, see [Chapter 6, Configure the Redundancy Modules on page 105](#).

Figure 14 - RMCT Synchronization Status Tab

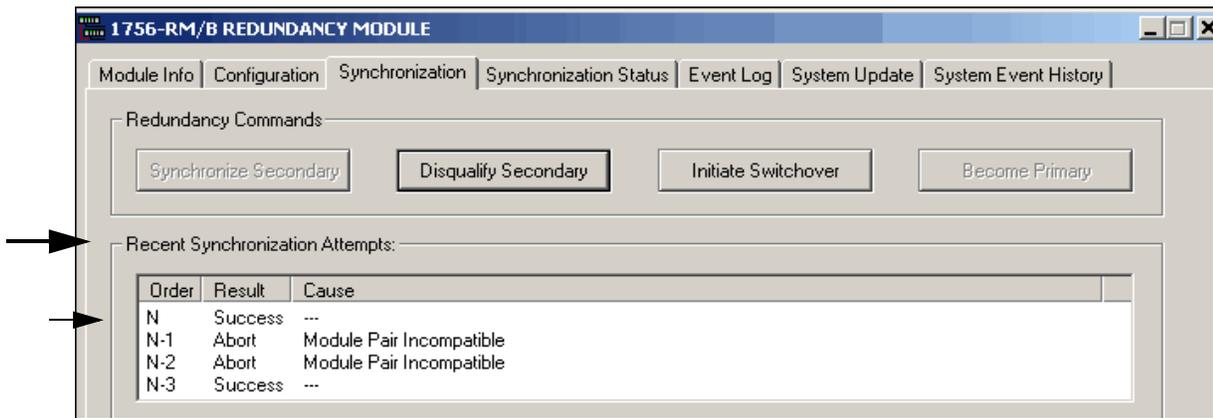
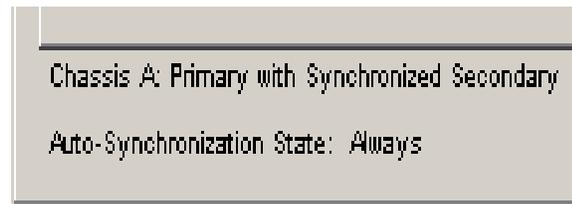


Figure 15 - Synchronization Status Tab for Chassis Compatibility



In addition, you can view events specific to qualification in the Event Log of the RMCT.

Figure 16 - Event Log with Qualification Events

Chassis A						
Event	Log Time	Slot	Module ...	Description	Classification	
326087	9/25/2009 11:15:04:3...	3	1756-RM	(1A) Chassis Redundancy State changed to PwOS	State Changes	
326086	9/25/2009 11:15:04:3...	2	1756-CN...	(21) Equally Able To Control	State Changes	
326085	9/25/2009 11:15:04:3...	2	1756-CN...	(14) Enter Qualification Phase 4	Qualification	
326084	9/25/2009 11:15:04:3...	3	1756-RM	(2E) Qualification Complete	Qualification	
326083	9/25/2009 11:15:04:3...	2	1756-CN...	(13) Enter Qualification Phase 3	Qualification	
326082	9/25/2009 11:15:03:3...	2	1756-CN...	(12) Enter Qualification Phase 2	Qualification	
326081	9/25/2009 11:14:49:7...	2	1756-CN...	(11) Enter Qualification Phase 1	Qualification	
326080	9/25/2009 11:14:49:6...	3	1756-RM	(2D) Qualification Attempted	Qualification	

Reset the Redundancy Module

There are two ways to reset the module.

- Cycle power to the chassis
- Remove the module from the chassis and reinsert the module

IMPORTANT Only choose to cycle power to the chassis if you will not lose control of your process.

Remove or Replace the Redundancy Module

To remove or replace the redundancy module, follow these steps.

1. Push on upper and lower module tabs to disengage them.
2. Slide the module out of the chassis.

IMPORTANT If you want to resume system operation with an identical module, you must install the new module in the same slot.

Notes:

Configure the EtherNet/IP Network

Topic	Page
Requested Packet Interval	77
Use IP Address Swapping	77
Use CIP Sync	81
Use Produce/Consume Connections	84
Configure EtherNet/IP Communication Modules in a Redundant System	85
Use An Enhanced Redundancy System in a Device-level Ring Topology	87

Requested Packet Interval

When using revisions earlier than 20.054, the RPI for I/O connections in a redundancy-enabled controller tree must be less than or equal to 375 ms. When using revision 20.054 or later, the RPI can be the same as a non-redundant chassis.

CPU Usage

The System Resource Utilization table describes CPU usage for EtherNet/IP communication modules.

Table 14 - System Resource Utilization Table

If the CPU utilization rate is	Then
0...80%	No action is required. Important: This is the optimal rate.
Greater than 80%	<ul style="list-style-type: none"> Take steps to reduce your CPU utilization. See the EtherNet/IP Network Configuration user manual, publication ENET-UM001. Adjust your connection's requested packet interval (RPI). Reduce the number of devices connected to your module. <p>Important: Your EtherNet/IP communication module can function at 100% CPU capacity, but at or near this rate, you run the risk of CPU saturation and performance problems.</p>

Use IP Address Swapping

IP address swapping is a feature available to EtherNet/IP communication modules in an enhanced redundancy system where a partnered set of EtherNet/IP communication modules swap IP addresses during a switchover.

IMPORTANT You must use IP address swapping to use remote I/O and produce/consume connections of an EtherNet/IP network.

Determine Use of IP Address Swapping

Depending on your EtherNet/IP network configuration, you can choose to use IP address swapping between your partnered EtherNet/IP communication modules in the event of a switchover.

If your partnered EtherNet/IP communication modules are on the	Then
Same subnet	use IP address swapping
Different subnets	do not use IP address swapping

If you are using different subnets, you are responsible for programming your system to use the address and subnet of the new primary chassis in the event of a switchover.

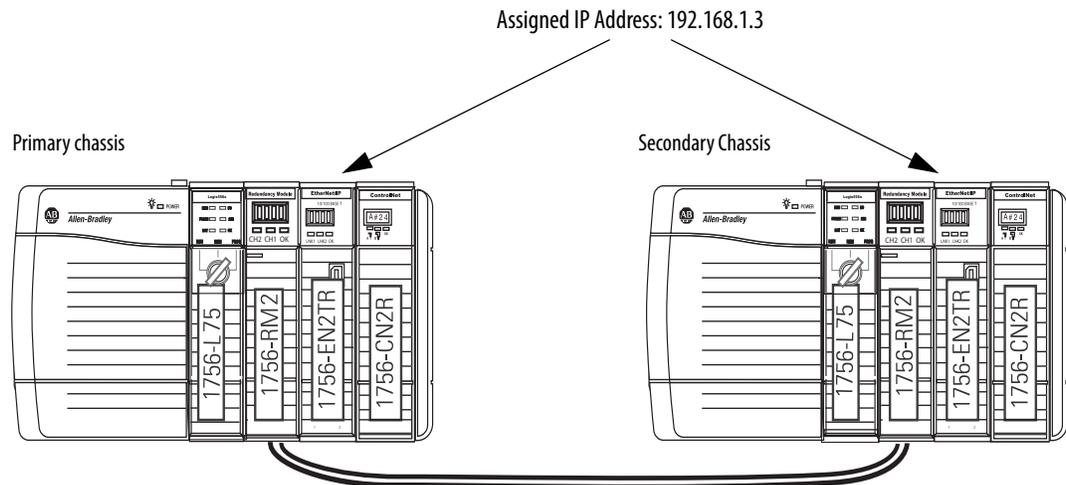
Use IP Address Swapping

If you use IP address swapping, assign the same values for these configuration parameters on both EtherNet/IP communication modules in the partnered set:

- IP address
- Subnet mask
- Gateway address

This graphic shows a partnered set of EtherNet/IP communication modules during initial configuration.

Figure 17 - EtherNet/IP Communication Modules' IP Addresses During System Configuration

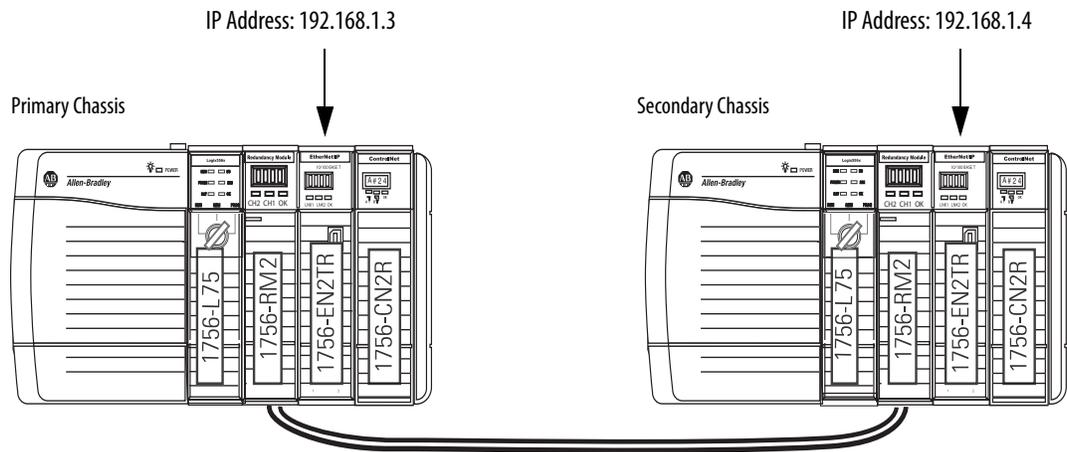


When an enhanced redundancy system begins operating, the primary EtherNet/IP communication module uses the IP address assigned during initial configuration. The secondary EtherNet/IP communication module automatically changes its IP address to the next highest value. When a switchover occurs, the EtherNet/IP communication modules swap IP addresses.

For example, if you assign IP address 192.168.1.3 to both EtherNet/IP communication modules in a partnered set, on initial system operation, the secondary EtherNet/IP communication module automatically changes its IP address to 192.168.1.4.

This graphic shows a partnered set of EtherNet/IP communication modules after system operation begins.

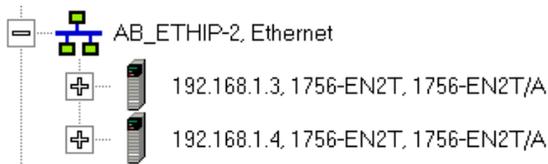
Figure 18 - EtherNet/IP Communication Modules' IP Addresses After System Operation Begins



TIP Do not assign IP addresses to EtherNet/IP communication modules outside the partnered set to values that conflict with those used in the partnered set. In the previous example, the partnered set uses 192.168.1.3 and 192.168.1.4. Use 192.168.1.5 or higher for all EtherNet/IP communication modules outside the partnered set.

This graphic shows the partnered set of EtherNet/IP communication modules in RSLinx Classic software after system operation begins.

Figure 19 - IP Addresses in RSLinx Classic Software



Static versus Dynamic IP Addresses

We recommend that you use static IP addresses on EtherNet/IP communication modules in enhanced redundancy system.



ATTENTION: If you use dynamic IP addresses and a power outage, or other network failure occurs, modules using dynamic IP addresses can be assigned new addresses when the failure is resolved. If the IP addresses change, your application could experience a loss of control or other serious complications with your system.

You cannot use dynamic IP addresses with IP address swapping.

Reset the IP Address for an EtherNet/IP Communication Module

If necessary, you can reset a 1756-EN2x communication module's IP address to the factory default value. To return to the factory default, set the module's rotary switches to 888 and cycle power.

After cycling power to the EtherNet/IP communication module, you can either set the module's switches to the desired address or set the switches to 999 and use one of these methods to set the IP address:

- BOOTP-DHCP server
- RSLinx Classic communication software
- RSLogix 5000 programming software

Use CIP Sync

Beginning with enhanced redundancy system revision 19.052 or later, you can use CIP Sync technology. CIP Sync technology provides a mechanism to synchronize clocks between controllers, I/O devices, and other automation products in your architecture with minimal user intervention.

CIP Sync technology uses Precision Time Protocol (PTP) to establish a Master/Slave relationship among the clocks for each CIP Sync-enabled component in the system. A single master clock, known as the Grandmaster, sets the clock to which all other devices on the network synchronize their clocks.

IMPORTANT Before you use this enhancement in an enhanced redundancy system, revision 19.050 or later, see these publications for a full understanding of CIP Sync technology in any system:

- Integrated Architecture™ and CIP Sync Configuration Application Technique, publication [IA-AT003](#)
 - ControlLogix System User Manual, publication [1756-UM001](#)
-

Consider these points when you use CIP Sync technology in an enhanced redundancy system, revision 19.052 or later:

- If you enable CIP Sync Time Synchronization in the controllers in a redundant chassis pair, you must also enable Time Synchronization in the EtherNet/IP communication modules in the redundant chassis pair so all devices have a single path to the Grandmaster.

If time synchronization is enabled in any controller in the primary chassis of a disqualified redundant chassis pair, and no other devices in the primary chassis have time synchronization enabled, the redundant chassis pair attempts to qualify. However, in these application conditions, the attempt to qualify fails.

- While CIP Sync technology can handle multiple paths between master and slave clocks, it resolves mastership most effectively if you configure the redundant paths so that Time Synchronization is enabled in only the minimum required number of EtherNet/IP communication modules.

For example, if your redundant chassis pair has three 1756-EN2T communication modules and all are connected to the same network, enable Time Synchronization in only one of the modules.

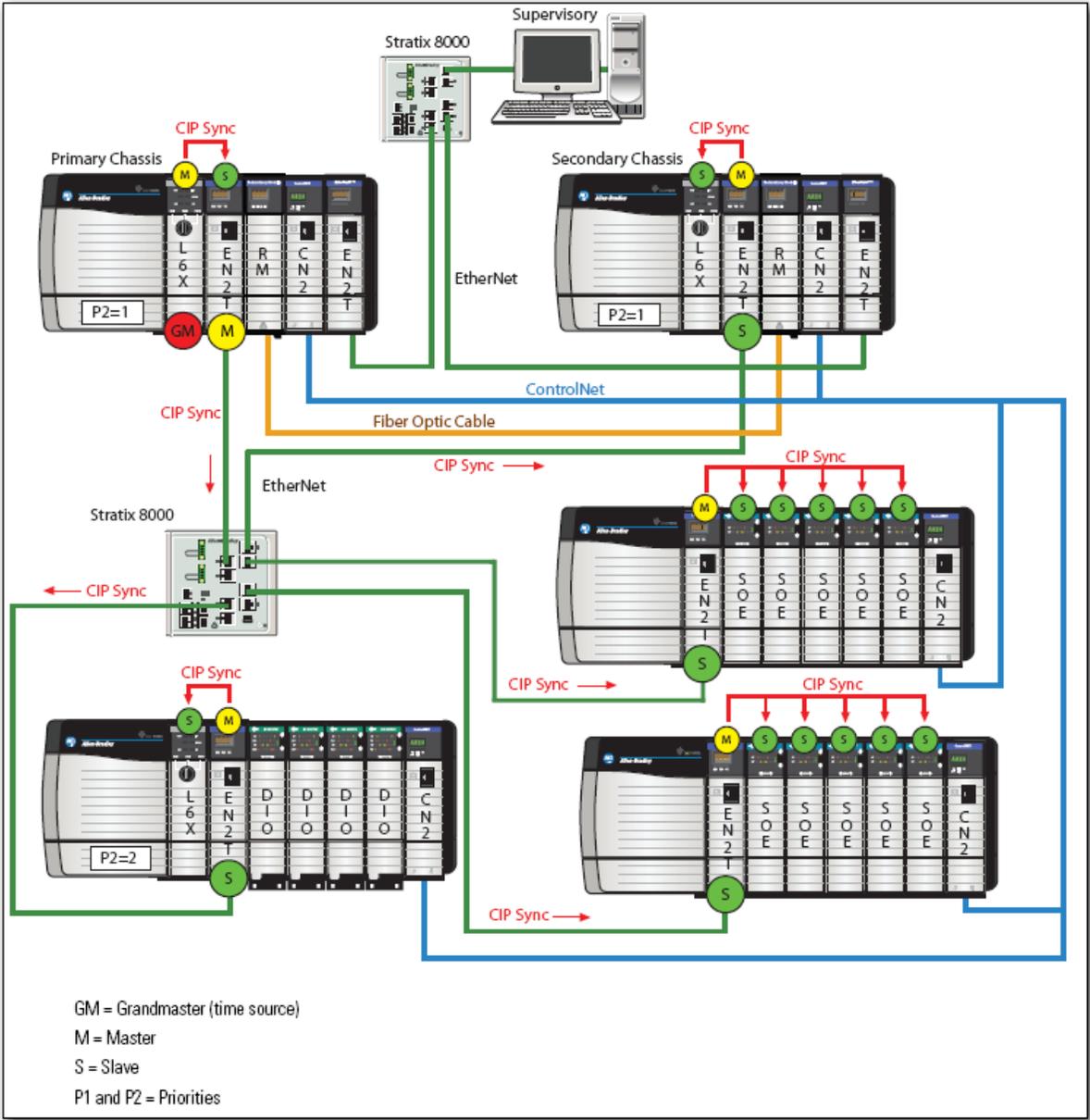
- If the primary controller is the Grandmaster, the enhanced redundancy system automatically manages the CIP Sync clock attributes so that the controller in the primary chassis is always set to be the Grandmaster instead of the secondary controller. This clock management ensures a change to a new Grandmaster when the redundancy system switches over.
- When a switchover occurs, these events take place:
 - The Grandmaster status transfers from the original primary controller to the new primary controller. This transfer can take longer to complete than if Grandmaster status was transferred between devices in a nonredundant system.
 - After the switchover is complete, system synchronization can take longer in an enhanced redundancy system, revision 19.052 or later, that uses CIP technology than one that does not.
- If you attempt to use the Redundant System Update (RSU) feature to update an enhanced redundancy system, revision 16.081 or earlier, that uses Coordinated System Time (CST), the enhanced redundancy system, revision 19.052 or later, does not permit a locked switchover and the update fails to complete.

To work around this restriction, first disable CST Mastership in the original redundancy system and then use RSU to update to enhanced redundancy system, revision 19.052 or later.

This figure shows an example enhanced redundancy system, revision 19.052 or later, using CIP Sync technology.

Use of **ControlNet** is **not required** when using CIP Sync technology in an enhanced redundancy system. It is included in this figure for example purposes.

Figure 20 - Enhanced Redundancy System, Revision 19.052 or later, Using CIP Sync Technology

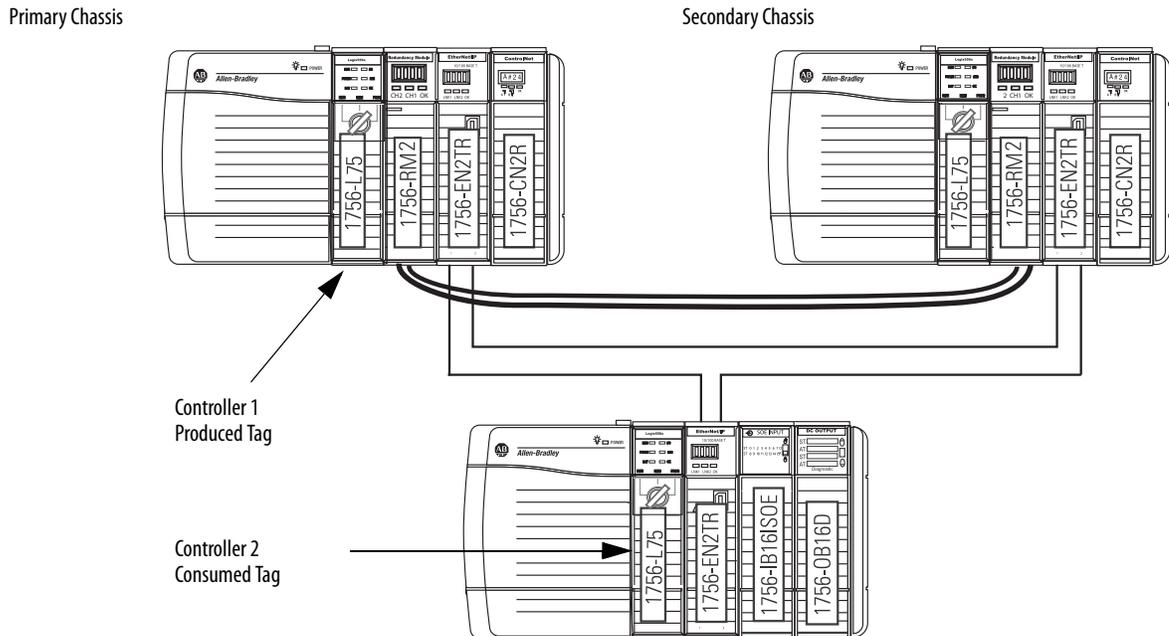


Use Produce/Consume Connections

Beginning with enhanced redundancy system, revision 19.053 or later, you can use produce/consume connections over an EtherNet/IP network. Controllers let you produce (broadcast) and consume (receive) system-shared tags.

TIP When using 1756-L7x controllers in your system, you must use revision 19.053 or later.

Figure 21 - Example System Using Produced and Consumed Tags



These requirements exist when you use produced and consumed connections over an EtherNet/IP network in an enhanced redundancy system, revision **19.052** or later:

- You cannot bridge produced and consumed tags over two networks. For two controllers to share produced or consumed tags, both must be attached to the same network.
- Produced and consumed tags use connections in both the controllers and the communication modules being used.
- Because the use of produced and consumed tags uses connections, the number of connections available for other tasks, such as the exchange of I/O data, is reduced.

The number of connections available in a system depends on controller type and network communication modules used. Closely track the number of produced and consumed connections to leave as many as necessary for other system tasks.

- You must configure both connections, that is, the connection between the primary controller and the remote controller, and the connection between the remote controller and the primary controller, for Multicast. However, if the redundancy system is the producer, it can be Unicast, because that is configured in the remote controller, which is allowed.

IMPORTANT If controllers in the redundant chassis pair produce tags over an EtherNet/IP network that controllers in remote chassis consume, the connection from the remote controller to the redundant controller can briefly drop during a switchover. This anomaly occurs if the EtherNet/IP communication modules in the remote chassis do not use specific firmware revisions.

For the latest firmware revisions by product, go to [GET SUPPORT NOW](#).

For more information on produced and consumed connections, see Logix5000 Controllers Produced and Consumed Tags user manual, publication [1756-PM011](#).

IMPORTANT Sockets are supported in the 1756-EN2T, 1756-EN2TR and 1756-EN2F modules, firmware revision 5.008 or later. For additional information, see [ENET-AT002](#).

IMPORTANT Unicast functionality in enhanced redundancy systems supports produced tags. Unicast consumed tags are not supported.

Configure EtherNet/IP Communication Modules in a Redundant System

Use these procedures to configure EtherNet/IP communication modules used in redundant chassis.

Before You Begin

Before you begin configuring the EtherNet/IP communication modules in the redundant chassis, verify that these tasks have been completed:

- The redundancy modules are installed and connected in the redundant chassis.
- A plan for IP address use has been executed:
 - If you are using IP address swapping, plan for the use of two consecutive IP addresses in the partnered set.
 - If you are not using IP address swapping, plan for the use of two IP addresses.
- Know the subnet mask and gateway address for the Ethernet network the redundant modules are to operate on.

Options for Setting the IP Addresses of EtherNet/IP Communication Modules

By default, ControlLogix EtherNet/IP communication modules ship with the IP address set to 999 and with Bootstrap Protocol (BOOTP)/Dynamic Host Configuration Protocol (DHCP)-enabled.

Use one of these tools to set the IP addresses for your EtherNet/IP communication modules:

- Rotary switches on the module
- RSLinx Classic communication software
- RSLogix 5000 software
- BOOTP/DHCP utility - Provided with RSLogix 5000 software

Half/Full Duplex Settings

The enhanced redundancy system uses the duplex settings of the EtherNet/IP communication module that is currently the primary. After a switchover, the duplex settings of the new primary EtherNet/IP communication module are used. By default, the duplex setting is automatic. We recommend that you use this setting whenever possible.

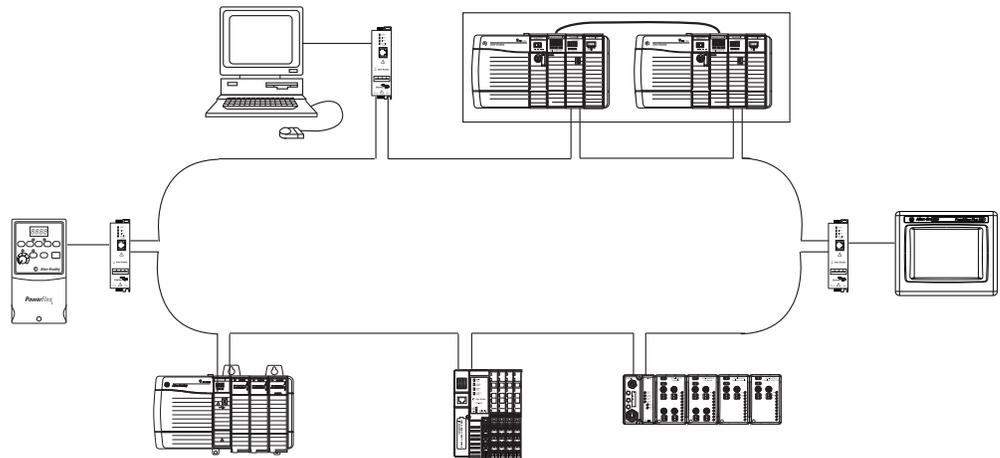
To avoid communication errors, configure both the primary and secondary EtherNet/IP communication modules with the same duplex settings. Using different duplex settings on partnered EtherNet/IP communication modules can result in messaging errors after a switchover.

Use An Enhanced Redundancy System in a Device-level Ring Topology

A DLR network is a single-fault tolerant ring network intended for the interconnection of automation devices. This topology is implemented at the device level because the use of EtherNet/IP embedded switch technology embeds switches into the end devices themselves. No additional switches are required.

This graphic shows an example DLR network that includes an enhanced redundancy system, revision 19.052 or later, connected to the network.

Figure 22 - Example DLR Network



Products with embedded switch technology have these features in common:

- Support for the management of network traffic to be sure of timely delivery of critical data
- Designed according to the ODVA specification for EtherNet/IP networks
- Ring recovery time less than 3 ms for DLR networks of 50 or fewer nodes
- Support for CIP Sync technology
- Two ports to connect to DLR networks in a single subnet

Devices on a DLR network can function on the network in these required roles:

- Supervisor Nodes - There are two types of supervisor nodes:
 1. Active Supervisor Node - The network requires one active supervisor node per DLR network that executes these tasks:
 - Verifies ring integrity
 - Reconfigures the ring to recover from a single fault
 - Collects ring diagnostic information

2. Back-up Supervisor Node - An optional node that behaves like a ring node unless the active supervisor node cannot execute required tasks. At that point, the back-up node becomes the active supervisor node.
- Ring Node - A node that processes data transmitted over the network or passes the data to the next node on the network. When a fault occurs on the DLR network, these nodes reconfigure themselves, relearn the network topology, and can report fault locations to the active ring supervisor.

We recommend that you configure at least one back-up supervisor node on the DLR network.

During normal network operation, an active ring supervisor uses beacon, and other DLR protocol frames to monitor network health. Back-up supervisor and ring nodes monitor beacon frames to track ring transitions between Normal and Faulted states.

You can configure two beacon-related parameters:

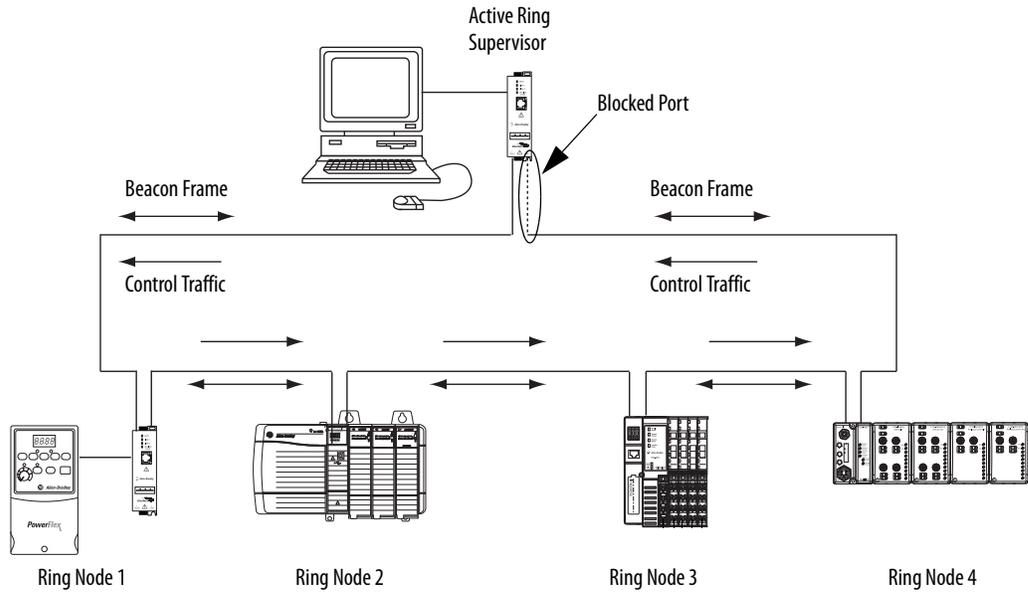
- Beacon interval - Frequency at which the active ring supervisor transmits a beacon frame through both of its ring ports.
- Beacon timeout - Amount of time that supervisor or ring nodes wait before timing out the reception of beacon frames and taking appropriate action.

IMPORTANT Although these two parameters are configurable, the default values accommodate most applications.
We strongly recommend that you use the default values.

During normal operation, one of the active supervisor node's network ports is blocked for DLR protocol frames. However, the active supervisor node continues to send beacon frames out of both network ports to monitor network health.

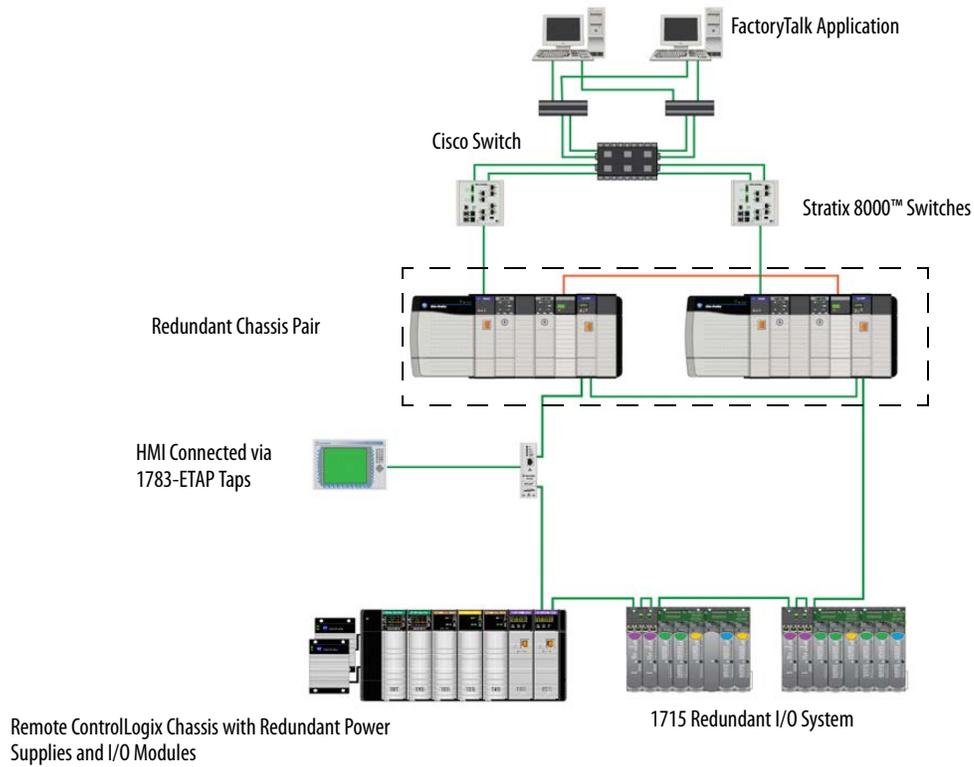
The graphic below shows the use of beacon frames sent from the active ring supervisor.

Figure 23 - Normal DLR Network Operation



This graphic shows an example of an operating DLR network that includes an enhanced redundancy system.

Figure 24 - Enhanced Redundancy System in a DLR Network



Complete these steps to construct and configure the example DLR network.

1. Install and connect devices on the DLR network but leave at least one connection open.

IMPORTANT

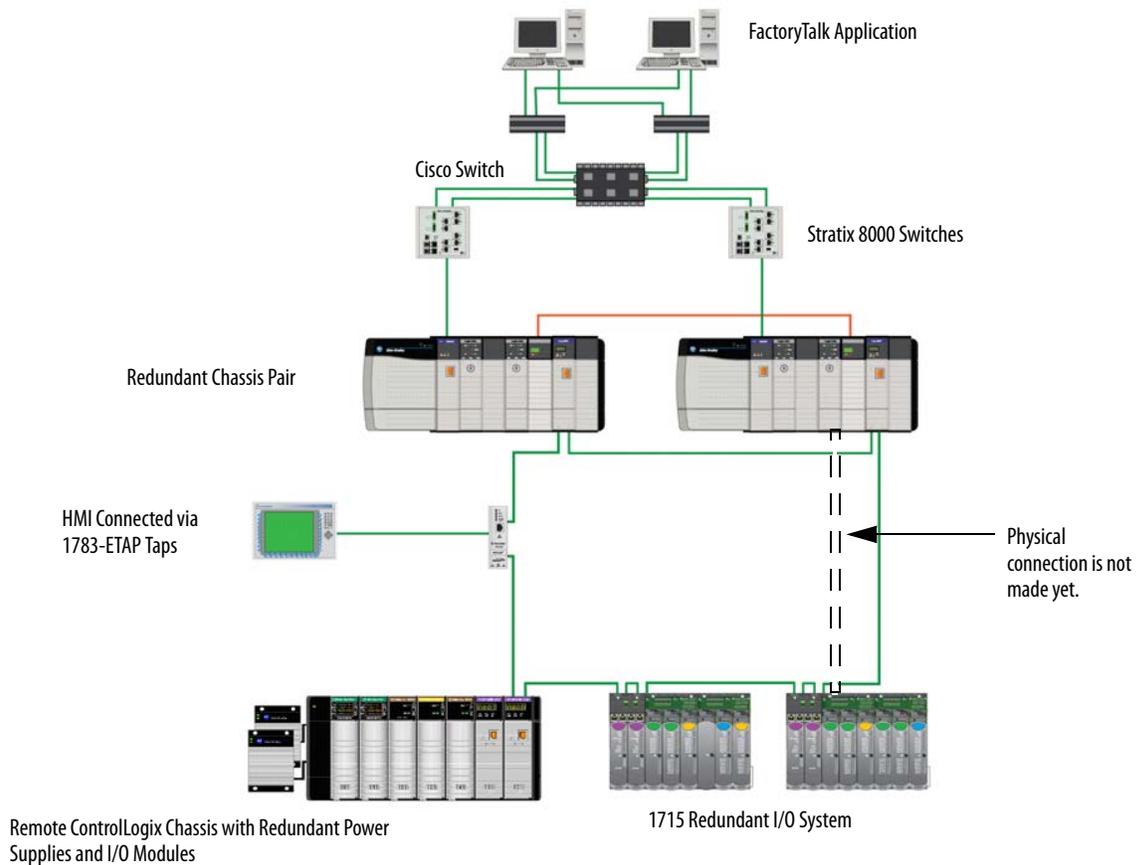
When you initially install and connect devices on the DLR network, leave at least one connection open, that is, temporarily omit the physical connection between two nodes on the DLR network.

You must configure an active supervisor node for the network before network operation begins when the final connection is made.

If you fully connect your DLR network without a supervisor configured, a network storm can result, rendering the network unusable until one link is disconnected and at least one supervisor is enabled.

This graphic shows the DLR network with one connection left open.

Figure 25 - DLR Topology with One Connection Unmade



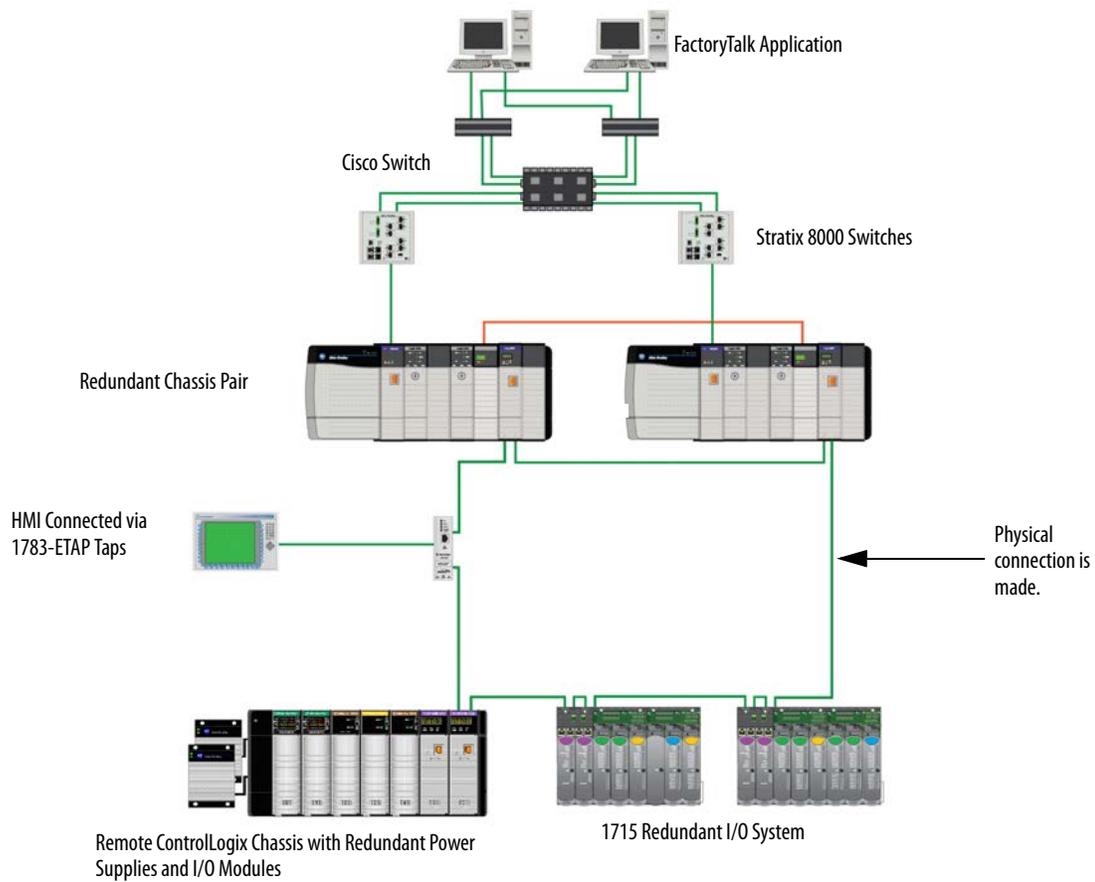
2. Configure and enable one active supervisor and any back-up nodes on the network.

Use either of these tools to configure and enable supervisor nodes on a DLR network:

- RSLogix 5000 programming software
- RSLinx Classic communication software

3. Complete the physical connections on the network to establish a complete and fully functioning DLR network. This figure shows the example DLR network on [page 91](#) with all physical connections complete.

Figure 26 - Fully Connected DLR Network



4. Verify supervisor configuration and overall DLR network status with either of these tools:

- RSLogix 5000 software
- RSLinx Classic communication software

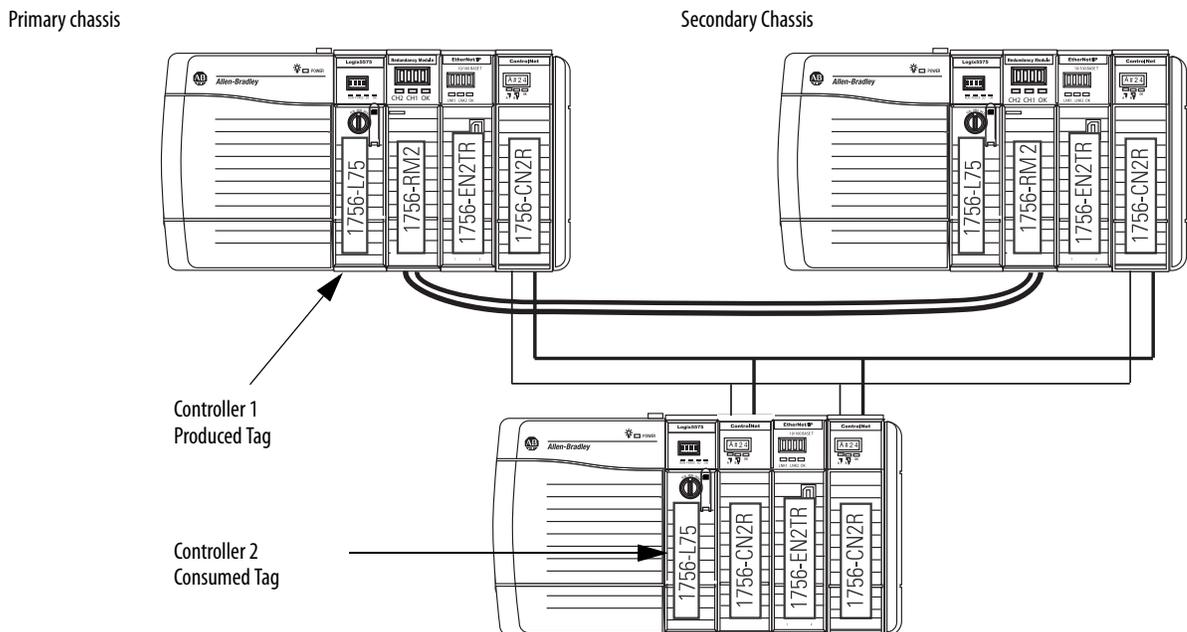
Configure the ControlNet Network

Topic	Page
Produce/Consume Connections	93
Network Update Time	95
Use a Scheduled or Unscheduled Network	97
Schedule a New Network	98
Update an Existing Scheduled Network	100
Check the Network Keeper States	101

Produce/Consume Connections

You can use produce/consume connections over a ControlNet network. Controllers let you produce (broadcast) and consume (receive) system-shared tags.

Figure 27 - Example System Using Produced and Consumed Tags



Keep these points in mind when you use produced and consumed connections over a ControlNet network in an enhanced redundancy system:

- During a switchover, the connection for tags that are consumed from a redundant controller can drop briefly.
 - The data does not update.
 - The logic acts on the last data that it received.

After the switchover, the connection is reestablished and the data begins to update again.

- You cannot bridge produced and consumed tags over two networks. For two controllers to share produced or consumed tags, both must be attached to the same network.
- Produced and consumed tags use connections in both the controllers and the communication modules being used.
- Because the use of produced and consumed tags uses connections, the number of connections available for other tasks, such as the exchange of I/O data, is reduced.

The number of connections available in a system depends on controller type and network communication modules used. Closely track the number of produced and consumed connections to leave as many as necessary for other system tasks.

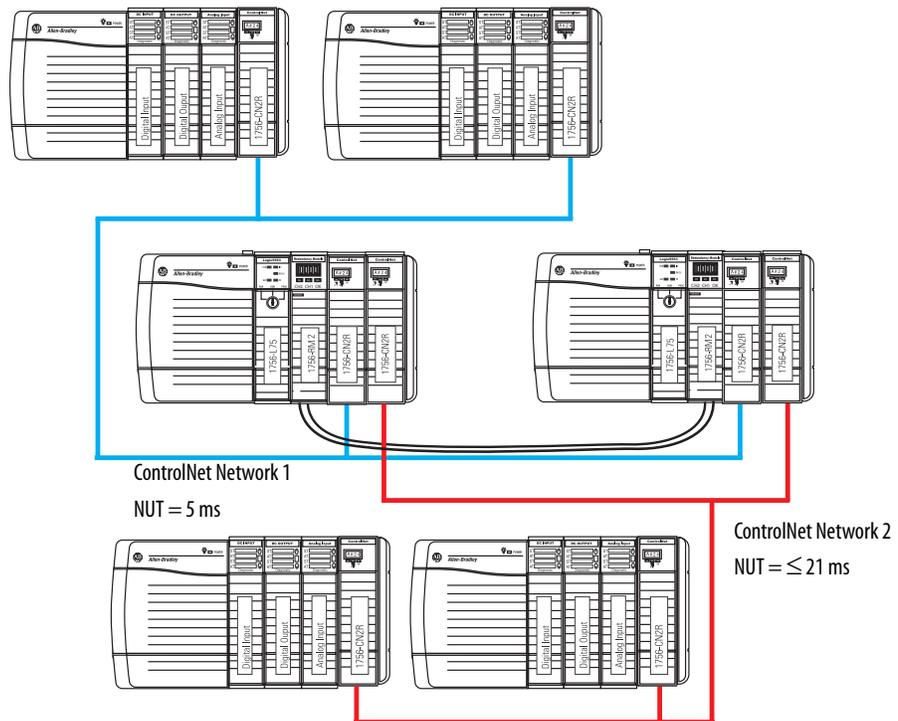
Network Update Time

The network update time (NUT) that you specify for your redundant system impacts your system performance and your switchover response time. Typical NUTs used with redundant systems range from 5...10 ms.

NUTs with Multiple ControlNet Networks

You can choose to use multiple ControlNet networks with your enhanced redundancy system.

Figure 28 - Example of Two ControlNet Networks



When you use multiple ControlNet networks, the networks must use compatible NUTs. Compatible NUTs are determined based on the network that uses the smallest NUT.

Use this table to determine the compatible NUTs for your system.

Table 15 - Compatible NUT Values for Multiple ControlNet Networks

If the smallest NUT of a network is (ms)	Then the largest NUT of any other network must be less than or equal to (ms)
2	15
3	17
4	19
5	21
6	23
7	25
8	27
9	29
10	31
11	33
12	35
13	37
14	39
15	41
16	43
17	46
18	48
19	50
20	52
21	55
22	57
23	59
24	62
25	64
26	66
27	68
28	71
29	73
30	75
31	78
32	80
33	82
34	84
35	87
36	89
37...90	90

Use a Scheduled or Unscheduled Network

It is up to the user to decide between using a scheduled or unscheduled network.

Use a Scheduled Network

Schedule or reschedule your ControlNet network when you are executing these tasks:

- Commissioning a new redundant system.
- Adding a new chassis of remote ControlLogix I/O that is set to use the Rack Optimized communication format.
- Adding any remote I/O besides ControlLogix I/O. For example, if adding FLEX I/O modules, you must schedule the network.
- Using produced/consumed data. Any time you add a produced/consumed data tag, you must reschedule the ControlNet network.

To schedule or reschedule your ControlNet network, you put your redundant system in Program mode.

Use an Unscheduled Network

You can use an unscheduled network when you are doing the following:

- Adding a new remote I/O chassis of ControlLogix I/O that does not use the Rack Optimized communication format. That is, direct connections to the I/O are used.
- Adding a ControlLogix I/O module to a chassis that has already been scheduled and uses the Rack Optimized communication format.
- Adding some drives that support adding I/O while online.
- Using ControlNet to monitor HMI or the controller program.

You can add those components to the unscheduled network while your redundant system is online and in Run mode. We recommend that you do not use an unscheduled network for all of your I/O connections.

The use of 1756-CN2/B, 1756-CN2R/B, and 1756-CN2RXT modules provides increased capacity for adding I/O while online compared to 1756-CNB or 1756-CNBR modules. With this increased capacity, you can easily add I/O and increase ControlNet connections used without affecting your redundant system performance.

Add Remote ControlNet Modules While Online

If you are adding a remote I/O chassis comprised of a ControlLogix ControlNet module and ControlLogix I/O while your redundant system is running (online), make these considerations:

- Do not use Rack Optimized communication formats. The ControlNet module and I/O must be configured for direct connections.
- For each remote I/O module used, plan for one direct connection to be used.

Schedule a New Network

Complete these steps to schedule a new ControlNet network for an enhanced redundancy system.

IMPORTANT

Before you schedule a ControlNet network, turn on the power to both redundant chassis.

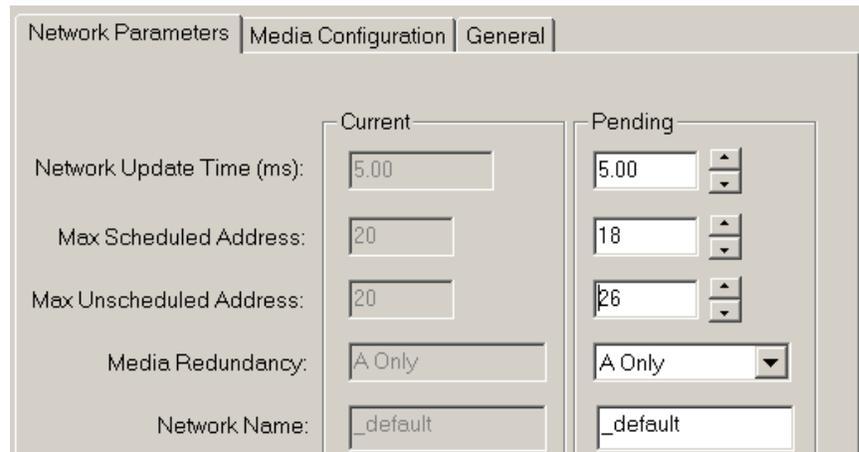
If you schedule a ControlNet network while the secondary chassis is off, the keeper signature of a 1756-CN2/B or 1756-CN2R/B module may not match its partner, and the secondary chassis will fail to synchronize.

1. Turn on the power to each chassis.
2. Start RSNetWorx for ControlNet software.
3. From the File menu, choose New.
4. From the Network menu, choose Online.
5. Select your ControlNet network and click OK.
6. Check Edits Enabled.

Edits Enabled

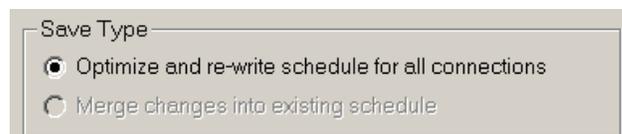
7. From the Network menu, choose Properties.

- In the Network Parameters tab, enter the parameters that are appropriate for your system.



Parameter	Specify
Network Update Time (ms)	The minimum repetitive interval when data is sent over the ControlNet network.
Max Scheduled Address	The highest node number that uses scheduled communication on the network.
Max Unscheduled Address	The highest node number that you use on the network.
Media Redundancy	The ControlNet channels you are using.
Network Name	A name for identifying the ControlNet network.

- Click OK.
- From the Network menu, choose Single Pass Browse.
- From the File menu, choose Save.
- Type a name for the file that stores the network configuration, then click Save.
- Click Optimize and re-write Schedule for all Connections (default) and click OK.



You have finished scheduling your new ControlNet network.

Update an Existing Scheduled Network

If you are adding the redundant chassis to an existing ControlLogix system that uses a ControlNet network, complete these steps to update the existing ControlNet network.

1. Turn on the power to each chassis.
2. Start RSNetWorx for ControlNet software.
3. From the File menu, choose Open.
4. Select the file for the network and click Open.
5. From the Network menu, choose Online.
6. Click **Edits Enabled**.

Edits Enabled

7. From the Network menu, choose Properties.
8. In the Network Parameters tab, update the parameters specific to your system.

	Current	Pending
Network Update Time (ms):	5.00	5.00
Max Scheduled Address:	20	18
Max Unscheduled Address:	20	26
Media Redundancy:	A Only	A Only
Network Name:	_default	_default

9. Click OK.
10. From the Network menu, choose Single Pass Browse.
11. From the File menu, choose Save.
12. Click Optimize and re-write schedule for all connections and click OK.

Save Type

Optimize and re-write schedule for all connections

Merge changes into existing schedule

13. Click OK.

You have completed updating your scheduled ControlNet network.

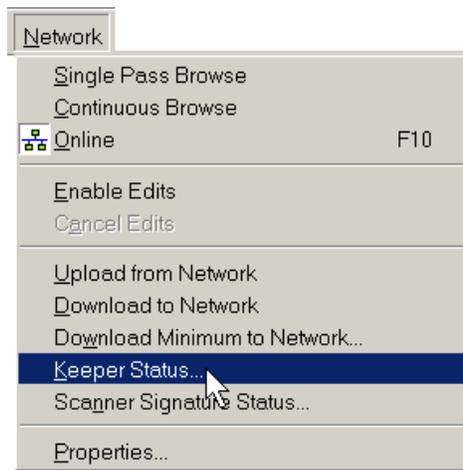
Check the Network Keeper States

After you schedule your ControlNet network, check the states of keeper-capable nodes. Checking the status of keeper-capable nodes is important because if a major network disruption occurs, the keepers provide network configuration parameters required to recover.

For more information about keepers and their function in a ControlNet network, see the ControlNet Modules in Logix5000 Control Systems User Manual, publication [CNET-UM001](#).

To check the status of keepers on the ControlNet network, complete these steps.

1. In RSNetWorx for ControlNet software, from the Network menu choose Keeper Status.



2. Verify that one keeper-capable device outside the redundant chassis is indicated as active and valid.
3. Verify that all of the keeper-capable devices on the network are valid.

Keeper Status ? x

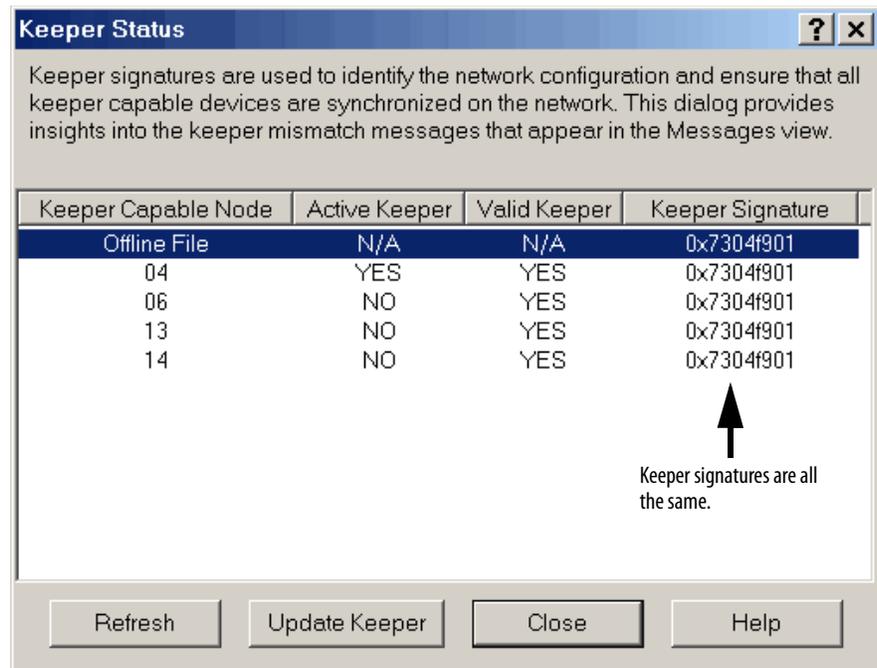
Keeper signatures are used to identify the network configuration and ensure that all keeper capable devices are synchronized on the network. This dialog provides insights into the keeper mismatch messages that appear in the Messages view.

Keeper Capable Node	Active Keeper	Valid Keeper	Keeper Signature
Offline File	N/A	N/A	0x7304f901
04	YES	YES	0x7304f901
06	NO	YES	0x7304f901
13	NO	YES	0x7304f901
14	NO	YES	0x7304f901

Active and valid keeper device. →

↑
Keeper-capable devices are valid.

- Verify that all of the nodes on the network have the same keeper signature.



- TIP** If the keeper signatures of partnered ControlNet modules are different, your redundant chassis may not synchronize.
- If the keeper signatures of your partnered ControlNet modules are different, update the keepers of the redundant ControlNet modules.

Save the Project for Each Primary Controller

After you have scheduled your ControlNet networks, go online with each controller in your primary chassis and save the project. This makes downloading a project easier in the future because you won't be required to reschedule the network after completing the download.

Automatic Keeper Crossloads

The 1756-CN2/B, 1756-CN2R/B, and 1756-CN2RXT ControlNet modules have an Automatic Keeper Crossload feature that makes replacing a ControlNet module in a redundant chassis easier. The Automatic Keeper Crossload feature also reduces the need to use RSNetWorx for ControlNet software once the system is running.

With the Automatic Keeper Crossload feature, ControlNet modules can automatically upload the keeper signature and network parameters from the active keeper of a ControlNet network.

To replace a ControlNet module that has been configured and scheduled on the ControlNet network, remove the existing module and insert a 1756-CN2/B, 1756-CN2R/B, or 1756-CN2RXT module. The module you are inserting must be unconfigured or have a keeper signature of all zeros.

- TIP** To clear the keeper signature of a 1756-CN2, 1756-CN2R, or 1756-CN2RXT module, complete these steps.
1. Disconnect the module from the ControlNet network and remove it from the chassis.
 2. Set the node address switches to 00.
 3. Insert the module back into the chassis and wait for the status display to indicate Reset Complete.
 4. Remove the module and set the node address switches to the intended node address.
 5. Insert the module into the chassis.

After being inserted and connected to the ControlNet network, the unconfigured 1756-CN2, 1756-CN2R, and 1756-CN2RXT modules crossload the appropriate configuration from the active keeper on the ControlNet network and become configured with the appropriate keeper signature.

Notes:

Configure the Redundancy Modules

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About the Redundancy Module Configuration Tool (RMCT)

The Redundancy Module Configuration Tool (RMCT) is used to configure the redundancy modules and to determine the status of the redundancy system.

Use the RMCT to complete these configuration-related tasks:

- Set Auto-Synchronization parameters.
- Set the time and date of redundancy modules.
- View and set module information.
- View and set Chassis ID parameters (Chassis A, Chassis B).
- Lock the redundant system for an update.
- Conduct a test switchover.

You can also use this functionality available with the RMCT to determine the redundant system's status:

- View error diagnostics specific to redundant chassis.
- View partnered modules' qualification and compatibility status.
- Identify noncompliant modules for removal.
- View redundant system event history.

The chassis platform configuration identifies the common operating platform of the modules in the redundant chassis and applies to all redundancy modules. It may be one of the following values depending on the redundancy release installed in the system and the type of communication modules running in the redundant chassis.

Table 16 - Chassis Platform Configuration

Type	Description
Standard	The redundant chassis is operating on a Standard platform. Modules supported in redundancy release revisions 16.057, 16.056, 16.053, and 16.050 and releases earlier than revision 16 comprise the standard platform.
Enhanced	The redundant chassis is operating on an Enhanced platform. Modules supported in redundancy release revision 16.054 and all releases of revision 16.080 and later comprise the enhanced platform.
Hybrid	The redundant chassis contains a mix of modules belonging to standard and enhanced platforms. All Hybrid platforms are an unsupported redundant system configuration.

Determine if Further Configuration is Required

The default configuration of the redundancy modules lets you synchronize your redundant chassis without additional configuration if you are using a basic redundant chassis pair.

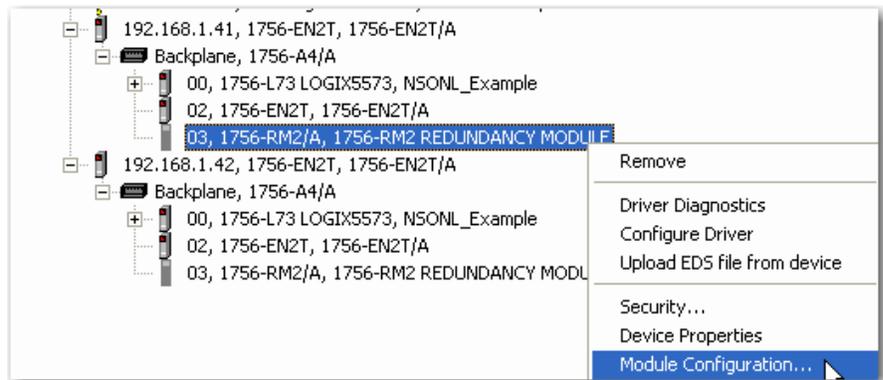
However, some applications and uses of the redundancy system can require additional configuration. For example, you must use the RMCT for additional configuration if you need to complete any of these tasks:

- Set the redundancy modules to a different time or date (recommended).
- Program your controller to control the redundant system.
- Change the redundancy synchronization options of the redundant system.
- Change the synchronization states of your redundant chassis.
- Conduct a test switchover.
- Complete a firmware update of a module in the redundant chassis while the system is online.

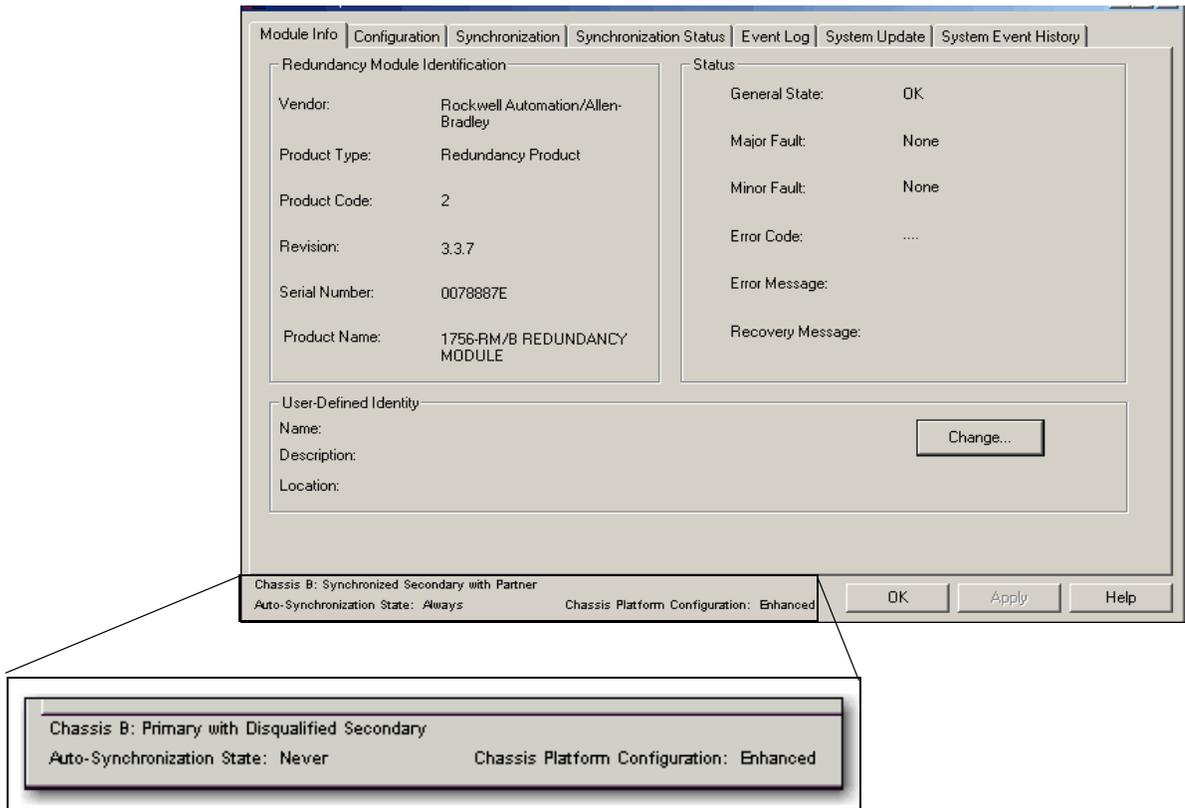
If you need to complete any of these tasks, reference the sections that follow.

Use the RMCT

To access and begin using the RMCT, launch RSLinx Classic software and browse to your redundancy module. Right-click the redundancy module and choose Module Configuration.



When you access the RMCT, the dialog box always indicates the status of the redundancy chassis in the bottom-left corner.



Identify the RMCT Version

You must use a version of the RMCT that is compatible with your redundancy module firmware.

Beginning with version 20.054, the redundancy module firmware reports back to the Redundancy Module Configuration Tool (RMCT) as to which version of the RMCT is compatible. In the case of an incompatibility, the RMCT will show only the Module Info tab and indicate the version that the firmware is compatible with.

If using a version earlier than 20.054, go to the Tech Support website at <http://www.rockwellautomation.com/support.com> to determine which RMCT version is required for use with your redundancy module firmware revision.

To find the latest firmware bundle on the website, follow these steps.

1. Once on the site, choose Control Hardware.
2. On the Firmware Updates page, choose the latest firmware bundle.
3. Download if different from your current module's firmware.

Complete these steps to check or verify the version of the Redundancy Module Configuration Tool (RMCT) that you have installed.

TIP

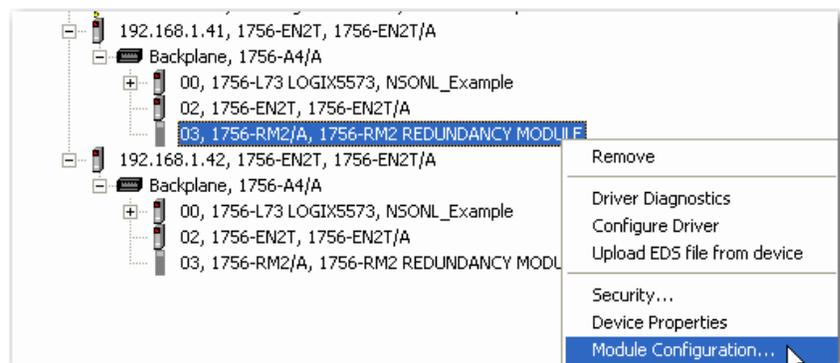
The RMCT launches at the version that is compatible with the 1756 redundancy module firmware that is currently installed.

If you have not updated your 1756 redundancy module firmware after upgrading your RMCT version, the RMCT version that is indicated may not reflect the version you updated to. You can also check the RMCT version that you have installed by using Add or Remove Programs in the Control Panel.

1. Launch RSLinx Classic software.
2. Click the RSWho icon.

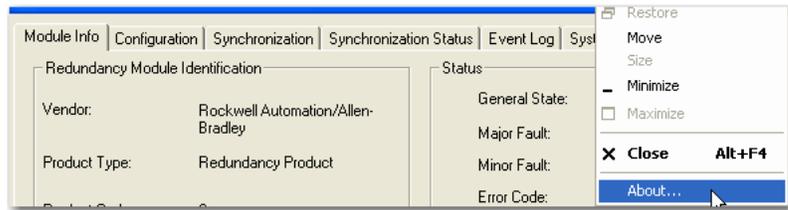


3. Right-click your redundancy module and choose Module Configuration.

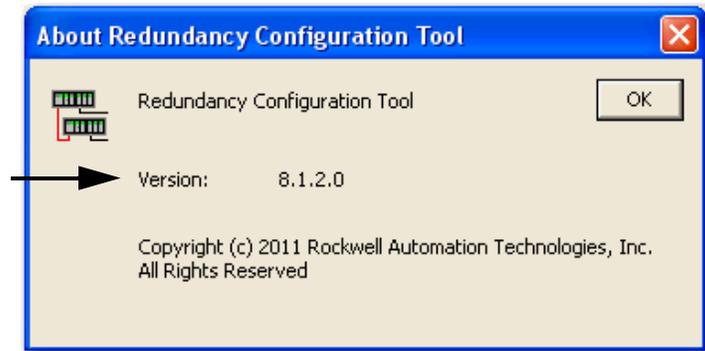


The Module Configuration dialog box opens.

4. Right-click the title bar and choose About.



The About dialog box opens and indicates the RMCT version.



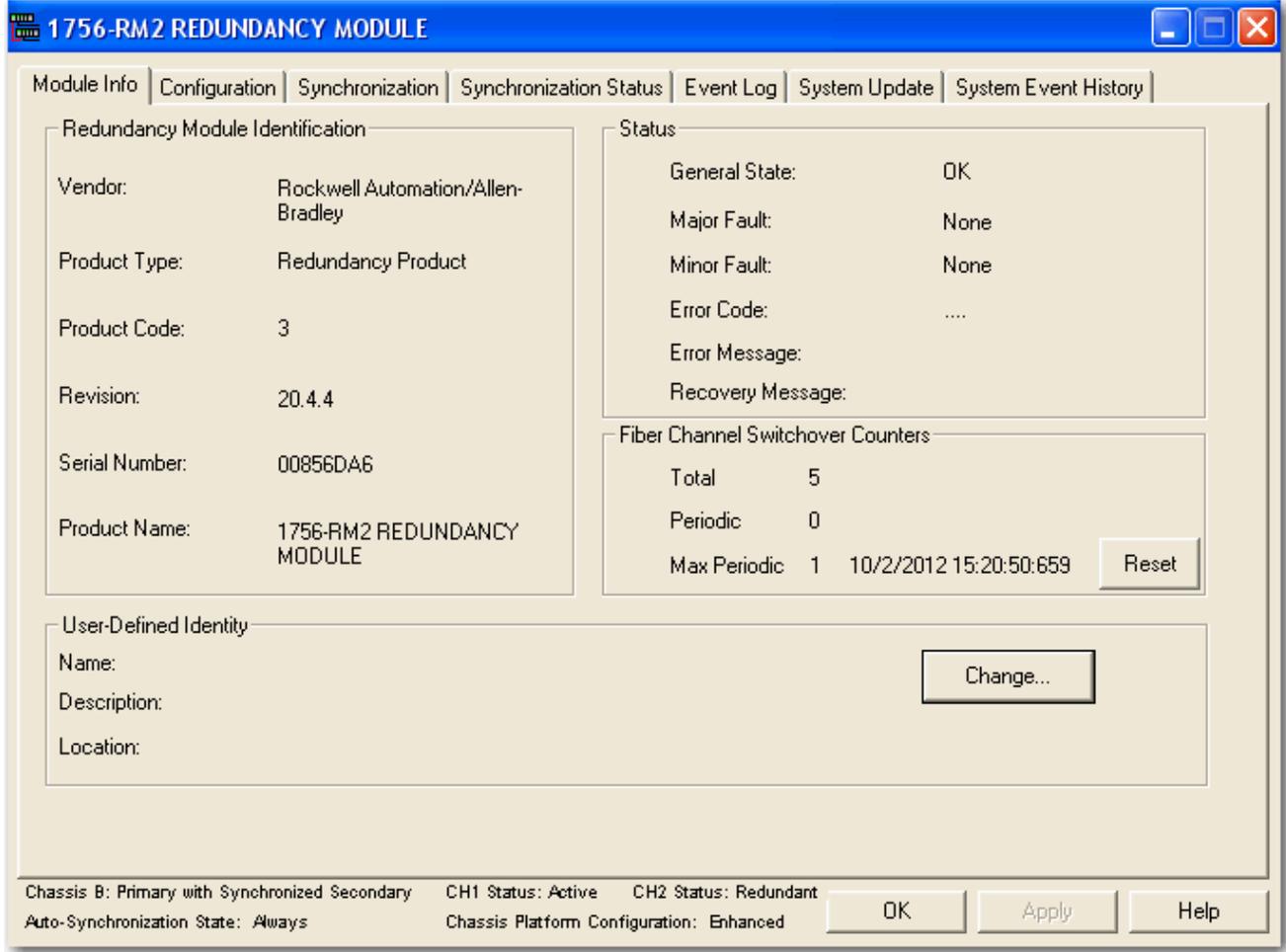
Update the RMCT Version

The RMCT version that is compatible with your redundancy module firmware is packaged with the redundancy system firmware bundle. To launch the installation of the RMCT, open the folder that contains the redundancy firmware revision and double-click the executable file titled Redundancy_Module_CT.exe.

The RMCT Installation Wizard opens and prompts you with the steps required to install the RMCT.

Module Info Tab

The Module Info tab of the RMCT provides a general overview of the redundancy module's identification and status information. This status information is updated approximately once every two seconds.



NOTE: Not all indicators are shown for 1756-RM/A and 1756-RM/B modules.

These parameters are indicated in the Module Info tab.

Table 17 - Module Info Tab - Parameters Indicated

Parameter	Description
Vendor	Name of the redundancy module's vendor.
Product Type	General product type of the redundancy module.
Product Code	CIP product code for the redundancy module.
Revision	Major and minor revision information for the redundancy module.
Redundancy Module Serial Number	Serial number of the redundancy module.
Product Name	Predefined catalog name of the redundancy module.
General Status	General state of the redundancy module. Possible values include Startup, Load, Fault, and OK.
Major Fault	Redundancy module's major fault status. When a major fault is detected, the system does not provide redundancy support.
Minor Fault	Redundancy module's minor fault status. When a minor fault is detected the system continues to provide redundancy support.
Error Code	Error code related to the fault if one exists.
Error Message	Text-based message describing the error if a fault exists.
Recovery Message	Text-based message that indicates the recovery from a fault.
Total	Indicates the number of channel switchovers that have occurred from CH1 to CH2 and vice versa on the module since its last powerup. It is reset to 0 automatically by firmware on a power cycle.
Periodic	Indicates the number of switchovers that have occurred between CH1 and CH2 over the last 10-second interval. The counter is constantly updated to reflect the value recorded at every 10-second interval. The counter is automatically reset to 0 on a power cycle.
Max Periodic Switchovers	The maximum number recorded in the Periodic counter. The time of the update is recorded every time the counter is updated. The counter is automatically reset to 0 on a power cycle and may also be reset by clicking the Reset button. ⁽¹⁾
CH1 Status	Fiber Channel 1 status. The status shows the operating condition of the respective fiber channels in terms of one of the following values: <ul style="list-style-type: none"> – Unknown - Operating state is not yet determined – Active - Channel is operating normally as the ACTIVE channel – Redundant - Channel is operating normally as the REDUNDANT channel – Link Down - Channel is disconnected. Causes can be: the cable is disconnected/broken/damaged; signal is attenuated, connector is loose, the partner 1756-RM2 module is power down or in a major fault state – No SFP - No transceiver was detected, it has failed, it is loosely connected, it is not installed – SFP !Cpt - Transceiver is not a Rockwell Automation supported unit – SFP Fail - Transceiver is in a failed state
CH2 Status	Fiber Channel 2 status. Refer to CH1 Status on page 112 .
Chassis Platform Configuration	Indicates whether configuration is enhanced or standard (version 19.05x and above always displays 'enhanced').

(1) The Periodic counters can be used to identify a burst of switchovers that may take place due to intermittent channel failures within a few seconds. The recorded time may be helpful to correlate the switchover occurrences with any external failures that may have occurred on the fiber cables.

In addition, you can click Change to edit the User-Defined Identity parameters to meet your application needs.

Configuration Tab

Use the Configuration tab to set redundancy options and the module's internal clock. After you modify a parameter, the Apply Workstation Time button becomes active.

The screenshot shows a software window with several tabs: Module Info, Configuration, Synchronization, Synchronization Status, Event Log, System Update, and System Event History. The Configuration tab is active. It is divided into two main sections:

- Redundancy Module Options:** This section contains several fields:
 - Auto-Synchronization: A dropdown menu set to "Always".
 - Serial Number: A text field containing "00856DA6".
 - Chassis ID: A dropdown menu set to "Chassis A".
 - Name: A text field.
 - Description: A text field.
 - Location: A text field.
 - Enable User Program Control: A checked checkbox.
- Redundancy Module Date and Time:** This section contains:
 - Current Date: A dropdown menu set to "10/ 3/2012".
 - Current Time: A time spinner set to "1:53:50 PM".
 - A "Set" button next to the time spinner.
 - Date Format: Two radio buttons, "dd/mm/yyyy" (unselected) and "mm/dd/yyyy" (selected).
 - An "Apply Workstation Time" button.

At the bottom of the window, there is a status bar with the following information:
Chassis B: Primary with Synchronized Secondary CH1 Status: Active CH2 Status: Redundant
Auto-Synchronization State: Always Chassis Platform Configuration: Enhanced

At the bottom right, there are three buttons: "OK", "Apply", and "Help".

Auto-Synchronization

The first parameter in the Configuration tab is the Auto-Synchronization parameter. The value you set this parameter to determines a significant part of your redundant system behavior.

TIP

Verify that your Auto-Synchronization parameter is at the proper value **before** you make any changes to your redundant system. This helps prevent system errors.

For example, if you are upgrading your redundant system firmware, verify that this parameter is set to Never or Conditional before disqualifying your secondary chassis. If this parameter is Always, you cannot properly disqualify your chassis and conduct the update.

Use this table to determine the Auto-Synchronization setting that best suits your application.

If you use this parameter	Then this synchronization behavior results
Never	<p>The system remains in the same state, that is, either synchronized or disqualified, until one of these events takes place:</p> <ul style="list-style-type: none"> • A command is issued from the RMCT to either synchronize or disqualify. • The controller commands synchronization or disqualification through the use of a MSG instruction. For this to occur, Enable User Program Control must be checked. • A fault on the primary causes a switchover.
Always	<p>The system automatically synchronizes on a regular basis.</p> <p>If you attempt to disqualify the system by using the Disqualify Secondary command in the RMCT, the resulting disqualification is temporary as the system automatically qualifies and synchronizes again.</p> <p>If the controller program disqualifies the system, the resulting disqualification is also temporary.</p>
Conditional	<p>The system behavior with this setting is dependent on the Auto-Synchronization state of your system, found in the lower left portion of the RMCT window after setting the Auto-Synchronization parameter to Conditional:</p> <ul style="list-style-type: none"> • If your Auto-Synchronization parameter is set to Conditional and your Auto-Synchronization state is 'Conditional, Enabled', then the system continually attempts to synchronize. • If your Auto-Synchronization parameter is set to Conditional and your Auto-Synchronization state is 'Conditional, Disabled', then the system does not automatically attempt to synchronize. <p>To change from 'Conditional, Enabled' to 'Conditional, Disabled', click Disqualify Secondary on the Synchronization tab.</p> <p>To change from 'Conditional, Disabled' to 'Conditional, Enabled', click Synchronize Secondary on the Synchronization tab.</p>

Chassis ID

The chassis ID parameter is used to assign a generic label to the chassis that house the redundancy modules. The available chassis labels are Chassis A and Chassis B.

If you change the chassis label in the RMCT of the primary redundancy module, the secondary module and chassis are automatically assigned the other chassis label.

The chassis label assigned to the module remains associated with the same physical chassis, regardless of its primary or secondary control designation.

Enable User Program Control

If you plan to use MSG instructions in your controller program to initiate a switchover, change the redundancy module time, or conduct synchronization, then you must check Enable User Program Control in the Configuration tab.

If you leave Enable User Program Control unchecked, the redundancy modules do not accept any commands from the controller.

Redundancy Module Date and Time

The Redundancy Module Date and Time parameters can be applied separate from the Redundancy Module Options parameters. The time specified with these parameters is the time referenced by the event logs when a redundant system event occurs.

To make changes to the redundancy module time settings, use the pull-down menu or type your changes then click Set to implement time changes. Or, to set the redundancy module's time to match that of the workstation, click Apply Workstation Time.

IMPORTANT We recommend that you set the redundancy module date and time when you commission a system. We also recommend that you periodically check the date and time settings to make sure they match those of the controller.

If a power failure occurs on the redundant chassis, you must reset the date and time information of the redundancy modules. The modules do not retain those parameters when power is lost.

Synchronization Tab

The Synchronization Tab provides commands for these options:

- Changing the synchronization state of the system (synchronize or disqualify)
- Initiating a switchover
- Forcing the disqualified secondary to become the primary

The commands available are described in the [Commands in the Synchronization Tab](#) section on [page 117](#).

This tab also provides information about the last four synchronization attempts in the Recent Synchronization Attempts log. Attempts are identified by N or N-X. If the redundant chassis fail to synchronize, a cause is identified in the Recent Synchronization Attempts log.

The causes and their interpretations are described in the [Recent Synchronization Attempts Log](#) section on [page 118](#).

Module Info | Configuration | **Synchronization** | Synchronization Status | Event Log | System Update | System Event History

Redundancy Commands

Synchronize Secondary | Disqualify Secondary | Initiate Switchover | Become Primary

Recent Synchronization Attempts:

Order	Result	Cause
N	Success	---
N-1	Abort	Module Pair Incompatible
N-2	Abort	Module Pair Incompatible
N-3	Success	---

Refresh

Description

Select an entry in the Recent Synchronization Attempt list to see Details

Commands in the Synchronization Tab

These sections explain each redundancy command and the system conditions that are required for the command to be available.

Command	Description
Synchronize Secondary	<p>This command forces the primary redundancy module to attempt synchronization with its partner. This command is available in specific conditions:</p> <ul style="list-style-type: none"> • Available only when the chassis redundancy state is as follows: <ul style="list-style-type: none"> – Primary with Disqualified Secondary – Disqualified Secondary • Unavailable (dimmed) in all other chassis states <p>Synchronization is asynchronous with the execution of this command. Successful execution of this command begins with synchronization, which can take several minutes. Monitor the chassis status displayed at the bottom of the RMCT to determine when synchronization has completed.</p>
Disqualify Secondary	<p>This command forces the primary redundancy module to disqualify its partner.</p> <hr/> <div style="display: flex; align-items: center;">  <div> <p>ATTENTION:</p> <ul style="list-style-type: none"> • Disqualifying the secondary chassis makes it unable to assume control functions, that is, redundancy is lost. • If you disqualify the secondary and a major fault occurs on the remaining primary, a switchover does not occur. </div> </div> <hr/> <p>This command is available in specific conditions:</p> <ul style="list-style-type: none"> • Available only when the chassis redundancy state is as follows: <ul style="list-style-type: none"> – Primary with Synchronized Secondary – Synchronized Secondary • Unavailable (dimmed) in all other chassis states <p>If you use the Disqualify Secondary command when the Auto-Synchronization parameter is set to Always, a synchronization attempt occurs immediately after the secondary chassis becomes disqualified.</p> <p>To keep the secondary disqualified after issuing a Disqualify Secondary command, set the Auto-Synchronization parameter to Conditional or Never before disqualifying the secondary.</p>
Initiate Switchover	<p>This command forces the system to initiate an immediate switchover from the primary chassis to the secondary chassis. This command can be used when upgrading redundancy system firmware or when completing maintenance on one chassis of the redundant pair.</p> <p>This command can also be used to perform a realistic test of your redundant system behavior by simulating a failure detected in the primary control chassis.</p> <p>This command is available in specific conditions:</p> <ul style="list-style-type: none"> • Available only when the chassis redundancy state is as follows: <ul style="list-style-type: none"> – Primary with Synchronized Secondary – Synchronized Secondary • Unavailable (dimmed) in all other chassis states
Become Primary	<p>This command forces a disqualified secondary system to become a primary system and is available in specific conditions:</p> <ul style="list-style-type: none"> • Available only when the chassis redundancy state is Secondary with No Primary. • Unavailable (dimmed) in all other chassis states

Recent Synchronization Attempts Log

This table describes the possible result and causes of synchronization states.

Table 18 - Recent Synchronization Attempts Log - Result Interpretations

Result	Result Interpretation
Undefined	The result of the synchronization is unknown.
No attempt since last powerup	Synchronization has not been attempted since power was applied to the module.
Success	Full synchronization was successfully completed.
Abort	The synchronization attempt failed. See the table Recent Synchronization Attempts Log - Result Interpretations for further information.

If the Synchronization Attempts log indicates that the Synchronization attempt was aborted, use this table to further interpret the cause.

Table 19 - Synchronization Interpretation

Cause	Cause Interpretation
Undefined	The cause of synchronization failure is unknown.
Module Pair Incompatible	Synchronization aborted because one or more module pairs are incompatible.
Module Configuration Error	Synchronization aborted because one of the modules is improperly configured.
Edit Session In Progress	Synchronization aborted because an edit or session is in progress.
Crossloading Failure	An undetermined failure occurred during synchronization between redundancy modules.
Comm Disconnected	The cable between the redundancy modules was disconnected.
Module Insertion	Synchronization aborted because a module was inserted into a chassis.
Module Removal	Synchronization aborted because a module was removed from a chassis.
Secondary Module Failed	Synchronization aborted because of a failure in the secondary module.
Incorrect Chassis State	Synchronization aborted due to an incorrect chassis state.
Comm Does Not Exist	Synchronization could not be performed because the communication link between redundancy modules does not exist.
Nonredundant Compliant Module Exists	Synchronization could not be performed because one or more nonredundancy modules are present in one of the chassis.
Sec Failed Module Exists	A module in the secondary chassis has asserted the SYS_FAIL line, indicating that it has faulted or failed.
Local Major Unrecoverable Fault	Synchronization was aborted because of a local major unrecoverable fault.
Partner Has Major Fault	Synchronization was aborted because the partner module has a major fault.
Sec SYS_FAIL_L Subsystem Failed	The test of the SYS_FAIL line in the secondary chassis failed.
Sec RM Device Status = Comm Error	Synchronization was aborted because the secondary redundancy module's status indicates a communication error.
Sec RM Device Status = Major Recoverable Fault	Synchronization was aborted because the secondary redundancy module's status indicates a major recoverable fault.
Sec RM Device Status = Major Unrecoverable Fault	Synchronization was aborted because the secondary redundancy module's status indicates a major unrecoverable fault.
Incorrect Device State	Synchronization was aborted because the device is in the wrong state.
Primary Module Failed	Synchronization was aborted because of a failure in the primary module.
Primary Failed Module Exists	A module in the primary chassis has asserted the SYS_FAIL line, indicating that it has faulted or failed.
Auto-Sync Option	Synchronization was aborted because the Auto-Synchronization parameter of one of the redundancy modules was changed during synchronization.

Table 19 - Synchronization Interpretation

Cause	Cause Interpretation
Module Qual Request	Synchronization was aborted because another synchronization request was received. The current synchronization has stopped so that the new synchronization request can be serviced.
SYS_FAIL_L Deasserted	Synchronization was aborted because one of the modules came out of a faulted or failed state.
Disqualify Command	Synchronization was aborted because the redundancy module received a disqualify command from another device. The originating device sends this command when it is no longer capable of performing in the qualified state.
Disqualify Request	Synchronization was aborted because the redundancy module received a disqualify command from another device. The originating device sends this command when it is no longer capable of performing in the qualified state.
Platform Configuration Identity Mismatch Detected	There are modules in the primary or secondary chassis that do not belong to the enhanced platform.
Application Requires Enhanced Platform	A redundant controller is running an application that contains a feature qualified to run only on an enhanced redundant platform, for example, Alarms.
ICPT Asserted	A test line on the backplane is asserted.
Unicast Not Supported	A unicast connection is configured in the redundant controller, and enhanced redundancy systems do not support Unicast.
PTP Configuration Error	A redundant controller's PTP clock is not synchronized or the partner controller pair is synchronized to a different grandmaster.
Secured Module Mismatch	A mismatch was detected between a primary and secondary secured module.

Synchronization Status Tab

The Synchronization Status tab provides a module-level view of these items:

- Synchronization state (for example, Synchronized or Disqualified)
- Chassis designation (Primary or Secondary)
- Module compatibility with its partner (for example, Full or Undefined)

Each module installed in the chassis is identified and information regarding its partner and compatibility are provided.

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	100	1756-L73/A LOGIX5573	19.53	Synchronized	Primary	Full
1	---	<empty>	---	---	---	---
2	100	1756-EN2T/A	5.8	Synchronized	Primary	Full
3	100	1756-RM2 REDUNDANCY...	20.4	Synchronized	Primary	Full

Event Log Tab

The Event Log tab provides a history of events that have occurred on the redundant chassis.

These system events are indicated in the event logs:

- Qualification stages entered and completed
- Module insertion/removal
- Firmware errors
- Communication events and errors
- Configuration changes
- Other system events that affect qualification and synchronization

IMPORTANT

The events logged in this tab are not always indicative of an error. Many of the events logged are informational only.

To determine if additional action or troubleshooting is required in response to an event, see the [Event Classifications](#) table on [page 121](#).

The Event Log tab can be customized to view the log specific to only one chassis or the event logs of both redundant chassis. You can alter your view of the event logs by changing the Auto-Update and Partner Log parameters.

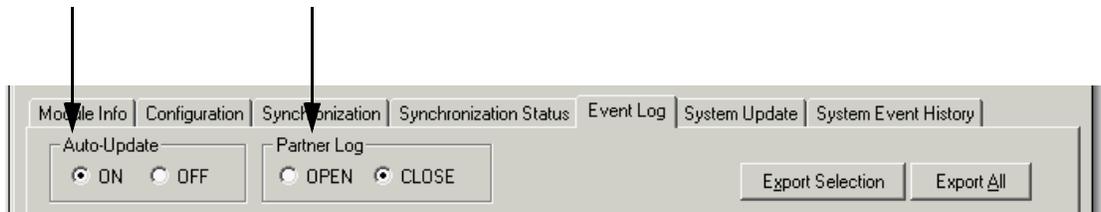
Table 20 - Settings for Event Log Views

Use this setting	To
Auto-Update	Keep the log from updating while you're viewing it.
Partner Log	View only the event log for the module you are accessing.

Figure 29 - Settings for Event Log Views

Check On to keep the log updating automatically.

Check Close to view only the log of one redundancy module.



Event Classifications

Each event identified and logged is classified. You can use these classifications to identify the severity of the event and determine if additional action is required.

Figure 30 - Event Classifications in the Event Log Tab

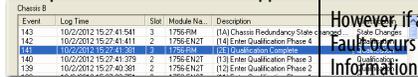
The screenshot shows a software interface for monitoring events. At the top, there are controls for 'Auto-Update' (ON/OFF) and 'Partner Log' (OPEN/CLOSE). Below these are 'Export Selection' and 'Export All' buttons. The main area is a table titled 'Chassis A' with the following columns: Event, Log Time, S..., Module Name, Description, and Classification. The table contains 15 rows of event data. An arrow points to the 'Classification' column, which lists various event types such as 'Starts/Stops', 'State Changes', 'Configuration', and 'Qualification'. At the bottom of the interface, there are buttons for 'Export Diagnostics', 'Clear Fault', and 'Extended Info >>'. The status bar at the very bottom indicates 'Chassis A: Primary with Disqualified Secondary' and 'Auto-Synchronization State: Never'.

Event	Log Time	S...	Module Name	Description	Classification
747435	11/16/2010 14:12:54:907	7	1756-RM	(91) Response to Open Bridge Connection	Starts/Stops
747434	11/16/2010 14:12:54:906	7	1756-RM	(90) Request to Open Bridge Connection	Starts/Stops
747433	11/16/2010 14:12:54:905	2	1756-L75	(35) Partner Connection Opened	State Changes
747432	11/16/2010 14:12:54:904	5	1756-EN2T	(33) Partner Ping Successful	Configuration
747431	11/16/2010 14:12:54:897	5	1756-EN2T	(10) Partner Connection Opened	State Changes
747430	11/16/2010 14:12:54:896	7	1756-RM	(91) Response to Open Bridge Connection	Starts/Stops
747429	11/16/2010 14:12:54:895	7	1756-RM	(90) Request to Open Bridge Connection	Starts/Stops
747428	11/16/2010 14:12:54:886	7	1756-RM	(91) Response to Open Bridge Connection	Starts/Stops
747427	11/16/2010 14:12:54:885	7	1756-RM	(90) Request to Open Bridge Connection	Starts/Stops
747426	11/16/2010 14:12:54:882	1	1756-CN2R	(33) Partner Ping Successful	Configuration
747425	11/16/2010 14:12:54:876	1	1756-CN2R	(10) Partner Connection Opened	State Changes
747424	11/16/2010 14:12:54:876	7	1756-RM	(91) Response to Open Bridge Connection	Starts/Stops
747423	11/16/2010 14:12:54:875	7	1756-RM	(90) Request to Open Bridge Connection	Starts/Stops
747422	11/16/2010 14:12:54:875	7	1756-RM	(D) Communication error	Minor Fault
747421	11/16/2010 14:12:54:874	7	1756-RM	(2C) Autoqualification Trigger	Qualification

Use this table to determine what an event classification indicates and if corrective action is required.

Table 21 - Classification Types

Classification Type	Description	Action Required
Configuration	A redundancy module configuration parameter has been changed. For example, if you change the Auto-Synchronization parameter from Always to Never, an event classified as Configuration is logged.	No corrective action is required. This event is provided for informational purposes and does not indicate serious anomaly with the redundancy system.
Command	An event related to commands issued to the redundant system has occurred. For example, if you change the Redundancy Module Date and Time parameters, a WCT time change event of the Command classification is logged.	No corrective action is required. This event is provided for informational purposes and does not indicate serious anomaly with the redundancy system.
Failure	A failure on the redundancy module has occurred. For example, an internal Firmware error event classified as a Failure can be indicated in the event log.	Action can be required to determine the cause of the failure. If the failure is not followed by a Switchover or Major Fault event, then the module could have corrected the error internally and additional action is not required. To determine if corrective action is required, double-click the event to see Extended Event Information and the suggested recovery method, if applicable.
Major Fault	A major fault has occurred on one of the redundancy modules.	Action can be required to determine the action needed to correct the fault. Double-click the event to see Extended Event Information and the suggested recovery method, if applicable.
Minor Fault	A minor fault has occurred on one of the redundancy modules.	No corrective action is required. This event is provided for informational purposes and does not indicate serious anomaly with the redundancy system.
Starts/Stops	Various internal chassis and module processes have started or stopped.	No corrective action is required. However, if an event that is classified as a Failure, State Change, or Major Fault occurs after the Starts/Stops event, view the Extended Event Information of both events to determine if the events are related.
State Changes	A chassis or module state change has occurred. For example, if the chassis designation changes from being a disqualified secondary to a qualified secondary, a State Change event is logged.	No corrective action is required. However, if an event that is classified as a Failure, or Major Fault occurs after the State Changes event, view the Extended Event Information of both events to determine if the events are related.
Switchover	An event related to a chassis switchover has occurred. For example, if an Initiate Switchover command is issued, an event classified as Switchover is logged.	Action can be required to determine the cause of the switchover and potential correction methods. Double-click the event to see Extended Event Information and the suggested recovery method, if applicable.
Synchronization	An event related to chassis synchronization has occurred. For example, if the Synchronization command has been issued, a Network Transitioned to Attached event is logged and classified as Synchronization.	No corrective action is required. This event is provided for informational purposes and does not indicate serious anomaly with the redundancy system.



Access Extended Information About an Event

Events logged in the Event Log tab can have additional information available. To access additional information about an event, double-click an event listed in the log.

Event	Log Time	Slot	Module Na...	Description	Classification
143	10/2/2012 15:27:41:541	3	1756-RM	(1A) Chassis Redundancy State changed ...	State Changes
142	10/2/2012 15:27:41:411	2	1756-EN2T	(14) Enter Qualification Phase 4	Qualification
141	10/2/2012 15:27:41:381	3	1756-RM	(2E) Qualification Complete	Qualification
140	10/2/2012 15:27:41:379	2	1756-EN2T	(13) Enter Qualification Phase 3	Qualification
139	10/2/2012 15:27:40:381	2	1756-EN2T	(12) Enter Qualification Phase 2	Qualification

↓ Double-click to open extended information.

Extended Information Definition - Chassis B [X]

Event Information

Event Number: 141 Log Time: 10/2/2012 15:27:41:381

Event Class: Qualification

Submitter Information

Module Type: 1756-RM Slot No: 3

Serial No (in Hex): 856DA6

Event Details

Description: (2E) Qualification Complete

Extended Data Definition	
Extended Information Unavailable	

Extended Information Bytes (in Hex)

OK

View the Description and Extended Data Definitions.

↑ ↓ Scroll to view details of other events.

Interpret an Event's Extended Information

The information listed in this table can be provided (depending on the type of event) after you have accessed the Extended Information Definition dialog box.

Information Type	Description
Event Information	The enhanced redundancy system assigns this event information: <ul style="list-style-type: none"> • Event number • Date and time the event occurred • Event classification
Submitter Information	This information reflects information specific to the module that reported the event. Information provided in this section includes the: <ul style="list-style-type: none"> • Name of the module that originated the event • Slot number of the module that originated the event • Serial number of the module that originated the event
Event Details	This section provides these additional details about the event: <ul style="list-style-type: none"> • Description of the event • Examine the Extended Data Definition, which provides an explanation of the event and bytes, for errors • Extended Data Bytes (in Hexadecimal) that provides further details the event

Export Event Log Data

After you have viewed extended information about an event, you could need to export event data. You can export data with either of these features:

- Export Selection
- Export All - Available with enhanced redundancy system, Revision 19.052 or later

Export Selection

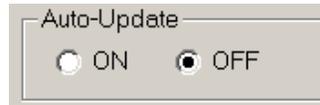
Use this feature to export event log data for a single or multiple event that occurs on a primary or secondary redundancy module.

Complete these steps to export event data for a single event.

TIP If the redundancy modules are not available in RSLinx Classic software after a fault, you must apply the recovery method indicated by the module before attempting to export the Event Log data.

1. Launch RSLinx Classic communication software and browse to the redundancy modules.
2. Right-click the **primary** redundancy module and choose Module Configuration.

- In the Auto-Update area, click Off to keep the log from updating.

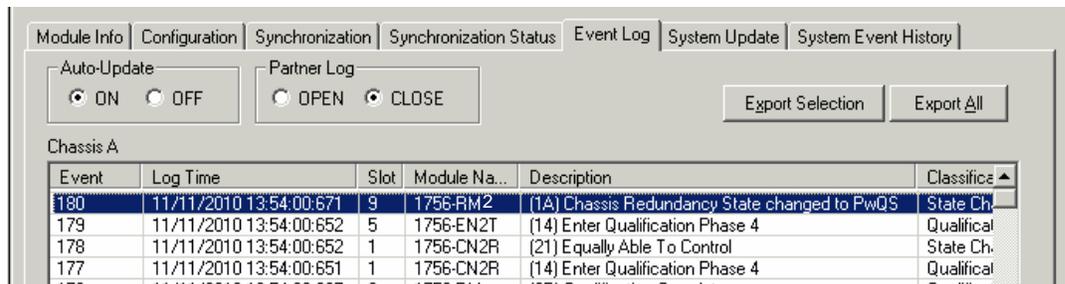


- In the Partner Log area, click Close.

This closes the event log of the partner module.



- Select a single event or multiple events for which you want to export data. To select multiple events, select a start event, press SHIFT, and select an end event.



- Click Export Selection.



The Export Event Log dialog box opens.

- Complete these steps on the Export Event Log dialog box.
 - Specify a file name and location or use the default name and location.
 - Check CSV (Comma-Separated Value).

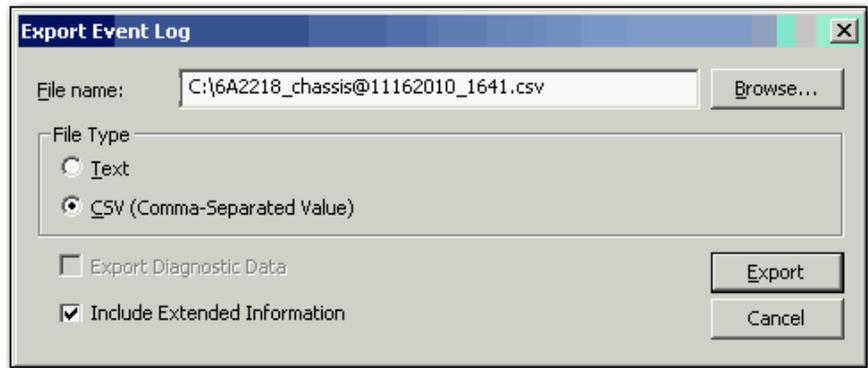
TIP If you are sending the exported Event Log files to Rockwell Automation Technical Support, you must use the CSV file type.

- Check Include Extended Information.

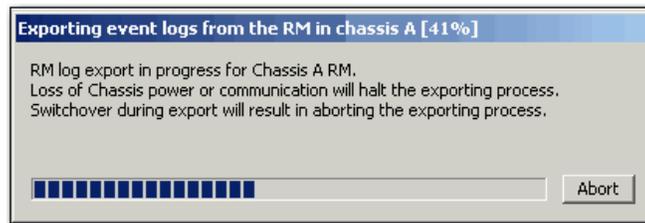
TIP If you are sending the exported Event Log files to Rockwell Automation Technical Support, include the diagnostic data and extended information.

If you include this data, Rockwell Automation Technical Support can analyze module and system failures more effectively.

8. Click Export.



The event log is exported. The log can take a few minutes to export.



9. If you want to export the secondary redundancy module log for a complete system view complete [step 1...step 8](#).

IMPORTANT If you are exporting event data to provide to Rockwell Automation Technical Support to troubleshoot an anomaly, you must obtain the event logs for both the primary and secondary redundancy modules. Rockwell Automation Technical Support needs before logs to effectively troubleshoot the anomaly. If you cannot access the secondary redundancy module's event log, export it from the partner event log via the primary redundancy module. Keep in mind, though, that the primary redundancy module's view of the secondary redundancy module's event log is typically limited. To troubleshoot an anomaly with Rockwell Automation Technical Support, you must obtain the secondary redundancy module's event log from the module's view itself.

Export All

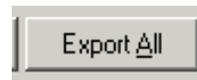
Use this feature to automatically export all the available event log data for events in both of the redundancy modules of the redundant chassis pair.

We recommend that you use this feature when troubleshooting system related anomalies, where the location of a fault could have occurred a lengthy period of time before the current event.

Complete these steps to export event log data for a single event.

TIP If the redundancy modules are not available in RSLinx Classic software after a fault, you must apply the recovery method indicated by the module before attempting to export the Event Log data.

1. Launch RSLinx Classic communication software and browse to the redundancy modules.
2. Right-click the **primary** redundancy module and choose Module Configuration.
3. On the Event Log tab, click Export All.



4. Click OK.
5. Select the redundancy module in the partner redundant chassis.
6. Complete these steps on the Export Event Log dialog box.
 - a. Specify a file name and location or use the default name and location.
 - b. Check CSV (Comma-Separated Value).

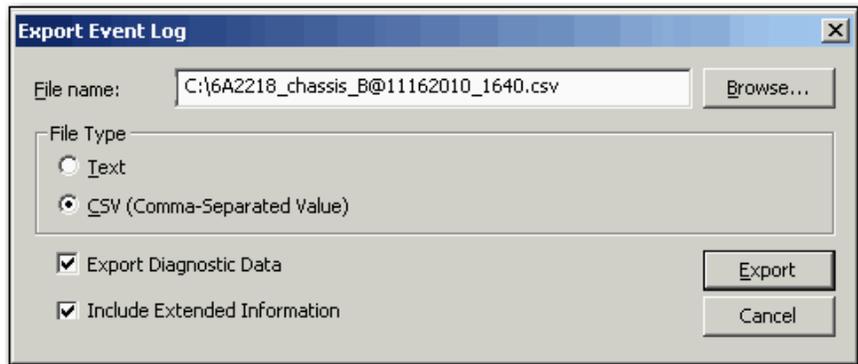
TIP If you are sending the exported Event Log files to Rockwell Automation Technical Support, you must use the CSV file type.

- c. Check Export Diagnostic Data.
- d. Check Include Extended Information.

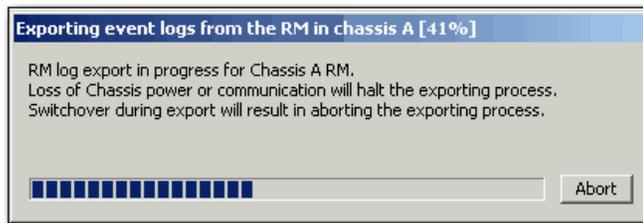
TIP If you are sending the exported Event Log files to Rockwell Automation Technical Support, include the diagnostic data and extended information.

If you include this data, Rockwell Automation Technical Support can analyze module and system failures more effectively.

7. Click Export.



The event log is exported. The log can take a few minutes to export.



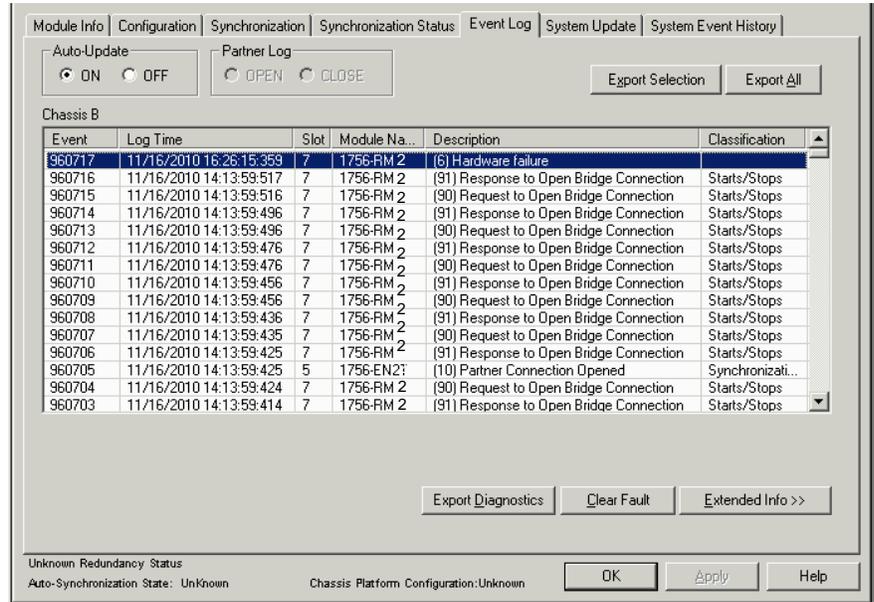
Wait for this dialog box to appear.



A .csv and a .dbg file is in the folder location specified. Make sure to provide both these files to Rockwell Automation Technical Support when troubleshooting an anomaly.

Clear a Fault

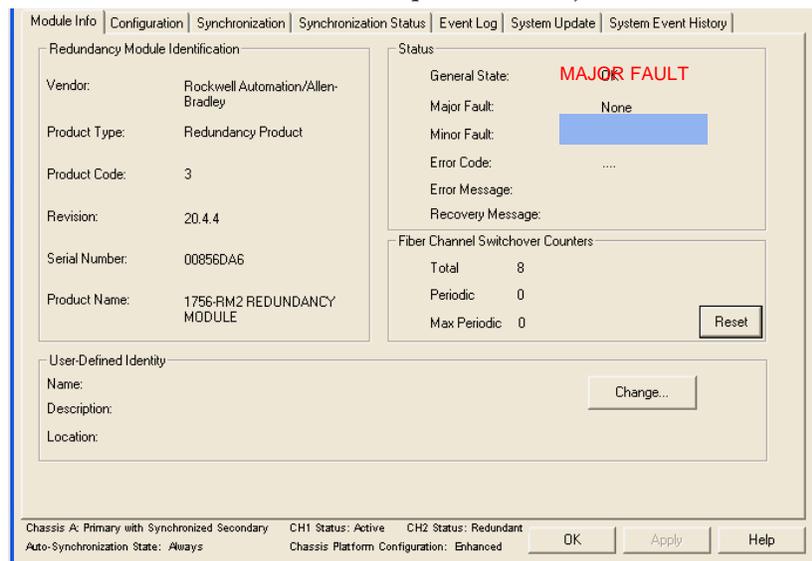
You can use the Clear Fault feature on the Event Log tab to clear major faults that occur on a redundancy module.



With this feature, you can remotely restart the redundancy module without physically removing and reinserting it from the chassis. The module restart clears the fault.

IMPORTANT Export all event and diagnostic data from the module before you clear major faults from the module. Clear Fault is active only when the redundancy module is in a major faulted state.

Module faults are displayed on the Module Info tab. This example graphic shows information for a module that has experienced a major fault.



System Update Tab

Use of the commands in the System Update tab lets you perform firmware updates in the secondary chassis while the primary chassis remains in control. Reference the lock and switchover logs in this tab for update information when completing a firmware update.



ATTENTION: When performing firmware updates by using commands in the System Update tab, redundancy is lost. In the event of a fault on the operating primary chassis, the system cannot switch control to the secondary chassis.

Module Info | Configuration | Synchronization | Synchronization Status | Event Log | **System Update** | System Event History

System Update Commands

System Update Lock Attempts

System Lock History	Initiation Time	Status	Result
N	—	Not attempted	—
N-1	—	Not attempted	—
N-2	—	Not attempted	—
N-3	—	Not attempted	—

Locked Switchover Attempts

Locked Switchover History	Initiation Time	Status	Result
N	—	Not attempted	—
N-1	—	Not attempted	—
N-2	—	Not attempted	—
N-3	—	Not attempted	—

System Update Commands

The three system update commands are available only when accessing a primary redundancy module. These commands are not available when accessing the secondary redundancy module.

TIP

While you are completing tasks to update the system by using the system update commands, you cannot access these tabs in the RMCT:

- Configuration
- Synchronization
- Synchronization Status

Attempting to access any of these tabs while the system is locked or is completing a locked switchover results in an error dialog box.

Lock For Update

The Lock for Update command lets you to synchronize a redundant chassis pair in these conditions:

- The secondary redundancy module uses updated firmware and an updated RSLogix 5000 software application program version.
- The running primary redundancy module uses a previous firmware revision and previous RSLogix 5000 software application program version.

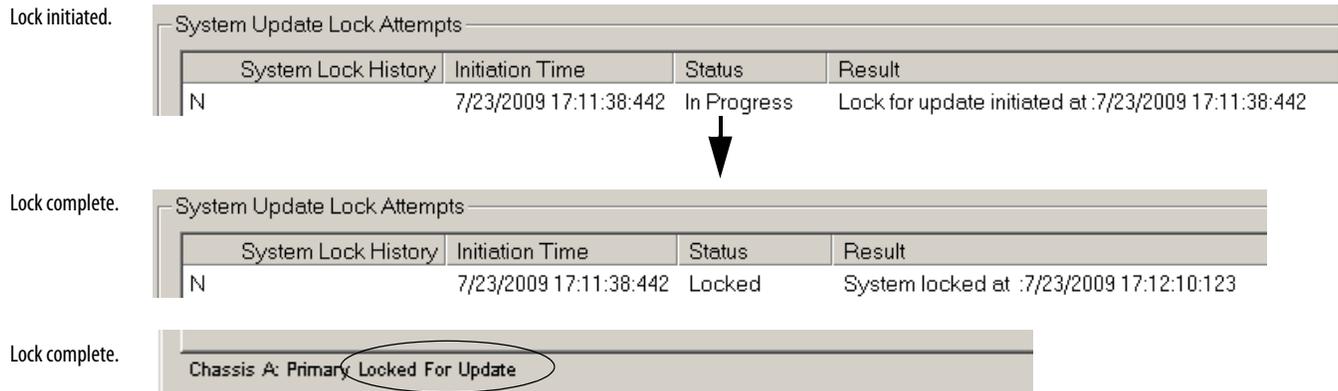
The Lock for Update command is available only when all the modules in the primary chassis have no compatibility anomalies. Before issuing the lock command, verify that you have completed these tasks:

- Set the Auto-Synchronization option in the Configuration tab to Never.
- Disqualify the secondary chassis by using the Disqualify Secondary command in the Synchronization tab of the secondary redundancy module's RMCT.
- Updated the primary and secondary redundancy modules to compatible firmware revisions.
- Updated all other modules in the secondary chassis to their intended firmware revisions.
- Made changes to the controller project that are required to accommodate the update and replacement of modules if needed.

For details about completing those tasks, see [Step 4: Update Redundant Chassis Firmware on page 67](#).

Clicking the Lock for Update command initiates the locking process. The lock can take several minutes to finish. Monitor the System Update Lock Attempts log to determine when the lock is complete. In addition, the chassis status shown at the bottom-left of the dialog box changes from Primary with Disqualified Secondary to Primary Locked for Update.

Figure 31 - Lock for Update Status Updates



Abort System Lock

The Abort System Lock command can be used to stop the system lock. It is available as soon as a lock for update is initiated.

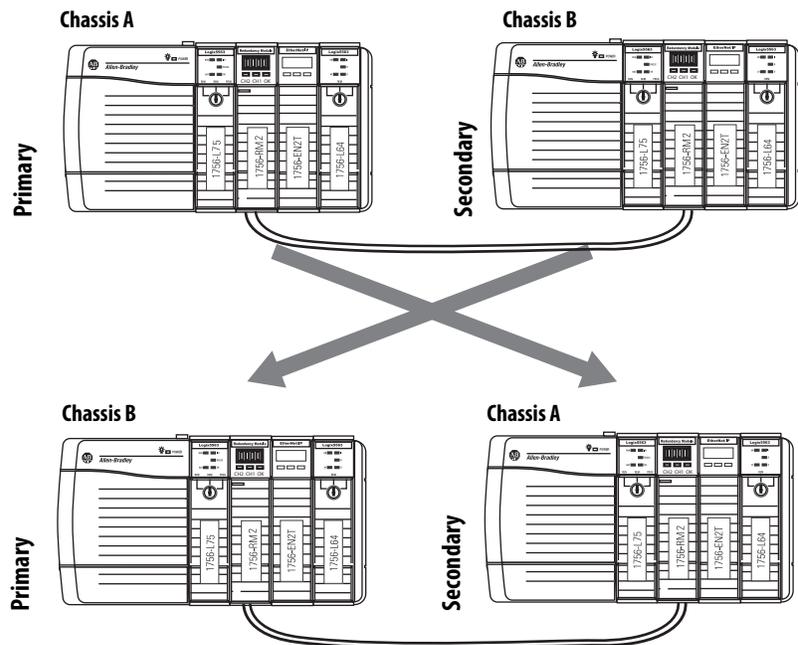
Clicking Abort System Lock returns the redundant chassis status to Primary with Disqualified Secondary. Clicking Abort System Lock also results in the system update stopping and the program in the secondary controller being cleared. If you click Abort System Lock, you need to download the program to the secondary controller before re-attempting a Lock for Update.

Initiate Locked Switchover

The Initiate Locked Switchover command is available only when the chassis redundancy state is Primary with Locked Secondary. That is, the Initiate Locked Switchover is available only after the lock for update is complete.

Clicking Initiate Locked Switchover results in your secondary chassis assuming control and becoming the new primary. The old primary is now the new secondary chassis and you can update the firmware of the modules in the new secondary chassis.

Figure 32 - Illustration of Switchover



The difference between a locked switchover and a normal switchover is that the locked switchover can be initiated only by the user. The normal switchover can be initiated by a user or by a fault in the primary chassis.

System Update Lock Attempts

The System Update Lock Attempts is where attempts to lock the system are logged. This log displays the last four lock attempts and provides this information specific to each attempt:

- Time and date
- Status (for example, Locked or Abort)
- Result (for example, System Locked or Invalid Response Received)

The status indicated in the System Update Lock Attempts log can be any one of the states listed in this table.

Table 22 - System Update Lock Attempts Log Statuses

Status	Interpretation
Not Attempted	A system lock has not been attempted since the last powerup.
In Progress	A lock is in progress.
Locked	The lock was successfully completed.
Abort	The lock attempt failed. The reason for the failure is indicated in a Result field.

If your status is indicated as Abort, one of these conditions can exist:

- An error occurred while communicating with the partner redundancy module.
- A module in the secondary chassis does not have a partner in the primary chassis.
- A module pair is incompatible.
- The SysFail test was unsuccessful in the primary redundancy module.
- A Major Recoverable Fault occurred in primary redundancy module.
- A Major NonRecoverable Fault occurred in primary redundancy module.
- A module was inserted into the chassis.
- A module was removed from the chassis.
- A failed module exists in the secondary chassis.
- A failed module exists in the primary chassis.
- An Abort System Update command received.
- Invalid response was received from a module.
- A module rejected the state change.
- A platform mismatch was detected.

Locked Switchover Attempts

The Locked Switchover Attempts log provides information about the status of the last four locked switchover attempts. This log includes this information about each attempt:

- Time and date
- Status
- Result

The status indicated in the Locked Switchover Attempts log can be any one of the states listed in this table.

Table 23 - Locked Switchover Event Log Statuses

Status	Description
Not Attempted	A locked switchover has not been attempted since the last powerup.
In Progress	A locked switchover is currently in progress.
Success	A locked switchover was successfully completed.
Abort	The locked switchover attempt failed. The cause of the failure is indicated in a Result field.

If a locked switchover is aborted, it can be because of the following

- A module declined a locked switchover readiness request.
- An invalid response was received from the locked switchover readiness request.
- After an initiate switchover prompt, a module rejected the command.
- After an initiate switchover prompt, a module replied with an invalid response.

System Event History

The System Event History tab provides a log of the last 10 major system events. The events logged here provide information specific to qualification, disqualification, switchovers, and redundancy module faults.

For each event logged, this information is provided:

- Time and date of the event
- Event class (for example, Qualification or Disqualification)
- Basic info about the origin of the event (for example, Commanded or Auto Qualification)
- Extended information about the event
- An editable user comment.

Module Info | Configuration | Synchronization | Synchronization Status | Event Log | System Update | System Event History

Event History

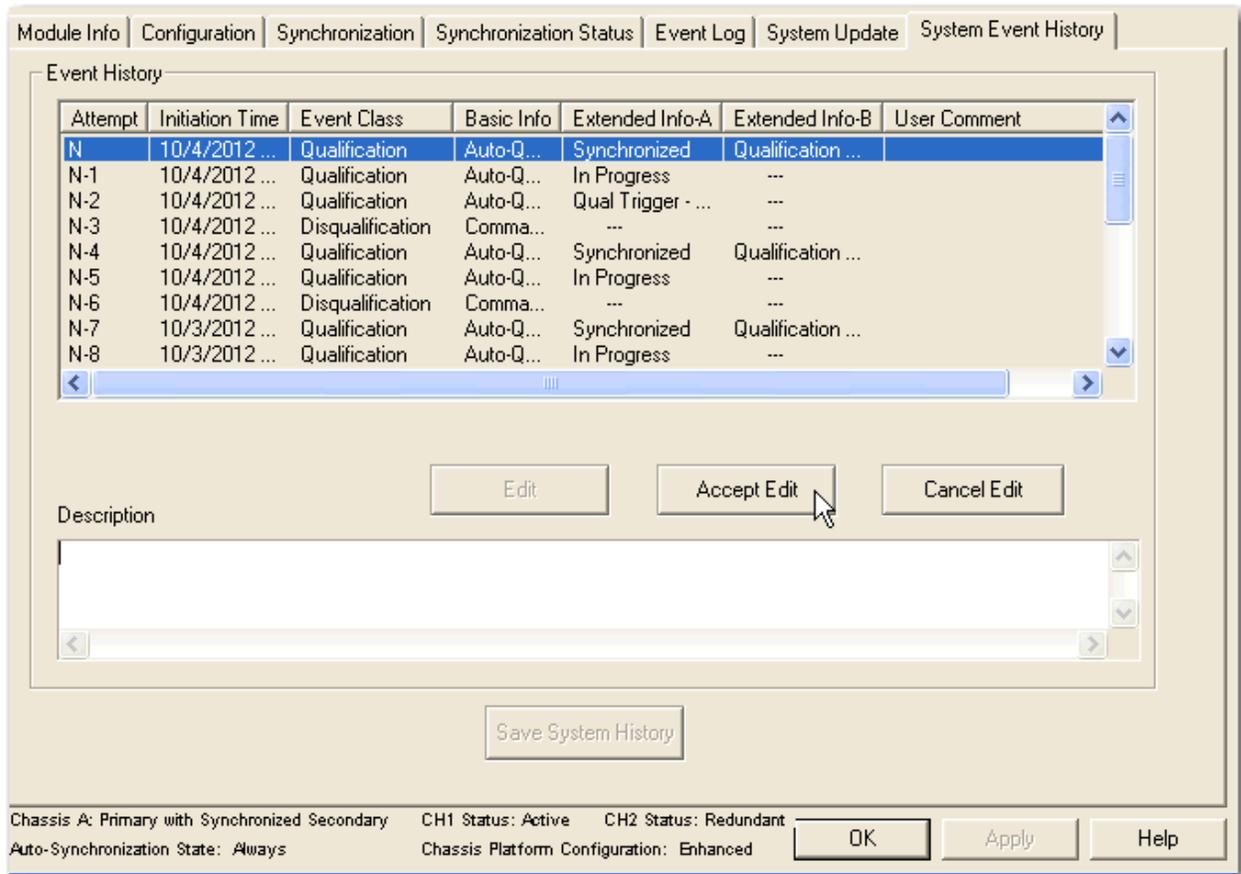
Attempt	Initiation Time	Event Class	Basic Info	Extended Info...	Extended Info-B	User Comment
N	7/24/2009 12:22:...	Qualification	Auto Qualification	Synchronized	Qualification Complete	Final attempt to
N-1	7/24/2009 12:22:...	Qualification	Auto Qualification	In Progress	—	
N-2	7/24/2009 12:22:...	Qualification	Commanded	—	—	
N-3	7/24/2009 12:15:...	DisQualification	Commanded	—	—	
N-4	7/24/2009 12:14:...	Qualification	Auto Qualification	Synchronized	Qualification Complete	
N-5	7/24/2009 12:14:...	Qualification	Auto Qualification	In Progress	—	
N-6	7/24/2009 12:14:...	Qualification	Auto Qualification	Module Com...	—	
N-7	7/24/2009 12:14:...	DisQualification	Commanded	—	—	
N-8	7/24/2009 12:12:...	Qualification	Auto Qualification	Synchronized	Qualification Complete	

Description

Final attempt to test system.

Edit a User Comment for a System Event

To edit the User Comment associated with a system event, select the event and then click Edit. Then type your event description and click Accept Edit.



Save System Event History

If you want to save the system event log to the nonvolatile memory of the redundancy module, click Save System History at the bottom of the System Event tab. Saving this history can assist with troubleshooting the system at a later time.



Using Dual Fiber Ports with the 1756-RM2/A Redundancy Module

The dual fiber ports of the 1756-RM2/A module constitute a redundant pair of communication channels between the partner 1756-RM2s in a redundant chassis pair. One of the channels is termed as 'ACTIVE', while the other channel is termed as 'REDUNDANT'. All data communication between the partner redundancy modules is conducted exclusively over the ACTIVE channel. If or when the ACTIVE channel fails, a 'Fiber Channel Switchover' is initiated automatically and all data communication shifts to the REDUNDANT channel, which then becomes the new ACTIVE channel.

Fiber Channel Switchover

Due to the fiber channel switchover, the redundant chassis pair continues to remain synchronized even in the event of a failure of the ACTIVE channel. Any of the following failures of the ACTIVE channel triggers an automatic fiber channel switchover to the REDUNDANT channel, provided the REDUNDANT channel is still operating in a normal condition:

- Signal attenuation along the fiber cable path routed between the partner redundancy modules
- A broken or damaged fiber cable routed between the partner redundancy modules
- Improper or loosely fit cable connector
- SFP transceiver fault
- Removal or loose connection of the SFP transceiver
- Data communication error (signalled by a failed CRC check)

Chassis synchronization is lost only when both of the channels have failed or are disconnected.

The fiber channel switchover may occasionally extend the completion of data communication packets between the partner redundancy modules. Therefore, the controller's scan time may occasionally experience a delay of 10 ms or less.

Configuration

The use of dual fiber ports is entirely 'plug & play'. There is no user configuration needed for any of the operations of the active and redundant channels. The firmware automatically manages the selection of active and redundant channels. The dual fiber cables between the partner redundancy modules can be crossed over between CH1 and CH2 without any restriction.

Monitoring and Repair

Synchronization is preserved if the REDUNDANT channel has failed or is being repaired. The repair of the REDUNDANT channel can be performed online while the redundant chassis pair is running synchronized. To aid online repairs, the fiber cable connections and SFP transceiver can be removed and inserted under power.

It is not mandatory to have the REDUNDANT channel connected between the two redundancy modules. The redundant chassis pair can be synchronized with just one of the channels connected. The REDUNDANT channel can be installed later while the chassis is running synchronized.

The status indicators on the front panel and the indicators and counters displayed in the RMCT provide monitoring of the channel status.

Notes:

Program the Redundant Controller

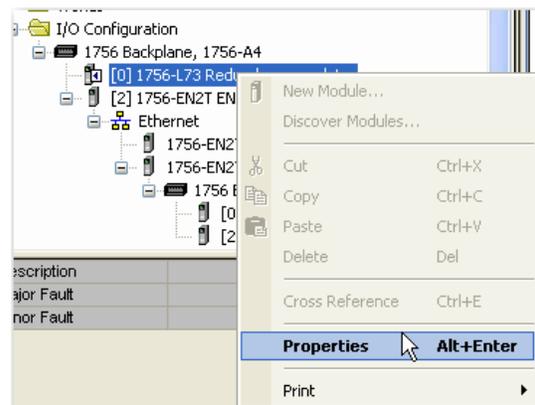
Topic	Page
Configure the Redundant Controller	141
Crossloads, Synchronization, and Switchovers	144
Crossloads and Scan Time	149
Program to Minimize Scan Times	152
Program to Maintain Data Integrity	159
Program to Optimize Task Execution	163
Program to Obtain System Status	168
Program Logic to Run After a Switchover	170
Use Messages for Redundancy Commands	171
Set the Task Watchdog	175
Download the Project	177
Store a Redundancy Project to Nonvolatile Memory	178
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Configure the Redundant Controller

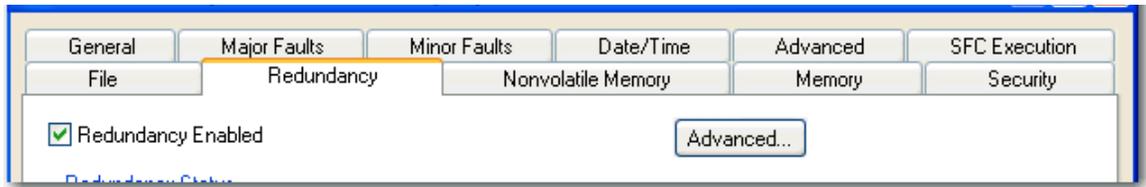
Both controllers in the ControlLogix enhanced redundancy system operate by using the same program. You do not need to create a project for each controller in the redundant system.

To configure your controllers to operate in a redundant system, complete these steps

1. Open or create a RSLogix 5000 project for your redundant controller.
2. Access the Controller Properties dialog box for the controller.



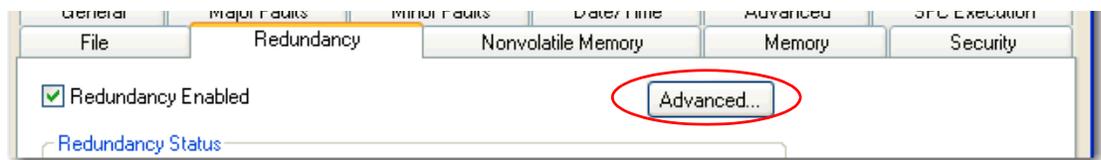
3. Click the redundancy tab and check Redundancy Enabled.



4. If you are going to complete edits to your redundant controller while online, see these sections for information about the parameters available in the Advanced settings:

- [Plan for Test Edits on page 183](#)
- [Reserve Memory for Tags and Logic on page 187](#)

5. Click the Advanced tab.

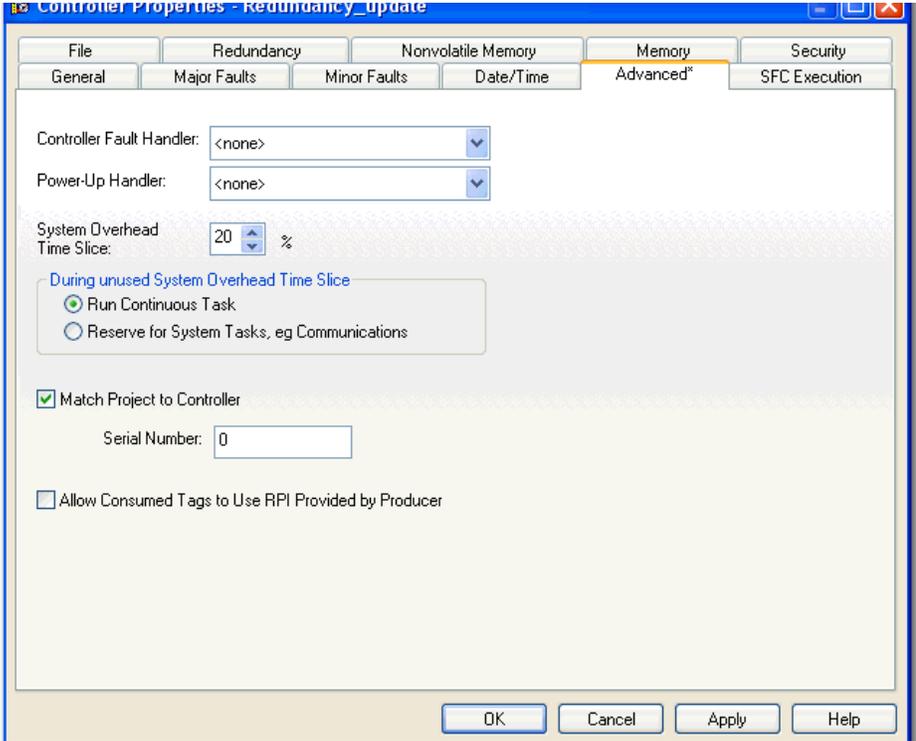


6. Verify that Match Project to Controller is unchecked.

IMPORTANT

Do not use Match Project to Controller property with redundant controllers. If you use the Match Project to Controller property available in the Advanced tab of the Controller Properties dialog box, you cannot go online with, download to, or upload from the new primary controller after a switchover. This is because the serial number of the new primary controller is not the same as the serial number of the old primary controller and the project cannot be matched to the newly-switched-to controller.

Verify this is not checked. →



You have completed the minimum configuration required for your redundant controllers.

Crossloads, Synchronization, and Switchovers

Crossloading and synchronization points are points where the primary controller transfers data to the secondary controller. Crossload and synchronization points keep the secondary controller ready to assume control in the event of a fault on the primary.

Before you begin programming your redundant controller, be aware of the impact of crossloads and synchronization on the execution of a program after a switchover. Understanding these concepts helps you to create programming that best meets the needs for your redundant application.

Continue reading the sections that follow for explanations of crossloads and synchronization and their relationship to switchovers and program execution.

Changing Crossload and Synchronization Settings

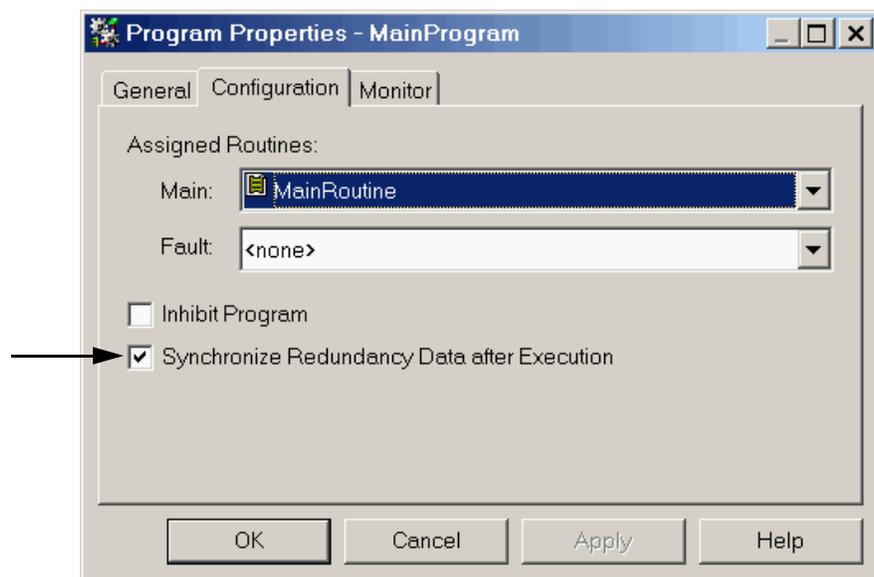
In the enhanced redundancy system, crossload and synchronization points for programs within the RSLogix 5000 project are configurable. You can limit which programs are followed by data crossloading and synchronization. In many applications, changing this setting can reduce the overall impact to the task scan time by reducing the number of times data is crossloaded.

If you reduce the number of crossload and synchronization points, the switchover time becomes longer. This increase in switchover time is because more programs may be rescanned after the switchover.

Synchronization is performed at the end of the last program in the task's program list, regardless of the program's Synchronize Data after Execution setting.

To change the synchronization setting of a program, open the program's Program Properties dialog box and check or uncheck Synchronize Data after Execution.

Use this setting to change crossload and synchronization points.



Default Crossload and Synchronization Settings

The default setting for a **program** in a redundant project is for a crossload to occur at the end of each program execution. However, for an **equipment phase**, the default is that the crossload not execute at the end of the phase.

Before you change the default crossload and synchronization settings, read the sections that follow so you have a complete understanding of the implications. For information about how to change the point in a task where a crossload occurs, see [Changing Crossload and Synchronization Settings on page 144](#).

Recommended Task Types

To avoid anomalies after a switchover occurs, we recommend that you use only one of these task configurations when programming your redundant controllers. Use either of the following:

- One continuous task
- Multiple periodic tasks with one task at the highest priority

The sections that follow explain the impact of crossloads and synchronization after a switchover based on the task structure you use.

Continuous Task After Switchover

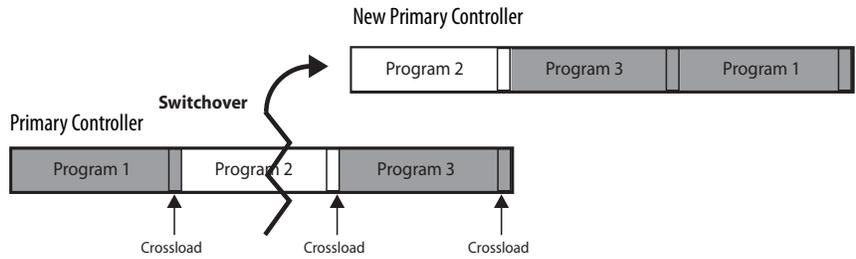
After a switchover occurs within a controller project that contains only a continuous task, the new primary begins executing at the last crossload and synchronization point. Depending on your crossload and synchronization setting, the program that the new primary controller begins with may be the following:

- The program that was interrupted by the switchover
- The program that immediately follows the last crossload and synchronization point

Continuous Task with Crossloads at Each Program End

This diagram demonstrates how programs set to crossload and synchronize at each program-end are executed after a switchover. As is shown, the new primary controller begins executing at the beginning of the program that was interrupted by the switchover. This is the switchover execution that occurs if you use the default crossload and synchronization setting for a program.

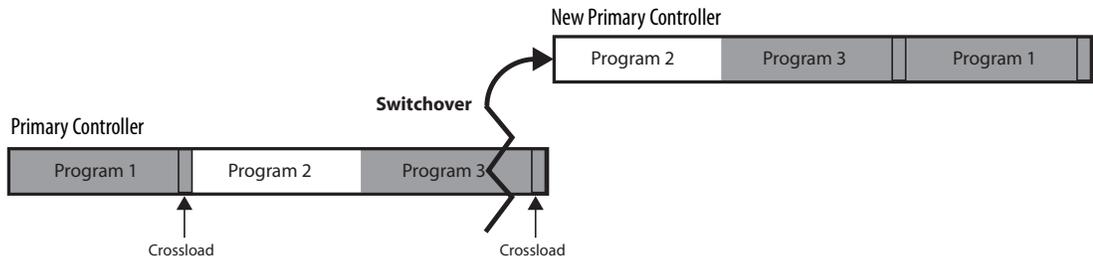
Figure 33 - Program Execution After a Switchover (crossload after each program)



Continuous Task with Varying Crossloads at Program End

This diagram demonstrates how programs set to crossload and synchronize at varying intervals are executed after a switchover. As is shown, the new primary controller begins executing the program that follows the last crossload and synchronization point.

Figure 34 - Program Execution After a Switchover (no crossload after each program)



For information about how to change the point in a task where a crossload occurs, see [Changing Crossload and Synchronization Settings](#) on [page 144](#).

Multiple Periodic Tasks



ATTENTION: If you use multiple periodic tasks, program all crucial outputs within the highest-priority task. Failure to program outputs in the highest-priority task can result in outputs changing state if a switchover occurs.

In a project where multiple periodic tasks are used, the point where program execution begins after a switchover depends on the following:

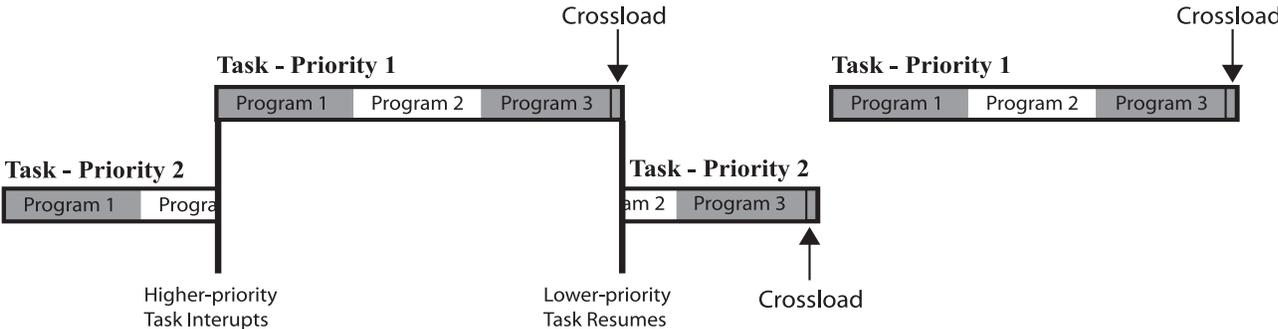
- Crossload and synchronization settings
- Task priority settings

As with the continuous task, the controller begins executing at the program that follows the last crossload and synchronization point.

In addition, a higher priority task may interrupt a lower priority task. If a switchover occurs during or just after the higher priority task executes and the lower priority task has not been completed, then the lower priority task and programs are executed from the point at which the last crossload occurred.

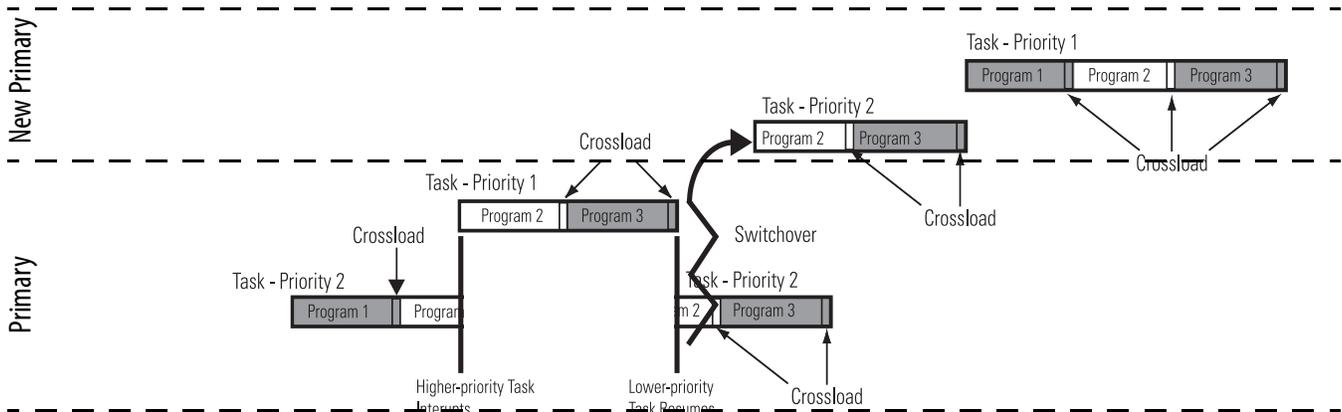
This diagram demonstrates how tasks at different priorities execute if a switchover occurs while a lower priority task is executing. Note that the crossload and synchronization points in this example are set to occur only at the end of the last program within the tasks and not at each program's end.

Figure 35 - Normal Periodic Task Execution (no switchover)



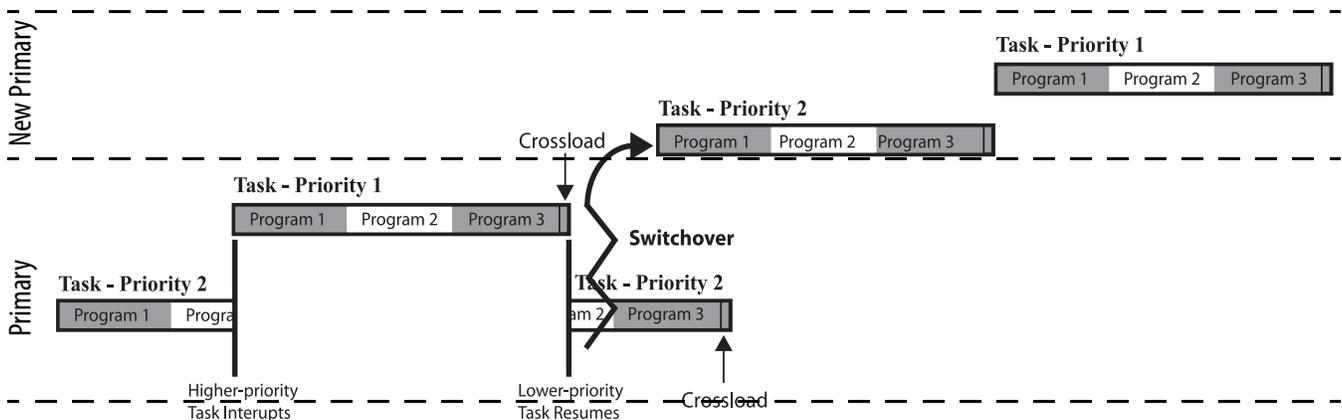
The diagram below shows a lower priority task that has not been completed and a switchover occurs. The lower priority task and programs are executed from the beginning of the program where the switchover occurred. This is because the program uses the default configuration and crossloads and synchronization points occur at the end of each program.

Figure 36 - Periodic Task Execution After Switchover When Configured to Crossload After Programs



The diagram below shows a lower priority task that has not been completed and a switchover occurs. The lower priority task and programs are executed from the beginning and not at the program where the switchover occurred. This is because the crossloads and synchronization points were not configured to occur at the end of each program.

Figure 37 - Periodic Task Execution After Switchover When Configured Not to Crossload After Programs



For more information about programs and tasks with controllers, see the Logix5000 Controllers Tasks, Programs, and Routines Programming Manual, publication [1756-PM005](#).

Crossloads and Scan Time

It is important to plan for controller crossloads because the length of the crossloads affects the scan time of your program. A crossload is a transfer of data from the primary controller to the secondary controller and may occur at the end of each program or at the end of the last program in a task.

The scan time of your program or phase is a total of the program execution time and the crossload time. The diagram below demonstrates this concept.

Figure 38 - Crossload and Scan Time



Estimate the Crossload Time

The amount of time required for a crossload is primarily dependent upon the amount of data being crossloaded. During a crossload, any tag that has been written to during the program execution is crossloaded. Even if a tag has not changed, but has been rewritten during the program execution, it will be crossloaded.

In addition to the time required to transfer tag value changes, the crossload also requires a small amount of overhead time to communicate information about the program being executed.

Redundancy Object Attributes for Crossload Times

Before you complete calculations to estimate the crossload time, you need to use a Get System Value (GSV) instruction to read certain attributes of the redundancy object. These attributes are data transfer sizes measured in DINTs (4-byte words) and are used to calculate the estimated crossload time.

TIP To get these attributes, you do not need to have the secondary chassis installed or operating. If you do not have the secondary chassis operating, the attribute values read indicate what data sizes would be transferred if the secondary chassis was in use.

This table indicates the two attributes you may choose to get specific to the crossload data transfer size. Get the attribute value that meets your application requirements.

If you need the	Then get this attribute value
Data size of the last data transferred during the last crossload	LastDataTransferSize
Data size of the largest crossload of data	MaxDataTransferSize

Remember that the LastDataTransferSize attribute refers to the transfer size of the **previous** crossload and synchronization point, which occurred prior to the program containing the GSV instruction.

If you need to measure the crossloaded data from the last program in the task's program list, you may need to add an additional program at the end of the task that acquires the LastDataTransferSize value from the program that was formerly at the end of the task.

Equation for Estimating Crossload Times

After you have either the size of the last data transfer or the maximum size of data transferred, use this equation to estimate your controllers' crossload time for each program.

1756-L6x Controllers

$$\text{Crossload time per sync point (ms)} = (\text{DINTs} * 0.00091) + 0.6 \text{ ms}$$

1756-L7x Controllers

The following equations apply when a 1756-L7x controller is paired with a redundancy module in both chassis in a redundancy system.

Table 24 - Crossload Times for 1756-L7x Controllers

Controller	Paired with Redundancy Module	Crossload Time
1756-L7x	1756-RM2/A	Crossload time per sync point (ms) = (DINTs * 0.000275) + 0.54 ms
	1756-RM/B	Crossload time per sync point (ms) = (DINTs * 0.00043) + 0.3 ms
	1756-RM/A	Crossload time per sync point (ms) = (DINTs * 0.00091) + 0.6 ms Where DINTs is the size of the data transferred measured in 4-byte words.

TIP

A sync point is a mechanism that the primary controller uses to keep the secondary controller in sync. By default, at the end of each program scan, the primary controller sends the secondary controller the sync point and the secondary controller responds by moving its execution pointer to match the primary controller.

The default for phases is not to send a sync point.

Beginning in revision 16.05x, the option exists to manipulate the sync points for faster program execution.

Program to Minimize Scan Times

Because your system switchover time is impacted by your total program scan time, there are several aspects of your program that must be as efficient as possible to facilitate the fastest possible switchover. The sections that follow indicate methods of making your program more efficient to minimize your program scan time.

These methods make your program more efficient and minimize program scan times:

- [Use a 1756-L7x Controller with a 1756-RM2/A Redundancy Module](#)
- [Use Multiple Controllers](#)
- [Minimize the Number of Programs](#)
- [Manage Tags for Efficient Crossloads](#)
- [Use Concise Programming](#)

Use a 1756-L7x Controller with a 1756-RM2/A Redundancy Module

Beginning with enhanced redundancy system revision 19.053, you can use 1756-L7x controllers in your application. Relative to the redundancy module being used, the 1756-L7x controllers scan the controller program faster than 1756-L6x controllers. The 1756-L7x controllers also scan the controller program fastest if the enhanced redundancy system uses the 1756-RM2/A redundancy module.

IMPORTANT Only the 1756-L72, 1756-L73, 1756-L74, and 1756-L75 controllers can be used in conjunction with the 1756-RM2/A redundancy modules and revision 19.053. See [Components Available for Use in a Redundant Chassis Pair on page 24](#).

If your application needs better controller performance, we recommend that you update from 1756-L6x controllers to 1756-L7x controllers and use 1756-RM2/A redundancy modules.

Use Multiple Controllers

When possible, use multiple controllers in your redundant system. If you use multiple controllers, you can strategically program between the controllers so the program execution and scan times are faster.

For more information about controllers that can be paired in redundant chassis, see [Components of an Enhanced Redundancy System on page 24](#).

Minimize the Number of Programs

When programming a redundant controller, use the fewest programs possible. Using the fewest programs possible is especially important if you plan to crossload data and synchronize the controllers after the execution of each program.

If you need to crossload data at the end of each program, make these programming considerations to minimize the crossload impact on the program scan time:

- Use only one or a few programs.
- Divide each program into the number of routines that is appropriate for your application. A routine does not cause a crossload or increase the scan time.
- Use the main routine of each program to call the other routines of the program.
- If you want to use more than one task for different scan periods, use only one program in each task.

Figure 39 - Use of Multiple Routines (preferred)

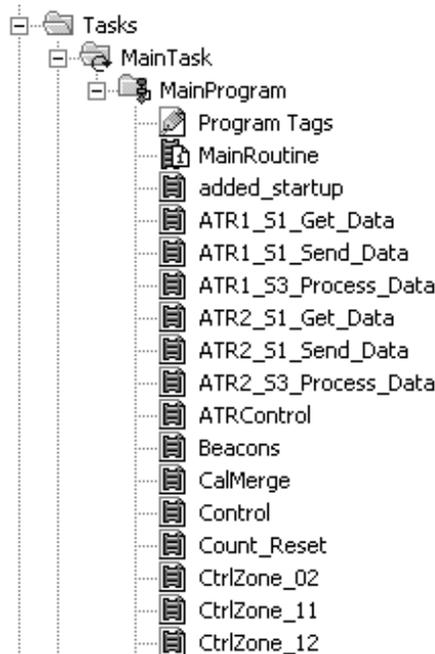
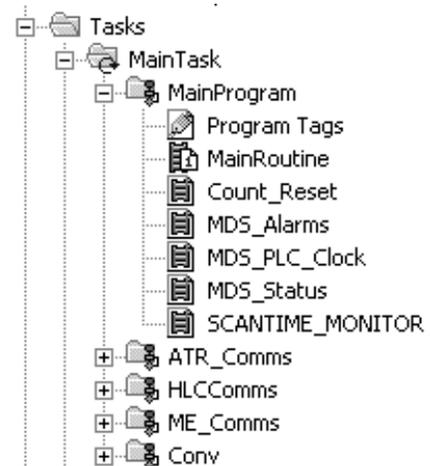


Figure 39 - Use of Multiple Programs (not preferred)



Manage Tags for Efficient Crossloads

To program for more efficient crossloads of data and to reduce the amount of time required for a crossload to execute, manage your data tags as recommended in these sections.

Delete Unused Tags

Deleting unused tags reduces the size of the tag database. A smaller database takes less time to crossload.

Use Arrays and User-Defined Data Types

If you use arrays and User-Defined Data Types, the tags use smaller 4-byte (32-bit) words for all of the data in the type or array. If you create an individual tag, the controller reserves 4 bytes (32 bits) of memory even if the tag uses only 1 bit.

Arrays and User-Defined Data Types help conserve the most memory with BOOL tags. However, we also recommend you use them for your SINT, INT, DINT, REAL, COUNTER, and TIMER tags.

Figure 40 - Example Savings with the Use of an Array

12 bytes of data to crossload (4 bytes for each tag).

Controller Tags - Redundancy				
Scope: <input type="text" value="Redundancy"/>		Show...		Show All
Name	Data Type	Style	Description	
Bool_Tag_1	BOOL	Decimal		
Bool_Tag_2	BOOL	Decimal		
* Bool_Tag_3	BOOL	Decimal		

4 bytes of data to crossload.

Controller Tags - Redundancy			
Scope: <input type="text" value="Redundancy"/>		Show...	
Name	Data Type	Style	Description
⊕ Bool_array1	BOOL[32]	Decimal	

TIP

If you have already created individual tags and programming that uses those tags, consider changing the individual tags to alias tags that reference the elements in an array.

If you choose to do this, your programming can still reference the individual tag names, but the crossload transfers the base array.

For more information about working with arrays, User-Defined Data Types, and alias tags, see the Logix5000 Controllers I/O and Tag Data Programming Manual, publication [1756-PM004](#).

Group Data Types Together in User-Defined Data Types

When you create a User-Defined Data Type for use in your redundancy program, group like data types together. Grouping like data types compresses the data size and helps reduce the amount of data transferred during a crossload.

Figure 41 - Example of Bytes Saved by Grouping Like Data

Figure 42 - Data Types

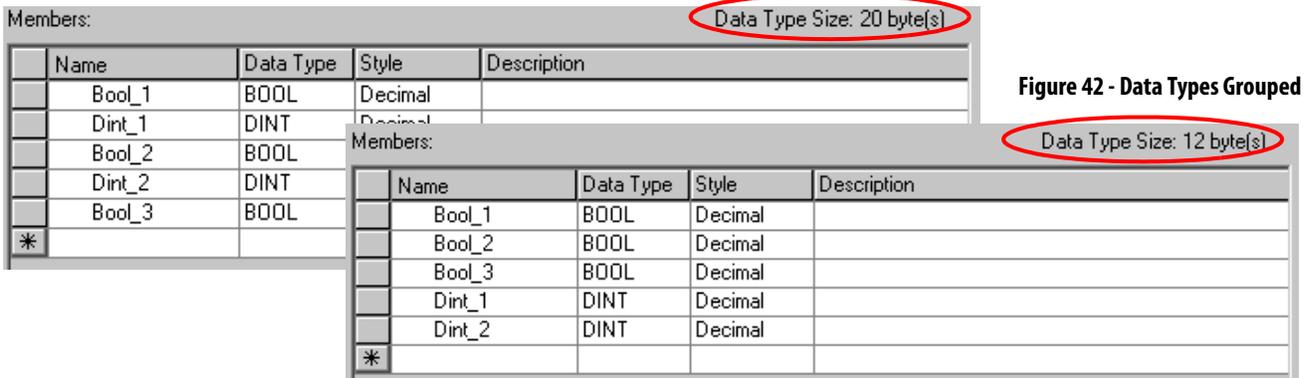


Figure 42 - Data Types Grouped

Group Data into Arrays of User-Defined Data Types by Frequency of Use

To update the secondary controller, the primary controller divides its memory into blocks of 256 bytes. Anytime an instruction writes a value, the primary controller crossloads the entire block that contains the value. For example, if your logic writes only 1 BOOL value to a block, the controller crossloads the entire block (256 bytes).

To minimize crossload time, group your data by how frequently your program uses it.

For example, if your application uses DINTs that you use only as constants to initialize your logic, BOOLs that you update every scan, and REALs that you update every second, you can create a separate User-Defined Data Type for each type of tag that is used at different points in the application. Using separate User-Defined Data Types for each group, rather than grouping all of the tags together in one User-Defined Data Type, helps to minimize the amount of data transferred during the crossload.

Figure 43 - Tags Grouped into User-Defined Data Types by Frequency of Use

Tag Name	Type
My_Bools	My_Bools_UDT
My_Bools.Bool_1	BOOL
My_Bools.Bool_2	BOOL
My_Bools.Bool_3	BOOL
My_Constants	My_Constants_UDT
My_Constants.Constant_1	DINT
My_Constants.Constant_2	DINT
My_Constants.Cosntant_3	DINT
My_Reals	My_Reals_UDT
My_Reals.Real_1	REAL
My_Reals.Real_2	REAL

Figure 43 - Tags in One User-Defined Data Type

Tag Name	Type
My_Data	My_Data_UDT
My_Data.Constant_1	DINT
My_Data.Constant_2	DINT
My_Data.Cosntant_3	DINT
My_Data.Bool_1	BOOL
My_Data.Bool_2	BOOL
My_Data.Bool_3	BOOL
My_Data.Real_1	REAL
My_Data.Real_2	REAL
My_Data.Real_3	REAL

Use DINT Tags Instead of SINT or INT Tags when Possible

We recommend that you use the DINT data type instead of the SINT or INT data types because the controller usually works with 32-bit values (DINTs or REALs). When processing, the controller converts SINT or INT tag values to DINT or REAL values. When processing is complete, the controller converts the value back to a SINT or INT value.

The controller automatically converts these data types while executing and processing a program. No additional programming is required. However, while this conversion process is transparent to you, it does require additional processing time that impacts your program scan time and your switchover time.

Use Concise Programming

Use these recommendations to create concise programming. Using concise programming makes your program execute faster and reduces your program scan time.

Execute an Instruction Only when Needed

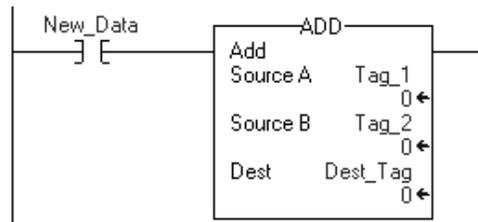
We recommend that you execute instructions only when needed because each time an instruction writes a value to a tag, the tag is crossloaded to the secondary controller. Even if the tag values is the same, it is rewritten and is therefore crossloaded.

Because many instructions write tag values whenever executed, strategic and economical use of instructions is needed. Strategic programming techniques include the following:

- Using preconditions to limit the execution of instructions
- Combining preconditions when possible
- Dividing programming into subroutines that are called only when required
- Running noncritical code every 2 or 3 scans instead of during every scan

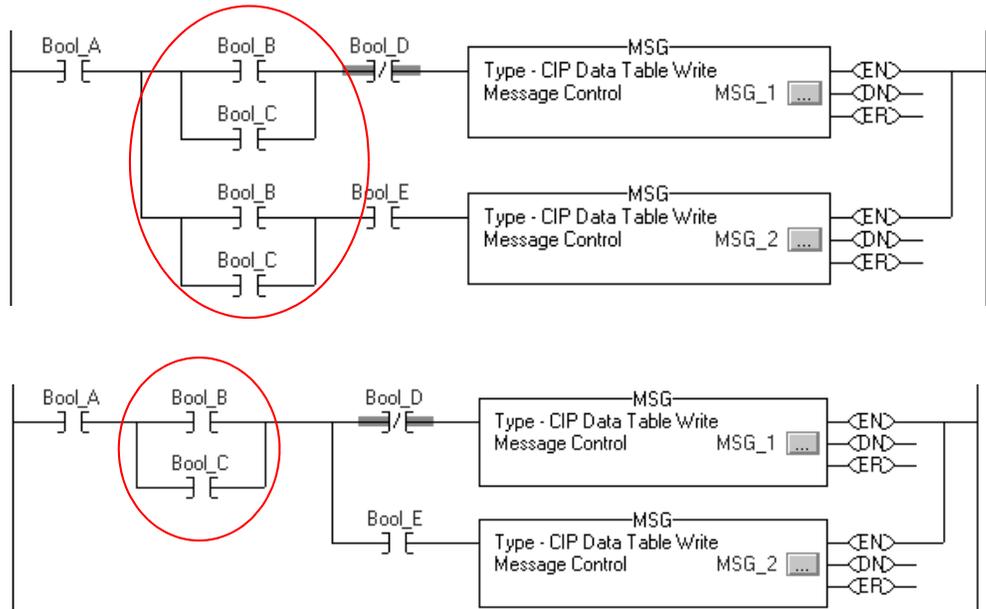
For example, precondition an ADD instruction to run only when the controller gets new data. As a result, the Dest_Tag is crossloaded only when the ADD instruction produces a new value.

Figure 44 - Precondition Used with ADD Instruction



In addition to using preconditions, try to group instructions that can be preconditioned by the same instructions together. In this example, the four preconditions used in the two branches can be combined to precede the two branches. Doing so reduces the number of precondition instructions from four to two.

Figure 45 - Efficient Precondition Use



Program to Maintain Data Integrity

When programming your redundant controllers, there are some instructions and techniques that may cause data loss or corruption when used. These instructions and techniques include the following:

- [Array \(File\)/Shift Instructions](#)
- [Scan-dependent Logic](#)

Array (File)/Shift Instructions

Interruptions to Array (File)/Shift Instructions by an a higher priority task and then switchover can result in an incomplete data shift and corrupted data.

These Array (File)/Shift instructions may result in corrupt data in the event of a switchover:

- Bit Shift Left (BSL)
- Bit Shift Right (BSR)
- FIFO Unload (FFU)

If Array (File)/Shift Instructions are used, these system behaviors may result:

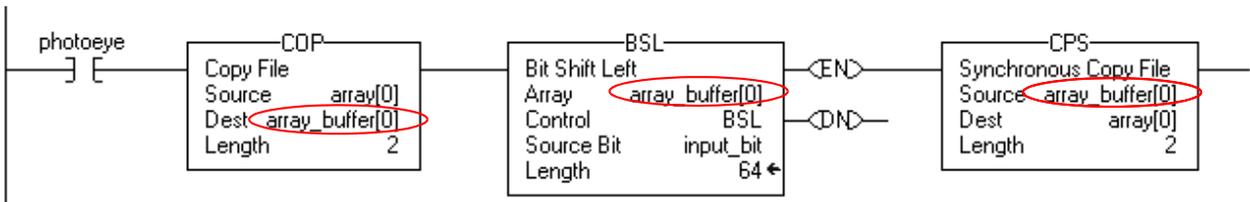
1. If a higher priority task interrupts one of the Array (File)/Shift instructions, the partially-shifted array values are crossloaded to the secondary controller.
2. If a switchover occurs before the instruction completes its execution, data remains only partially shifted.
3. After a switchover, the secondary controller starts its executing at the beginning of the program. When it reaches the partially-executed instruction, it shifts the data again.

Buffering Critical Data

If you cannot place Array (File)/Shift instructions in the highest-priority task, consider using a buffer with Copy File (COP) and Synchronous Copy File (CPS) instructions to maintain the integrity of the array of data.

The programming example shown here shows the use of a COP instruction to move data into a buffer array. The BSL instruction uses the data in that buffer array. The CPS instruction updates the array tag and maintains data integrity because it cannot be interrupted by a higher priority task. If a switchover occurs, the source data (that is, the array tag) remains unaffected.

Figure 46 - Using a Buffer to Maintain Data During Shift



For more information about BSL, BSR, FFU, COP, and CPS instructions see the Logix5000 Controllers General Instructions Reference Manual, publication [1756-RM003](#).

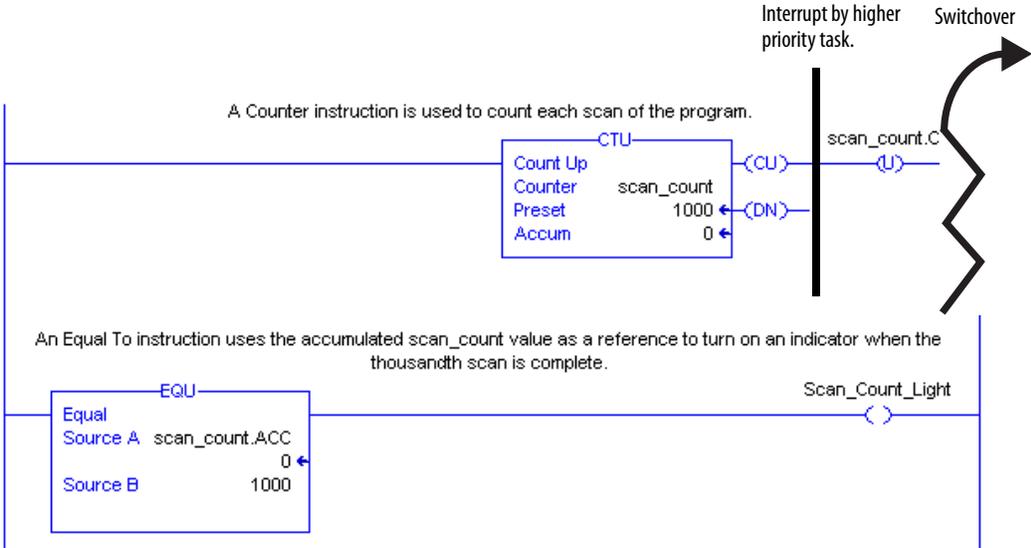
Scan-dependent Logic

If you program a lower priority task so that one instruction is dependent on another instruction that occurs elsewhere in your program, your programming may be disrupted by a task interrupt and switchover. The disruption can occur because the lower priority task may be interrupted by the higher priority task and then a switchover may occur before the lower priority task is completed.

When the lower priority task is executed from the beginning by the new primary controller after the switchover, the dependent instruction may not execute at the most recent value or state.

For example, if a higher priority task interrupts the logic shown in this example, the value of scan_count.ACC is sent to the secondary controller at the end of the program in the higher priority task. If a switchover occurs before the primary controller completes the EQU instruction, the new primary controller starts its execution at the beginning of the program and the EQU instruction misses the last value of scan_count.ACC. As a result, any programming that uses the Scan_Count_Light tag may also execute by using incorrect data.

Table 25 - Scan-dependent Logic

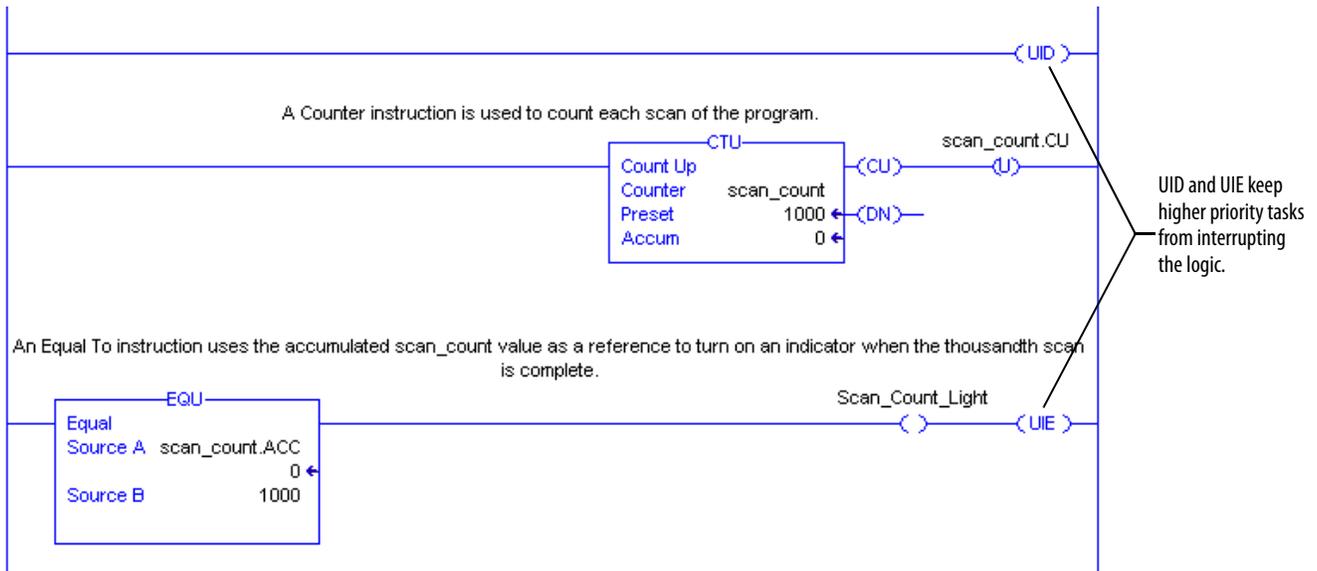


Bind Dependent Instructions with UID and UIE Instructions

If you cannot place scan-dependent instructions in the highest priority task, consider using the User Interrupt Disable (UID) and User Interrupt Enable (UIE) to prevent a higher priority task from interrupting the scan-dependent logic.

For example, if you bind the scan-dependent logic previously shown, a higher priority task would not interrupt the dependent instructions and a switchover would not result in inconsistent data.

Figure 47 - Scan-dependent Instructions Bound with UID and UIE Instructions



For more information about UID and UIE instructions, see the Logix5000 Controllers General Instructions Reference Manual, publication [1756-RM003](#).

Program to Optimize Task Execution

To make synchronization, crossloads, and HMI updates as fast as possible, make adjustments to the System Overhead Time Slice and the type of tasks used. These adjustments affect service communication tasks that take place during the time when the continuous task is not executing.

This table lists some of the communication that takes place during an continuous task and service communication periods.

Table 26 - Communication Tasks during Scheduled and Unscheduled Periods

During	These types of communication occur
Task execution	Update I/O data (not including block-transfers)
	Produced/consumed tags
Service communication	Communication with programming devices (for example, RSLogix 5000 software)
	Communication with HMI devices
	Execution of Message (MSG) instructions, including block-transfers
	Responses to messages from other controllers
	Synchronization of the redundant system
	Reestablishment and monitoring of I/O connections, such as Removal and Insertion Under Power conditions. This does not include normal I/O updates that occur during the execution of logic
	Bridging of communication from the serial port of the controller to other ControlLogix devices via the ControlLogix backplane

To increase service communication to allow for synchronization and the updating of HMI, consider using the techniques described in this table.

Table 27 - Methods to Increase Service Communication Periods

If your RSLogix 5000 project contains	Then see	On Page
Only a continuous task with no other tasks (This is the default task configuration.)	Specify a Larger System Overhead Time Slice	164
More than one task (for example, at least 2 periodic tasks)	Use Periodic Tasks	167

Specify a Larger System Overhead Time Slice

The system overhead time slice specifies the percentage of time the controller devotes to servicing communication, excluding the time for periodic tasks. The controller interrupts the continuous task to service communication, and then resumes the continuous task.

This table shows the ratio between executing the continuous task and servicing communication at various overhead time slices. Consider the following:

- When the system overhead time slice setting is between 10% and up to 50%, the time allocated for servicing communication is fixed at 1 ms, and the continuous task time slice changes to produce the desired ratio.
- When the system overhead time slice is greater than 50...90%, the time allocated to the continuous task is fixed at 1 ms, and the time allocated to servicing communication changes to produce the desired ratio.

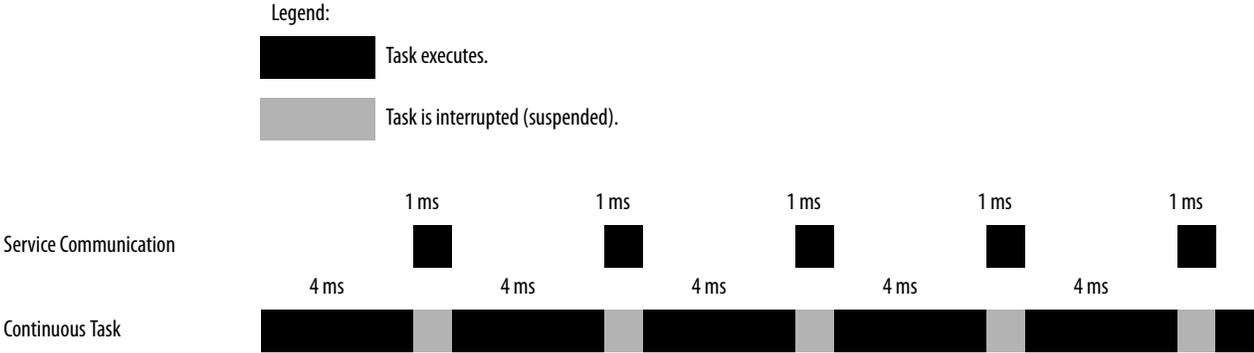
Table 28 - Overhead Time Slice

At this time slice	The continuous tasks runs for	And service communication occurs for as long as
10%	9 ms	1 ms
20%	4 ms	1 ms
25%	3 ms	1 ms
33%	2 ms	1 ms
50%	1 ms	1 ms
66%	1 ms	2 ms
75%	1 ms	3 ms
80%	1 ms	4 ms
90%	1 ms	9 ms

System Overhead Time Slice Examples

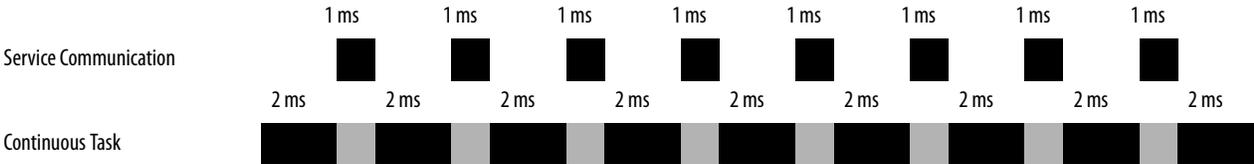
This diagram illustrates a system where the System Overhead Time Slice is set to 20% (default). With this percentage, communication is serviced after every 4 ms of continuous task execution. Communication is serviced for up to 1 ms before the continuous task is restarted.

Figure 48 - System Overhead Time Slice Set to 20%



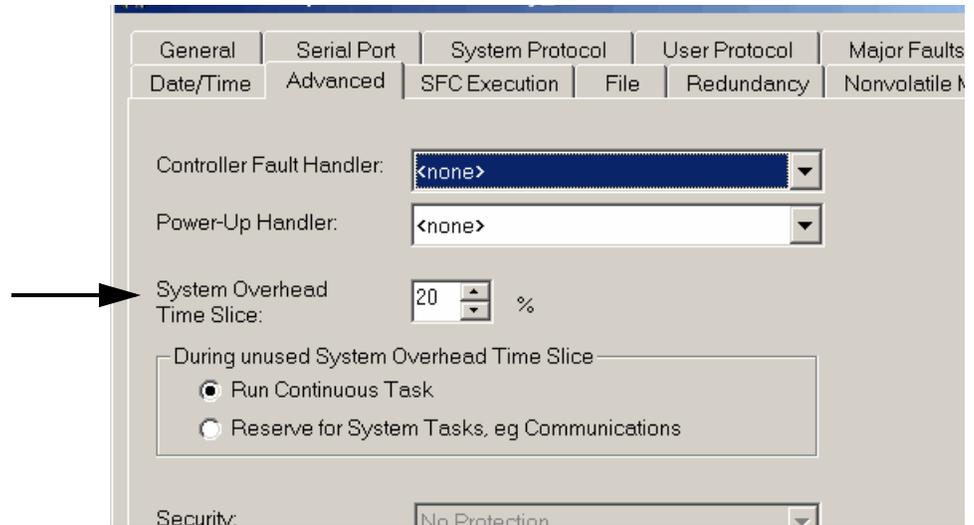
This diagram illustrates a system where the System Overhead Time Slice is set to 33%. With this percentage, communication is serviced after every 2 ms of continuous task execution. Communication is serviced for up to 1 ms before the continuous task is restarted.

Figure 49 - System Overhead Time Slice Set to 33%



Change the System Overhead Time Slice

To change the System Overhead Time Slice, access the Controller Properties dialog box and click the Advanced tab. You can enter your System Overhead Time Slice value.



Options for During the Unused System Overhead Time Slice

Enable the **Run Continuous Task** option (default setting) if you want the controller to revert to running the continuous task as soon as the communication servicing task has no pending activity. This has the effect of only using the allocated communication servicing time if there is a need for it.

When the Run Continuous Task option enabled, the controller immediately returns to the continuous task.

Use the **Reserve for System Task** option to allocate the entire 1 ms of the System Overhead Time Slice for service communication - even if no service communication or background tasks need to be executed. You might choose to use this option without service communication or background tasks to simulate a communication load on the controller during design and programming. Use this setting for testing purposes only.

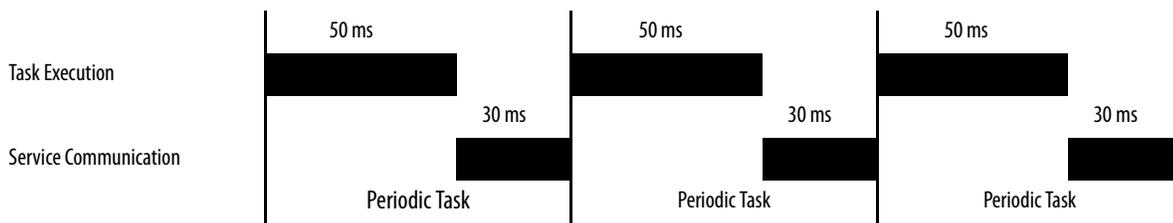
Use Periodic Tasks

If you have multiple tasks in your project, changing the System Overhead Time Slice does not affect how communication is serviced. To increase the time to service communication when multiple tasks are used, configure the periodic tasks such that more time might be available to service communication.

TIP **While you can use multiple periodic tasks in your redundant controller program, use the fewest number of tasks possible.**

If you use periodic tasks, communication is serviced any time a task is not running. For example, if you configure your task period at 80 ms and the task executes in 50 ms, the controller has 30 ms out of every 80 ms to service communication.

Figure 50 - Periodic Task Execution and Service Communication



If you use multiple periodic tasks, verify the following:

- The execution time of a highest priority task is significantly smaller than its period.
- The total execution time of all your tasks is significantly less than the period of the lowest priority tasks.

Verifying those settings generally leaves enough time for service communication. The example configuration of tasks shown here demonstrates those configuration settings.

Example of Periodic Task Configurations

Task	Priority	Execution Time	Period Specified
1	Higher	20 ms	80 ms
2	Lower	30 ms	100 ms
Total execution time:		50 ms	

In this example, the execution time of the highest priority task (Task 1) is significantly smaller than its period, that is, 20 ms is less than 80 ms, and the total execution time of all the tasks is significantly smaller than the specified period of the lowest priority task, that is, 50 ms is less than 180 ms.

Tuning the Period Specified

You may need to tune the period you specify for your periodic tasks to balance program execution and service communication.

TIP The crossloading of data during synchronization points extends task scan times in enhanced redundancy systems. We recommend that you balance program execution and service communication when the system is synchronized.

To check for overlaps, go online with the controller and access the Task Properties dialog box. In the Monitor tab, note the maximum scan time. Verify that the maximum scan time is smaller than the period you specified for the periodic task.

Program to Obtain System Status

For most redundant applications, you need to program to obtain the status of the system. Program to obtain system status when you do the following:

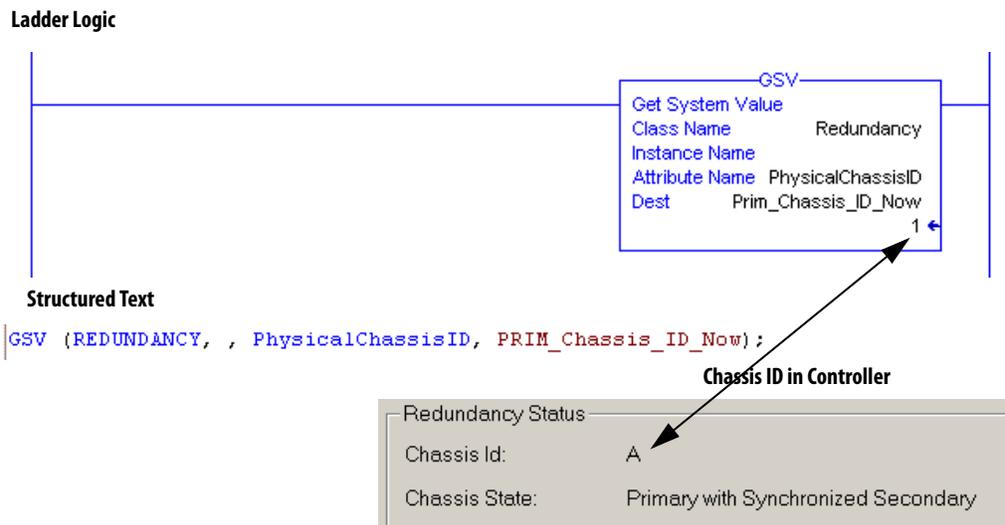
- Program HMI to display the system status
- Precondition logic to execute based on the system status
- Use the diagnostic information to troubleshoot the system

To obtain the status of your redundant system, use a Get System Value (GSV) instruction in your program and plan for the tags you are writing the values to.

In the example below, the GSV instruction is used to obtain the chassis ID (that is, the chassis A or B designation) of the chassis that is functioning as the primary. The **PhysicalChassisID** value is stored in the **PRIM_Chassis_ID_Now** tag. The **PhysicalChassisID** value retrieved matches the Chassis ID indicated in the Controller Properties dialog box.

If the Physical Chassis ID value is	Then the chassis ID is
0	Unknown
1	Chassis A
2	Chassis B

Figure 51 - GSV Instruction to Get Chassis ID

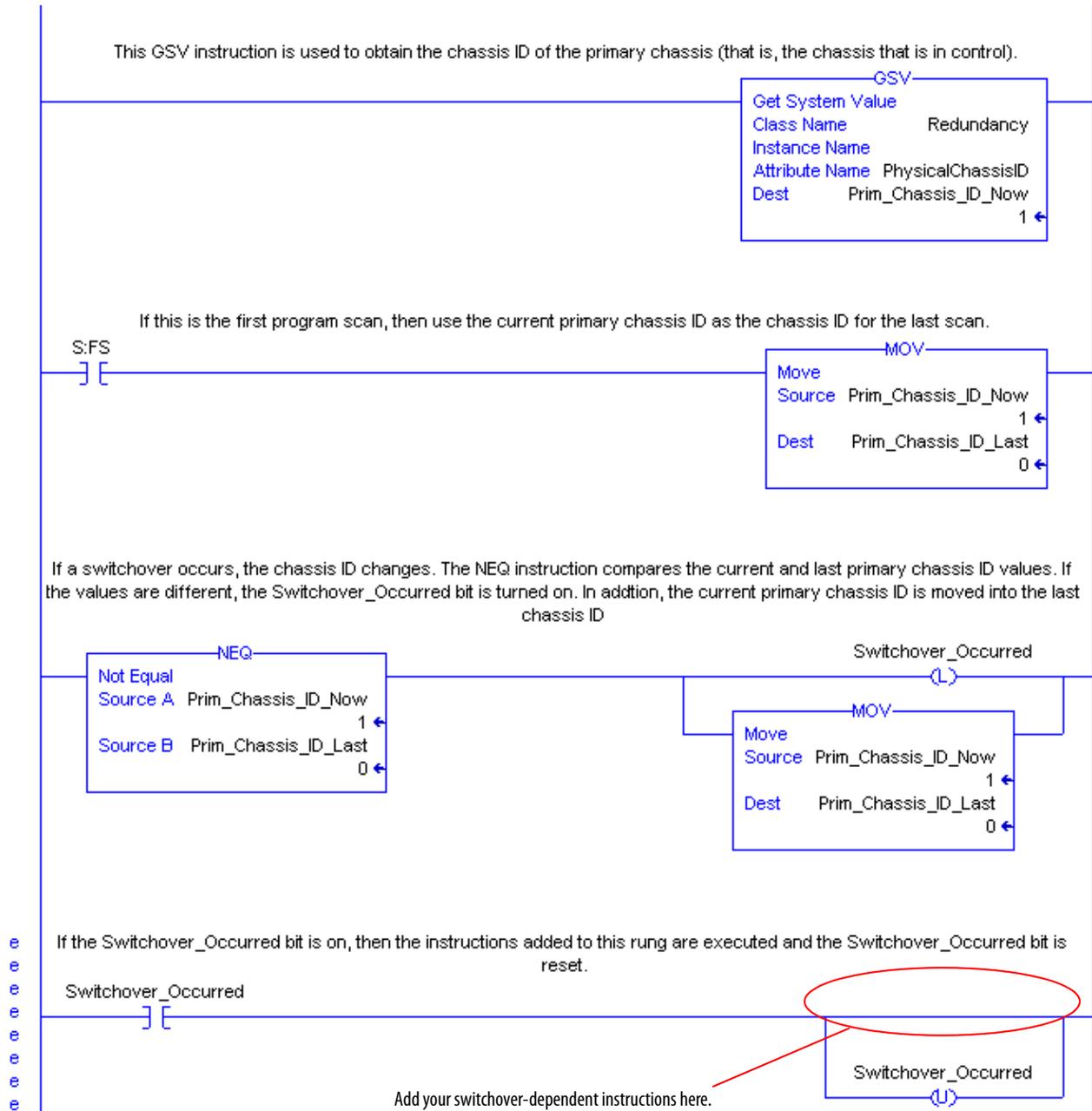


For more information about the REDUNDANCY object attributes, see [Appendix E, Redundancy Object Attributes on page 273](#).

Program Logic to Run After a Switchover

If your application requires certain logic or instructions to be executed after a switchover, then use programming and tags similar to that shown in this example.

Figure 52 - Precondition Used to Run Logic After Switchover - Ladder Logic



Use Messages for Redundancy Commands

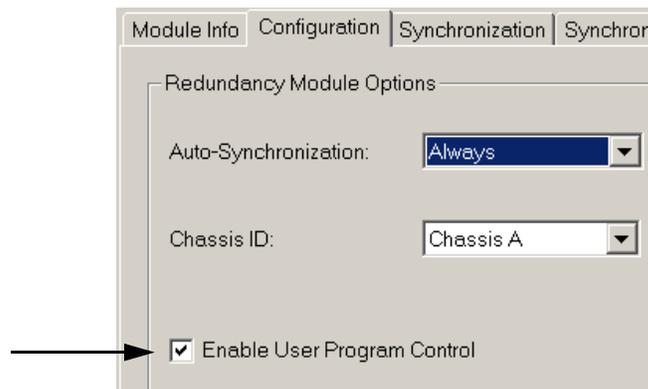
For some applications, you may want to program the controller to issue redundancy system commands via the redundancy modules. The sections that follow explain how to configure a MSG instruction to issue a redundancy command.

Verify User Program Control

For a MSG instruction to issue a command via the redundancy modules, the redundancy modules must be configured for user program control.

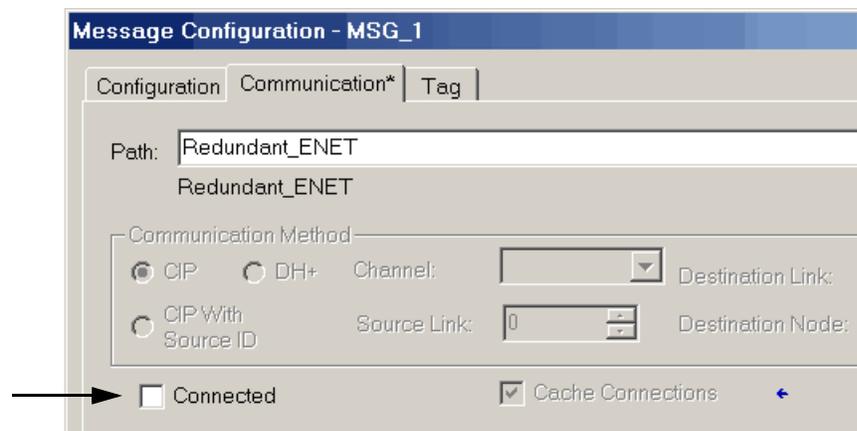
To verify that the modules are enabled for user program control, access the Configuration tab of the RMCT and verify that Enable User Program Control is checked.

Figure 53 - Enable User Program Control in the RMCT



Use an Unconnected Message

When you add your MSG instruction that is to be used for issuing the command through the redundancy modules, configure it as an unconnected message.



Configure the MSG Instruction

Use the MSG configuration settings that correspond to the command you intend to issue to the redundancy modules.

If you need to	See page
Initiate a Switchover	172
Disqualify the Secondary Chassis	174
Synchronize the Secondary Chassis	174
Set the Redundancy Module Date and Time	175

Initiate a Switchover

To initiate a switchover, use the MSG instruction parameters listed in this table.

Table 29 - MSG Instruction to Initiate a Switchover

In this tab	Edit this element	To use this value
Configuration	Message Type	CIP Generic
	Service Type	Custom
	Service Code	4e
	Class	bf
	Instance	1
	Attribute	None - no value needed
	Source Element	INT tag with a value of 1
	Source Length	2
	Destination Element	None - no value needed.
Communication	Path	Browse for the path to the 1756-RM or 1756-RMXT redundancy module.
	Connected box	Leave the Connected checkbox unchecked.

Use this table to when using MSG instructions during a switchover.

Table 30 - MSG Instruction Behavior During a Switchover

If the MSG instruction is	Then
From a redundant controller	In a redundant controller, any MSG instruction that is in progress during a switchover experiences an error. (The ER bit of the instruction turns on.) After the switchover, normal communication resumes.
To a redundant controller	For any MSG instruction from a controller in another chassis to a redundant controller, cache the connection: Properties of the Message to the Redundant Controller
Configured Message Instructions	
If the MSG instruction originates from a redundant controller	Then
During a switchover	The message instructions status bits are updated asynchronously to the program scan. Consequently, you cannot crossload your message instructions status bits to a secondary controller. During a switchover, any active message instructions become inactive. When this occurs, you will need to reinitialize the execution of your message instructions in the new primary controller.
During qualification	The scrolling display changes from CMPT for compatible to Qfng for qualifying. <ul style="list-style-type: none"> • If a configured message is cached, the primary controller automatically establishes a connection with no errors. • If a configured message is uncached or unconnected, the primary controller receives Error 1 Extended Error 301, No Buffer Memory.
If the message is targeted to a redundant controller	Then
During the erroring out of a message	All backplane communication ceases. This stoppage allows the redundant controller to receive the message instruction required to perform a switchover or any diagnostics. Important: If any of your messages are active during a switchover, you can expect one of these things to happen: <ul style="list-style-type: none"> • Cached and connected messages cause the message instruction to pause for 7.5 seconds because the initiating controller has not received a response from the targeted controller. For cached messages, the message instruction tries to execute three more times, each attempt followed by a pause of 7.5 seconds. If, after 30 seconds pass, the targeted controller does not respond to the initiating controller, then the switchover errors out with connected time out Error 1 Extended Error 203. An example of a connected message would be CIP data table read-and-write messages after a connection has been established. <ul style="list-style-type: none"> • Uncached messages error out after 30 seconds if you have just initiated them because the initiating controller never received a reply to the forward-open request. The error is Error 1F Extended Error 204, an unconnected time out. Examples of uncached messages would include CIP generic messages and messages captured during the connection process.
During qualification	Cached messages run with no errors. A connection has been established. Connected, but uncached, messages or unconnected messages error out with Error 1 Extended Error 301, No Buffer Memory .

Disqualify the Secondary Chassis

To disqualify the secondary chassis, use the MSG instruction parameters listed in this table.

Table 31 - Disqualify the Secondary Chassis

In this tab	Edit this element	To use this value
Configuration	Message Type	CIP Generic
	Service Type	Custom
	Service Code	4d
	Class	bf
	Instance	1
	Attribute	None - no value needed
	Source Element	INT tag with a value of 1
	Source Length	2
	Destination Element	None - no value needed.
Communication	Path	Browse for the path to the 1756-RM or 1756-RMXT redundancy module.
	Connected box	Leave the Connected checkbox unchecked.

Synchronize the Secondary Chassis

To disqualify the secondary controller, use the MSG instruction parameters listed in this table.

Table 32 - Synchronize the Secondary Chassis

In this tab	Edit this element	To use this value
Configuration	Message Type	CIP Generic
	Service Type	Custom
	Service Code	4c
	Class	bf
	Instance	1
	Attribute	None - no value needed
	Source Element	INT tag with a value of 1
	Source Length	2
	Destination Element	None - no value needed.
Communication	Path	Browse for the path to the 1756-RM or 1756-RMXT redundancy module.
	Connected box	Leave the Connected checkbox unchecked.

Set the Redundancy Module Date and Time

To set the wallclock time of the 1756-RM module, use the MSG instruction parameters listed in this table.

Table 33 - Set Wallclock Time

In this tab	Edit this element	To use this value
Configuration	Message Type	CIP Generic
	Service Type	Custom
	Service Code	10
	Class	8b
	Instance	1
	Attribute	b
	Source Element	WallClockTime[0] WallClockTime is a DINT[2] array that stores the CurrentValue of the WALLCLOCKTIME object
	Source Length	8
	Destination Element	None - no value needed.
Communication	Path	Browse for the path to the 1756-RM or 1756-RMXT redundancy module.
	Connected box	Leave the Connected checkbox unchecked.

Set the Task Watchdog

Watchdog times set for tasks in redundancy applications must be larger than watchdog times set for tasks in nonredundancy applications because more time is required to conduct crossloads and synchronization.

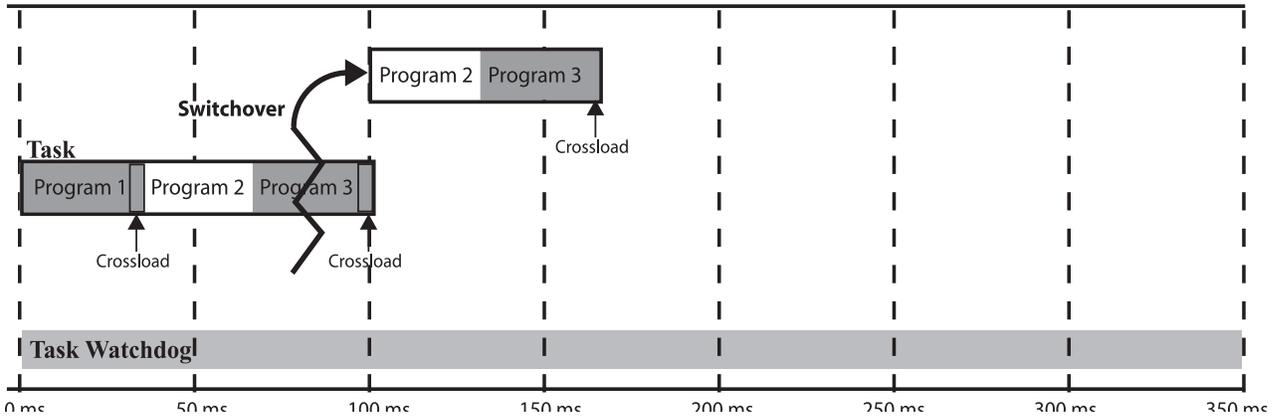
An increase in the required watchdog time is also a result of the way programs are executed in the event of a switchover. A program or programs may be executed a second time after switchover, depending on when in the task or program the switchover occurs and where in the task crossload and synchronization occurs.

If a program is executed a second time, the length of time required for the program scan is increased. However, the watchdog timer is not reset and continues to countdown from the beginning of the task that was started by the old primary controller. Therefore, the watchdog timer must be configured to account for the potential of additional program scans.

We recommend that you reevaluate the watchdog times in your application if either of these events occur:

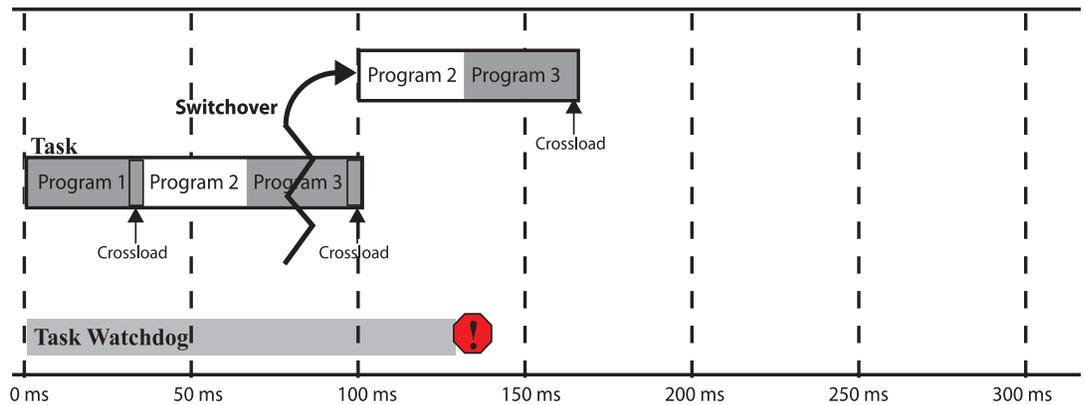
- A second controller is added to a redundancy chassis.
- The application in a second controller that is already in the system is modified.

Figure 54 - Watchdog Configured for Redundancy Switchover



In the event of a watchdog timeout, a major fault (type 6, code 1) results. If this fault occurs after a switchover, the control system fails-to-safe or to the configured hold state.

Figure 55 - Watchdog Not Configured for Redundancy Switchover



Minimum Value for the Watchdog Time

To set Watchdog time for your 1756-L6x controllers, use this table to determine which equation to use to calculate the time for each task.

If	Then use this equation
Using ControlNet I/O ms	$(2 * \text{maximum_scan_time}) + 150$
Using Ethernet I/O ms	$(2 * \text{maximum_scan_time}) + 100$

The *maximum_scan_time* is the maximum scan time for the entire task when the secondary controller is synchronized.

To set the 1756-L7x initial task tuning, follow these steps.

IMPORTANT This works only when there is no Continuous task configured in the Logix application.

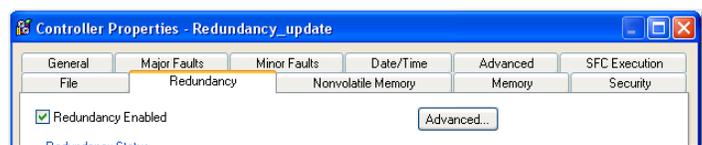
1. Monitor the Max Scan Time for each task while the redundant chassis pair is synchronized.
2. Set the Watchdog times for each task to 3 times the Max Scan Time.
3. Use the Logix5000 Task Monitor Tool to configure each Task Period. ⁽¹⁾
 - Adjust the Task periods of each so that the maximum scan time is less than 80% of the task period rate.
 - Adjust the Task periods so that the Logix CPU % utilization is never above 75%.
 - While performing these tests, the HMI and any other external systems must be connected to the Logix controller.

IMPORTANT Verify that there are no task overlaps.

Download the Project

Download the project only to the primary controller. When the secondary controller is synchronized, the system automatically crossloads the project to the secondary controller.

IMPORTANT If the secondary chassis was qualified and becomes disqualified after you download the project, verify that you have enabled the controller for redundancy.



(1) See the PlantPAx Automation System Reference Manual, publication [PROCES-RM001](#).

Store a Redundancy Project to Nonvolatile Memory

Use this procedure to store an updated project and firmware to the nonvolatile memory card of the controller.

IMPORTANT The controllers use these nonvolatile memory cards.

Cat. No.	Nonvolatile Memory Card
1756-L6x	1784-CF64 or 1784-CF128 CompactFlash cards
1756-L7x	1784-SD1 or 1784-SD2 Secure Digital cards

This section describes how to store a project to nonvolatile memory in either of these conditions:

- [Store a Project While the Controller is in Program or Remote Program Mode](#)
- [Store a Project While a System is Running](#)

IMPORTANT We recommend that you store the same project on both controllers' nonvolatile memory cards. By doing so, you can be assured that if a controller, primary or secondary, loses the project from its internal memory, you can load the most recent project back onto that controller.

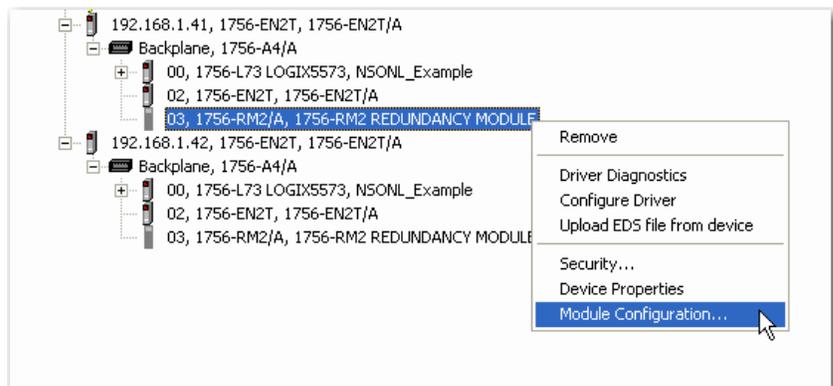
If you store the same project on both controllers' nonvolatile memory cards, while the process is running, you must save the project on the controllers while they are in the secondary controller state. To do so, you save the project on the secondary controller, conduct a switchover and save the project on the new secondary controller.

For more information, see the steps below.

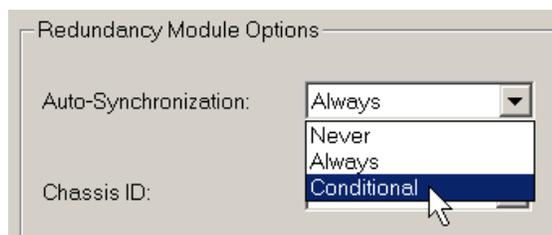
Store a Project While the Controller is in Program or Remote Program Mode

If you want to store your controller project in nonvolatile memory while your redundant system is not running, complete these steps. Before you begin, verify that a controller communication path has been specified and that you are able to go online with the primary controller.

1. Verify that the redundant chassis are synchronized. If they are not synchronized, synchronize them.
2. Use RSLogix 5000 software or the mode switch to put the primary controller into Program or Remote Program mode.
3. In RSLinx Classic communication software, right-click the 1756-RM module and choose Module Configuration to open the RMCT.



4. In the Configuration tab, set the Auto-Synchronization parameter to Conditional.



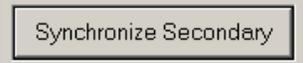
5. On the Synchronization tab, click Disqualify Secondary.

A rectangular button with a thin black border and a light gray background, containing the text "Disqualify Secondary" in a standard sans-serif font.

6. In RSLogix 5000 software, access the Controller Properties dialog box and click the Nonvolatile Memory tab.
7. Click Load/Store.
8. Click <-- Store and then click Yes.

When the store is complete, we go online with the secondary controller.

9. Complete [steps 6...8](#) to store the project in nonvolatile memory of the secondary controller.
10. In RSLinx Classic software, open the RMCT for one of the redundancy modules in the redundant pair.
11. In the Synchronization tab, click Synchronize Secondary.

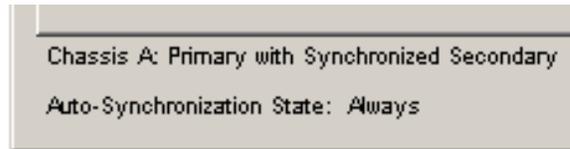
A rectangular button with a thin black border and a light gray background, containing the text "Synchronize Secondary" in a standard sans-serif font.

12. In the Configuration tab, set the Auto-Synchronization option to your desired setting.

Store a Project While a System is Running

If you want to store your controller project in nonvolatile memory while your redundant system is running, complete these steps.

1. Verify that the redundant chassis are synchronized.



2. In the RMCT, access the Configuration tab and set the Auto-Configuration parameter to Never.
3. In the Synchronization tab, click Disqualify Secondary.
4. Go online with the secondary controller.



IMPORTANT Do not go back online with the primary controller until you have completed this procedure.

5. Open the Controller Properties dialog box and click the Nonvolatile Memory tab.
6. Click Load/Store then <-- Store to store the project in nonvolatile memory.
7. In the RMCT, click the Synchronization tab.
8. Click Synchronize Secondary and wait for the system to synchronize.
9. Click Initiate Switchover.



10. Go online with the new secondary controller.
11. Complete [steps 5](#) and [6](#) to store the project.
12. In the RMCT, click the Configuration tab and set the Auto-Configuration to your desired setting.
13. In the Synchronization tab, click Synchronize Secondary.

You have completed the steps required to store your project while online.

Load a Project

If you need to load a project from nonvolatile memory, you must first disqualify your redundancy system. You then load the project from the primary controller and resynchronize the redundant chassis once the load is complete.

For details about loading a project from nonvolatile memory, see the Logix5000 Controllers Memory Card Programming Manual, publication [1756-PM017](#).

Online Edits

You can edit the redundant controller program while the system is online and running. However, in addition to considerations described in the Logix5000 Controllers Quick Start, publication [1756-QS001](#), considerations specific to redundancy must be made.

Support for Partial Import Online

Beginning with enhanced redundancy system revision 19.052 or later, you can use the Partial Import Online (PIO) feature available in RSLogix 5000 software.

Consider these points when using PIO with enhanced redundancy systems at revision 19.052 or later:

- If you select **Import Logix Edits as Pending** or **Accept Program Edits** when executing a PIO, the primary controller treats the PIO feature as a set of multiple test edits where, after the import is complete, you can switch between testing the edits or not.
- We recommend that you do not use **Finalize All Edits in Program** when importing edits. If you use this option, any failure due to the import causes a failure on the new primary controller after a switchover.
- If edits exist in the primary controller due to a PIO, they are treated the same as normal test edits with respect to the 'Retain Test Edits at Switchover' selection and Redundancy System Update.
- The primary controller rejects any attempt to qualify if a PIO is in progress.
- If you attempt to initiate a PIO on a primary controller in the process of qualifying the system, that PIO is rejected.

- A PIO to a primary controller may fail if a switchover occurs while the PIO is still in process.

When the anomaly occurs and the PIO fails, you may see any of these errors:

- Failed to import file 'c\...\xxx.L5x
Object already exists
- Failed to import file 'c\...\xxx.L5x
Already in request mode/state
- CIP error: Problem with a semaphore
- Internal Object Identifier (IOI) destination unknown

After switchover is complete, re-attempt the PIO and it completes successfully.

There are additional considerations necessary to performing online edits:

- [Plan for Test Edits](#)
- [Reserve Memory for Tags and Logic](#)
- [Finalize Edits with Caution](#)

Plan for Test Edits

Before you begin making edits to your redundant program while your system is running, verify that the Retain Test Edits on Switchover setting meets your application requirements.

IMPORTANT	We recommend that you leave the Retain Test Edits on Switchover setting at the default (that is, unchecked) to avoid faulting both controllers when testing your edits.
------------------	---

If you enable the system to retain the test edits on a switchover (that is, you check Retain Test Edits on Switchover), faults that result from the test edits can also occur on the new primary controller after a switchover.

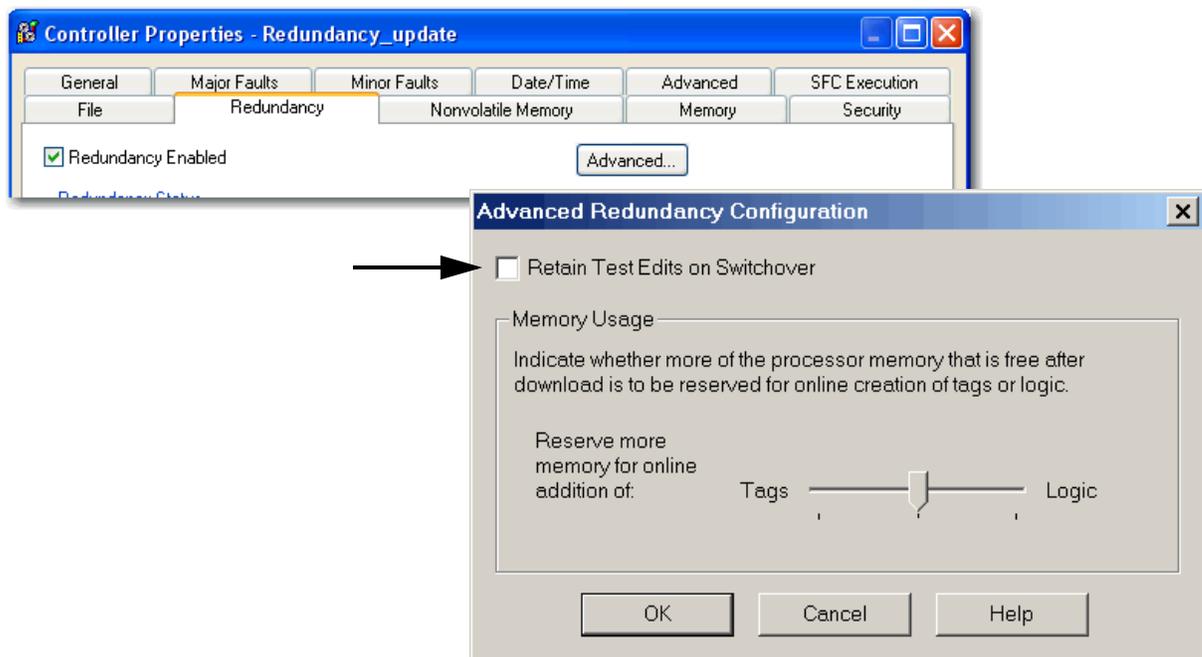
If you do not enable the system to retain the test edits on a switchover (that is, you leave Retain Test Edits on Switchover unchecked), faults that result from the test edits are not carried over to the new primary controller in the event of a switchover.

Use this table to determine the Retain Test Edits on Switchover setting that suits your application.

If you need to	Then
Prevent a test edit from faulting both the primary and secondary controller	Leave Retain Test Edits on Switchover unchecked
Keep test edits active, even in the event of a switchover and at the risk of faulting both controllers	Check Retain Test Edits on Switchover

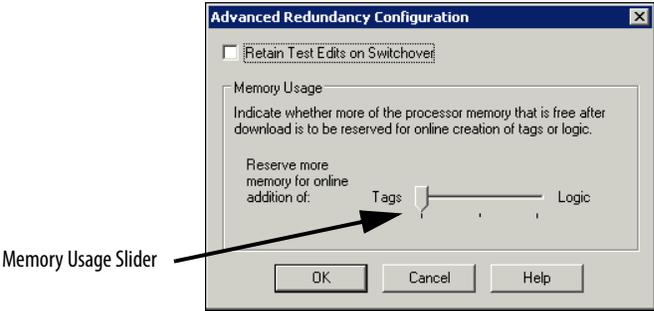
To change the Retain Test Edits on Switchover setting, click the Redundancy tab in the Controller Properties then click Advanced.

Figure 56 - Retain Test Edits on Switchover



IMPORTANT When using a 1756-L7x redundancy controller using version 19 software, and the Memory Usage slider is set all the way to Tags, the first synchronization attempt will be successful, but after switchover or disqualification, the next qualification attempt will fail, and one or more entries will appear in the secondary redundancy module event log with the following description: '(14) Error Setting Up Data Tracking.'

To recover from this issue, move the slider slightly to the right. This must be done offline or in Program mode. Additionally, you must download the updated application to the disqualified secondary to update its configuration. The next qualification attempt is successful.

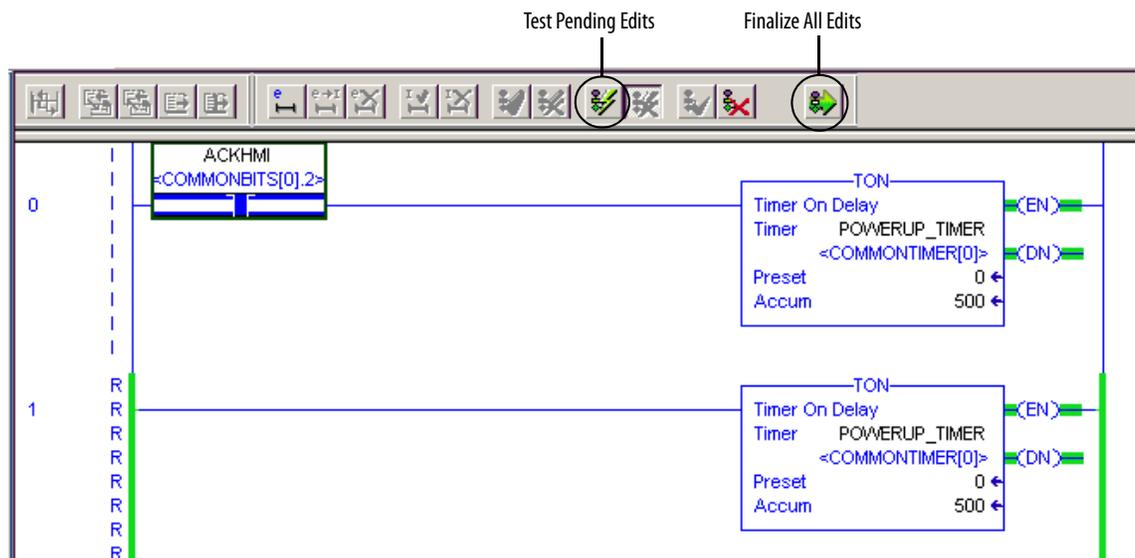


Finalize Edits with Caution

When you finalize edits to your program while online, the original program that existed before the changes were made is deleted. As a result, if the edits you finalize cause a fault on the primary controller, the new primary controller will also fault after the switchover.

Before you finalize any edits to your program, test the edits to verify that faults do not occur.

Figure 57 - Test Edits Before Finalizing



TIP

Even if you have not enabled the Retain Test Edits on Switchover property, faults can still occur on the primary and secondary controllers if the edits are finalized.

The Retain Test Edits on Switchover property affects only edits that are being tested. The Retain Test Edits on Switchover does not affect the redundant controllers that are running finalized edits.

Reserve Memory for Tags and Logic

Depending on your redundant application, you may need to change the memory usage property for your redundant controller. The setting you specify impacts how the controller divides memory for tags and logic to be stored to the buffer during a crossload to the secondary controller.

IMPORTANT For most applications, we recommend that the Memory Usage slider remain at its default position (center).

This table indicates when you might need to change the memory usage setting.

Table 34 - Possible Memory Usage Setting Change

If your online edits are primarily changes to	Then move the Memory Usage slider towards
Tags with little or no changes to logic	Tags
Logic with little or no new tags created	Logic

IMPORTANT Do not set the Memory Usage slider all the way to Tags or Logic:

- If you move the slider all the way to Tags, you may not be able to perform edits while online and OPC communication may fail.
- If you move the slider all the way to Logic, you cannot create or edit any tags while online.

Notes:

Monitor and Maintain an Enhanced Redundancy System

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Controller Logging	189
Use Programming to Monitor System Status	190
Verify Date and Time Settings	191
Verify System Qualification	192
Check the ControlNet Module Status	197

Tasks to Monitor the System

This chapter describes some of the key tasks to complete to monitor and maintain your enhanced redundancy system.

Controller Logging

Beginning with enhanced redundancy system revision 19.052, you can use the controller logging feature. This feature provides a way to detect and log changes, that is, RSLogix 5000 software and controller mode switch interactions, made to ControlLogix 1756-L6x and 1756-L7x controllers without adding any auditing software.

With controller logging, the controller can perform these tasks:

- Detect changes and create logs entries containing information about the changes.
- Store the log entries to a Compact FLASH (CF) card or Secure Digital (SD) card for later review.
- Provide programmatic access to log entry counters to provide change detection information remotely

Controller Log

A controller log is the record of changes. The log is stored on the controller's NVS memory automatically. You can store the log to a CF card or SD card on an as needed basis or automatically at predefined times. The controller's NVS memory and each external memory card type have a maximum number entries they can store.

Specific events are stored in the controller's log.

For more information on controller logging, see Logix5000 Controllers Information and Status Programming Manual, publication [1756-PM015](#).

Controller Logging in Enhanced Redundancy Systems

Because enhanced redundancy systems operate with partnered controllers, there are considerations you must consider with regard to controller logging:

- The primary and secondary controllers maintain separate logs.
- You do not need to synchronize the logs.
- On the primary controller, controller logging occurs exactly as it does on a controller in a nonredundant system, regardless of whether the system is qualified and synchronized or disqualified.
- A secondary controller logs the removal or insertion of removable storage components, that is, a CF or SD card, in any operating state. Otherwise, the secondary controller only logs events that occur when the controller is in a disqualified state.

Use Programming to Monitor System Status

IMPORTANT

When programming your enhanced redundancy system, program so your redundancy system status is continually monitored and displayed on your HMI device.

If your redundancy system becomes disqualified or a switchover occurs, the change in status is not automatically annunciated. You must program the system to communicate the change in status via your HMI or other status-monitoring device.

For more information and programming techniques, see [Program to Obtain System Status on page 168](#).

Verify Date and Time Settings

After you have completed programming your redundant system and have downloaded your program to the primary controller, check the Redundancy Module Date and Time information and verify it matches the date and time of your system.

TIP Consider checking the Redundancy Module Date and Time as a part of your regular maintenance procedures. Verifying the date and time information on a regular basis keeps the event logs of the redundancy modules accurate.

If the date and time are not correct, the redundant system event logs will not match the date and time information for the rest of the system. Incorrect date and time information complicates troubleshooting if an event or error occurs on your redundant system.

The screenshot displays the 'Redundancy Module Configuration' window. The 'Redundancy Module Options' section includes:

- Auto-Synchronization: Always
- Chassis ID: Chassis B
- Serial Number: Enhanced Redundancy Chassis B
- Name: Enhanced Redundancy Chassis B
- Description: This is the 1756-RM module in chassis B.
- Location: Quadrant 4 - A
- Enable User Program Control

 The 'Redundancy Module Date and Time' section includes:

- Current Date: 9/ 9/2009
- Current Time: 10:11:21 AM
- Date Format: dd/mm/yyyy mm/dd/yyyy
- Apply Workstation Time button

 A callout box labeled 'Verify Date and Time Settings' points to the date and time fields.

IMPORTANT If power to one of the redundancy modules is cycled, the redundancy module will power up with the time set to when the power was lost. If the partner redundancy module has remained active during this time, the time set in that module will be automatically transferred to the powering-up module. If a power failure event happens so that both modules are shut off, reset the time and date in the RMCT.

Setting and verifying the date and time settings after a power loss will help with troubleshooting if an error or event occurs.

Verify System Qualification

After you have completed programming your redundant system and have downloaded your program to the primary controller, check the system status to verify that the system is qualified and synchronized.

TIP The system qualification process can take several minutes. After a qualification command or a switchover, allow time for qualification to complete before taking action based on the qualification status.

Check Qualification Status via Module Status Displays

You can view qualification status by using the status displays and indicators of the secondary redundancy module and the primary and secondary ControlNet and EtherNet/IP communication modules.

Table 35 - Synchronized System

Primary Chassis Display		Secondary Chassis Display	
Redundancy Module	Communication Module	Redundancy Module	Communication Module
PRIM	PwQS	SYNC	QS

Table 36 - Qualifying System

Primary Chassis Display		Secondary Chassis Display	
Redundancy Module	Communication Module	Redundancy Module	Communication Module
PRIM and QFNG	PQgS	QFNG	QgS

Table 37 - System with a Primary and Disqualified Secondary

Primary Chassis Display		Secondary Chassis Display	
Redundancy Module	Communication Module	Redundancy Module	Communication Module
PRIM	PwDS	DISQ	Either: <ul style="list-style-type: none"> • CMPT (modules are compatible) • DSNP (no partner is present)

Example of Qualified and Disqualified Status Indicators

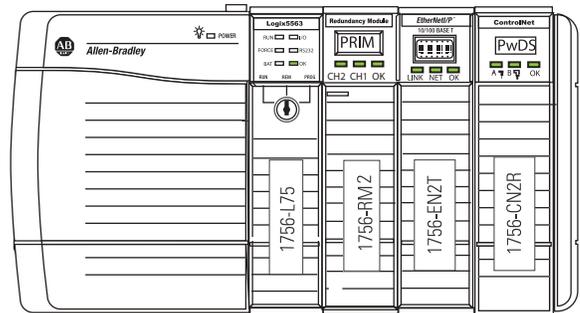
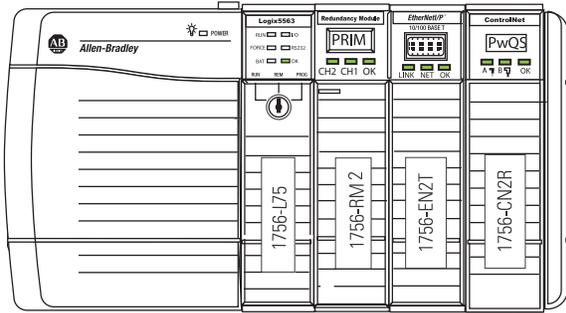
This example shows status display messages and status indicators that may appear differently depending on the qualification status of the redundant chassis. Note that these are only two examples of many possible status display message and indicator combinations for both the qualified and disqualified states.

Qualified Redundant Chassis

Disqualified Redundant Chassis

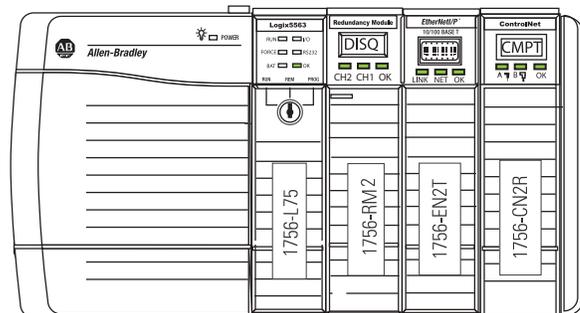
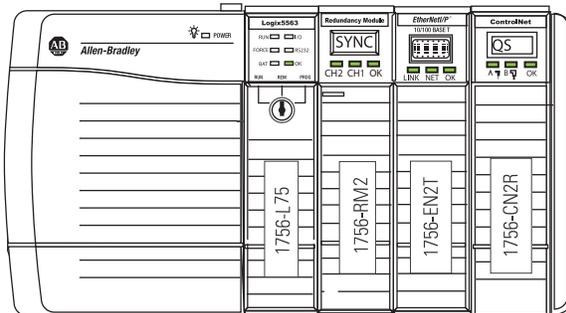
Primary Chassis

Primary Chassis



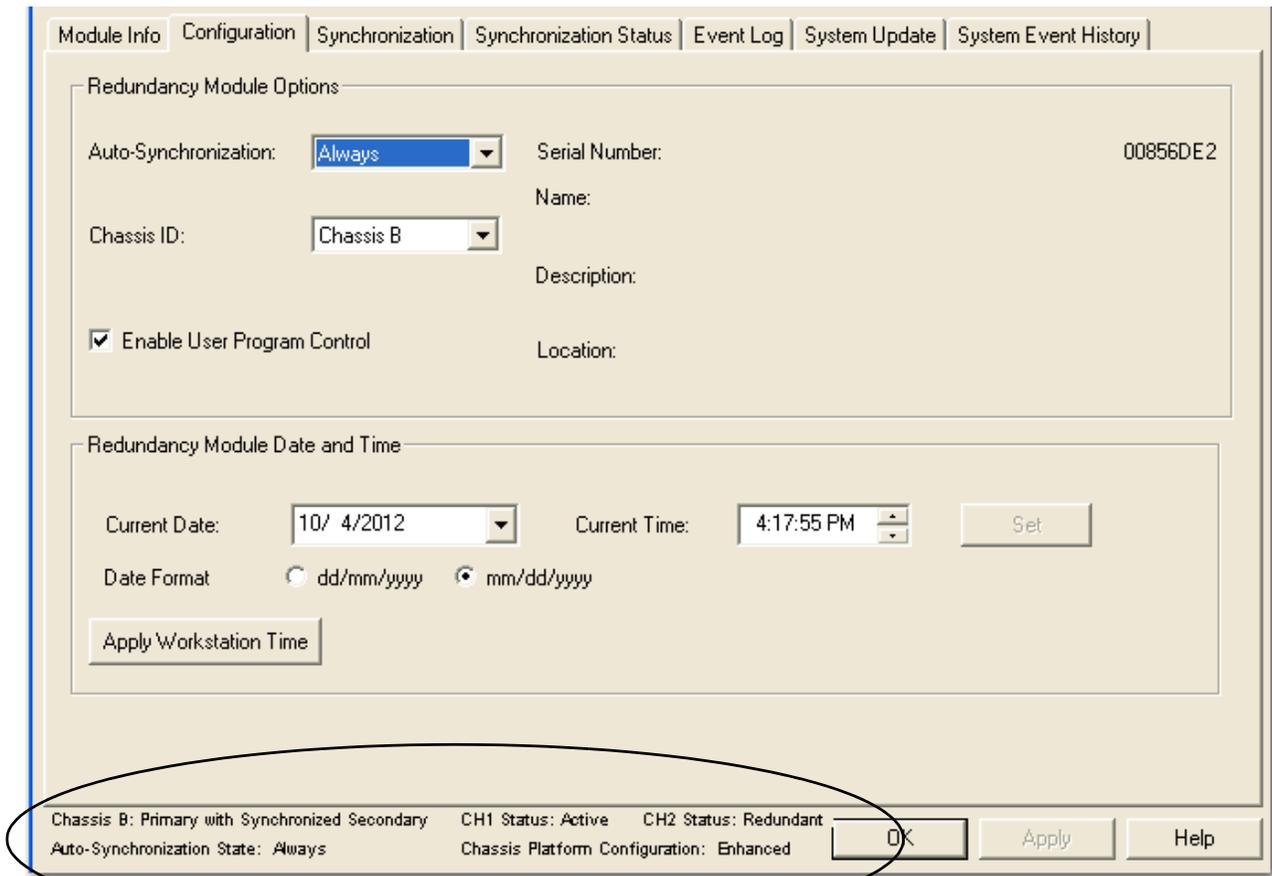
Secondary Chassis

Secondary Chassis



Check Qualification Status via the RMCT

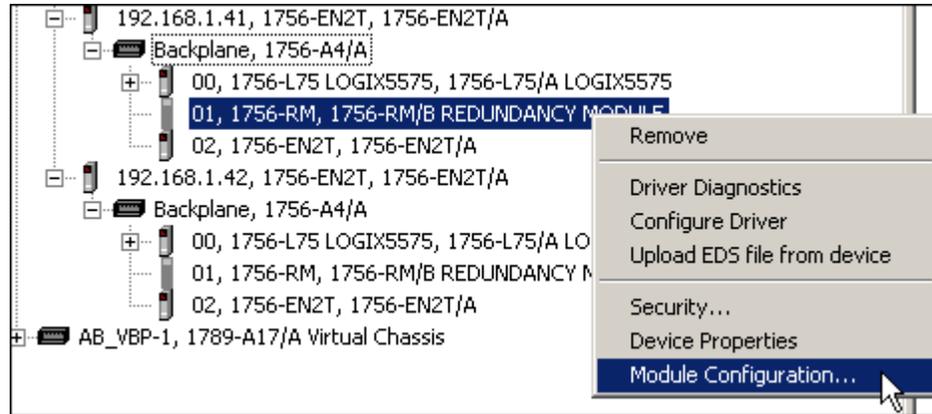
To determine the qualification status of your system by using the RMCT, open the RMCT and view the qualification status in the bottom-left corner of the tool.



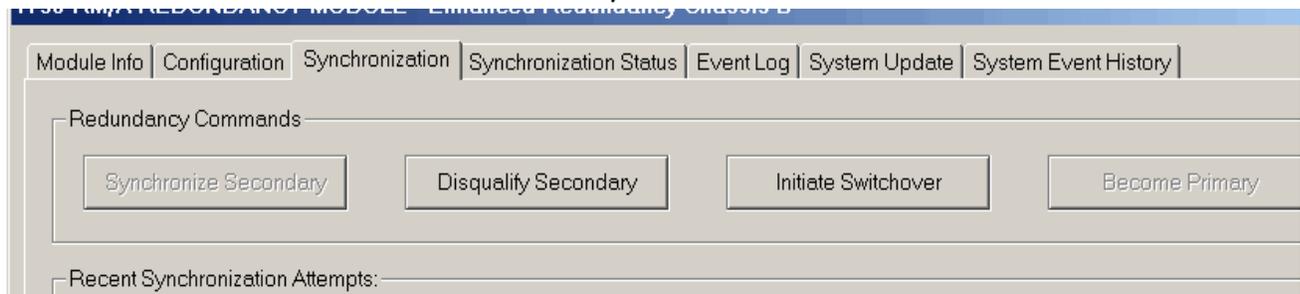
Conduct a Test Switchover

Complete these steps to verify that your redundant system switches over as expected. Your system must be fully-qualified before you begin.

1. In RSLinx Classic software, access the RMCT for the **primary** redundancy module.

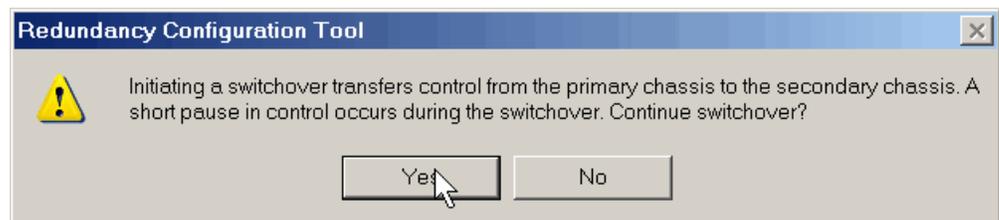


2. Click the Synchronization tab.



3. Click Initiate Switchover.

The Redundancy Configuration Tool dialog box opens.



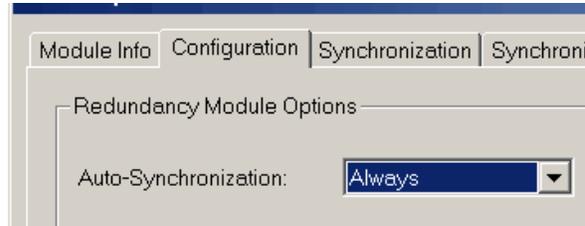
4. Click Yes.

The switchover begins.

5. View your HMI or other status-monitoring device to verify that the switchover was successful.

Synchronization After a Switchover

TIP If your **Auto-Synchronization** parameter is set to **Always**, your system begins synchronizing immediately after the switchover.



To monitor the synchronization of your system after you initiate the test switchover, you can monitor the synchronization process by using these methods:

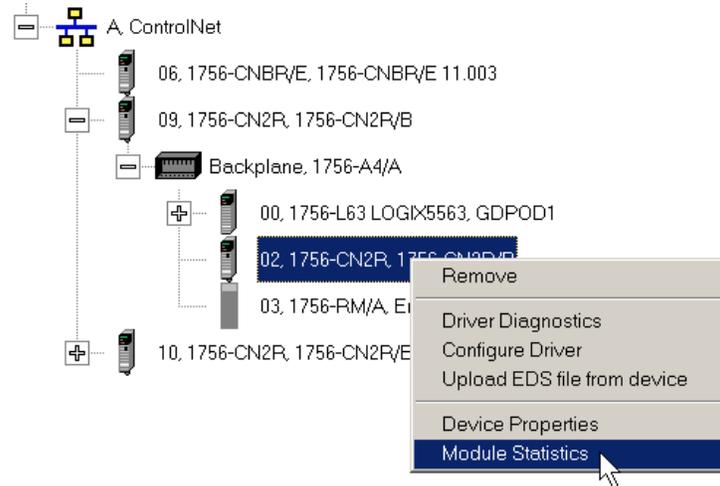
- Click the Synchronization Status tab and monitor the Secondary Readiness column. The states No Partner, Disqualified, Synchronizing, and Synchronized indicate the stages of synchronization.
- View the module status display of a **primary** communication module. The states PwNS, PsDS, PwQg and PwQS indicate the stages of synchronization.
- View the module status display of the **secondary** redundancy module. The states DISQ, QFNG, and SYNC indicate the stages of synchronization.

Check the ControlNet Module Status

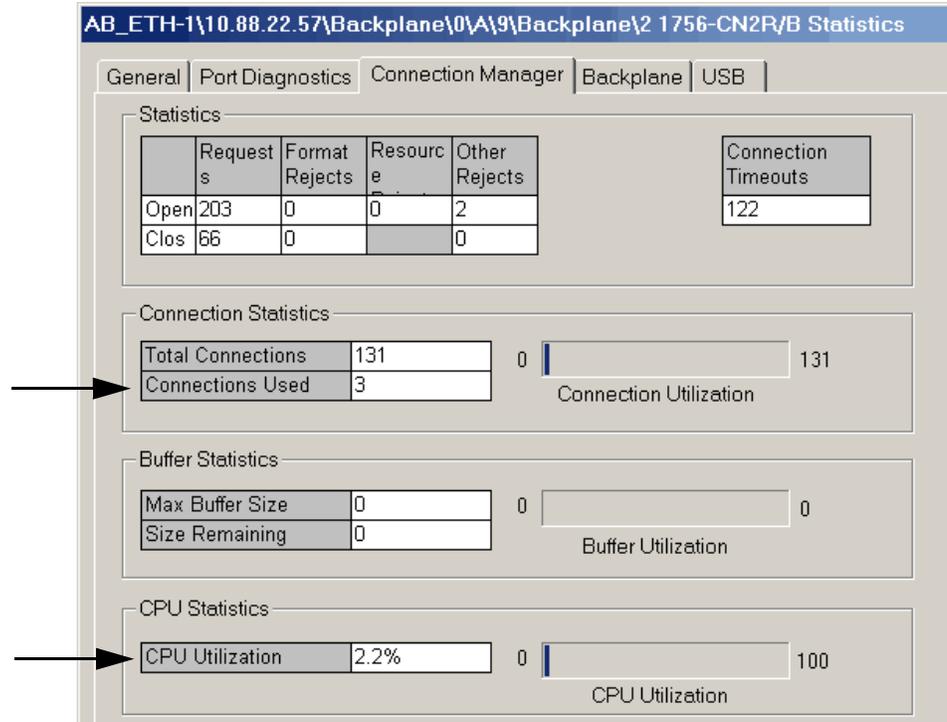
After you have programmed your redundant system and configured your ControlNet network, check two statistics specific to your ControlNet modules. These statistics include the CPU usage and the connections used.

To view the CPU usage and the number of connections used, complete these steps.

1. In RSLinx Classic software, open the Module Statistics for the ControlNet module.



2. Click the Connection Manager tab.



CPU Usage

The CPU usage of the ControlNet modules must be at 80%, or less. Keeping the CPU usage below 80% reserves enough CPU functionality for the ControlNet module to properly facilitate a switchover.

If the CPU usage is above 80%, the secondary chassis may not be able to synchronize with the primary chassis after a switchover occurs. In addition, unscheduled communication may be slowed.

If you need to reduce the CPU usage of your ControlNet modules, consider making the changes described in this list:

- Increase the Network Update Time (NUT) of the ControlNet network.
- Increase the Requested Packet Interval (RPI) of your connections.
- Reduce the amount of connections through the ControlNet modules.
- Reduce the number of messages used in the program.

Connections Used

If your ControlNet modules' connections used are near the limits of the module, you may experience difficulty when attempting to go online with the system or when attempting to add modules to the system.

For information about connections available with ControlNet modules, see [ControlNet Network Requirements on page 38](#).

Monitor the ControlNet Network

For most redundant applications, monitoring the status of the ControlNet network is important for maintenance and troubleshooting purposes.

For programming samples to monitor the ControlNet network, visit the Rockwell Automation Sample Code Library at <http://samplecode.rockwellautomation.com>. Applicable sample programs include the following:

- ME Faceplates for ControlNet Diagnostics
- ControlNet Connection and Media Status

Troubleshoot a Redundant System

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General Troubleshooting Tasks

When an error or other event occurs on the enhanced redundancy system, several tasks can be executed to determine the cause. After an error or event, you can perform these tasks:

- Check the module status indicators.
- View diagnostic information in RSLogix 5000 software.
- Access status and event information in the RMCT.
- Use RSLinx Classic software to view network status.
- Use RSNetWorx for ControlNet software to view ControlNet network status.

Check the Module Status Indicators

If an error or event occurs in the enhanced redundancy system, check the module status indicators to determine which module is causing the error or event.

If any of the modules have status indicators that are steady or blinking red, then examine that module status display and the RMCT or other software to determine the cause.

Figure 58 - Steady or Flashing Red Indicators that Indicate Errors on 1756-RM2/A or 1756-RM2XT Modules

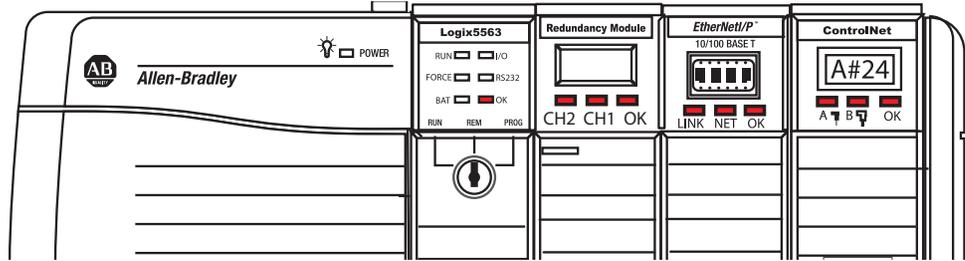
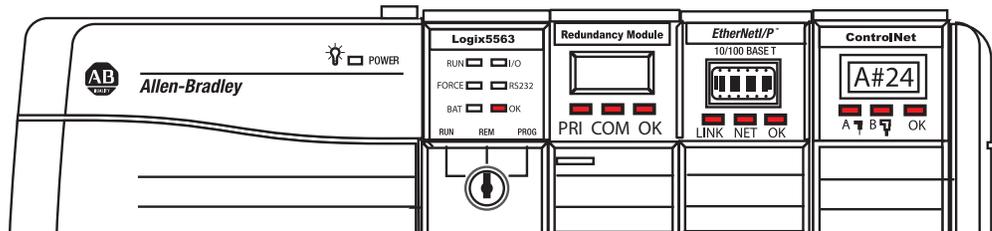


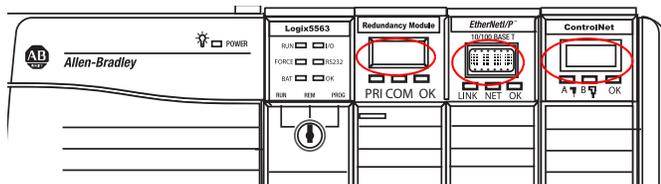
Figure 59 - Steady or Flashing Red Indicators that Indicate Errors on 1756-RM/1756-RMXT Modules



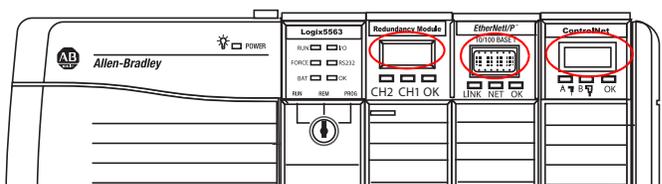
For more information about module status indicators, see [Appendix A, Status Indicators on page 227](#).

Figure 60 - Module Status Displays For Chassis with 1756-L6x and 1756-L7x Controllers

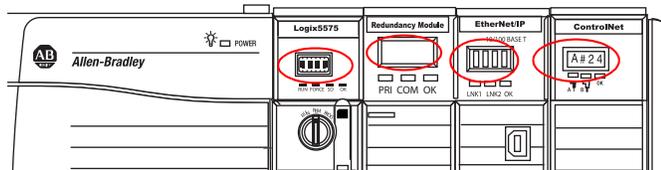
1756-L6x Controller and 1756-RM Module



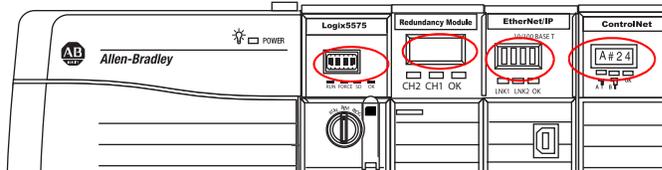
1756-L6x Controller and 1756-RM2/A Module



1756-L7x Controller and 1756-RM Module



1756-L7x Controller and 1756-RM2/A Module



Use RSLogix 5000 Software to View Errors

To view redundancy status by using RSLogix 5000 software, complete these steps.

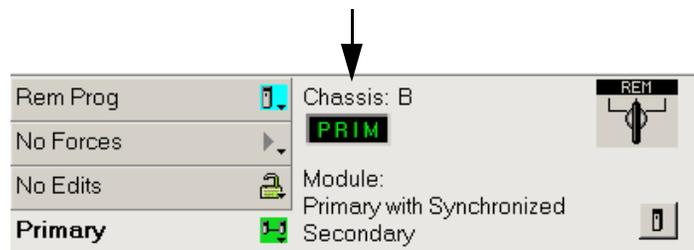
1. Go online with the redundant controller.



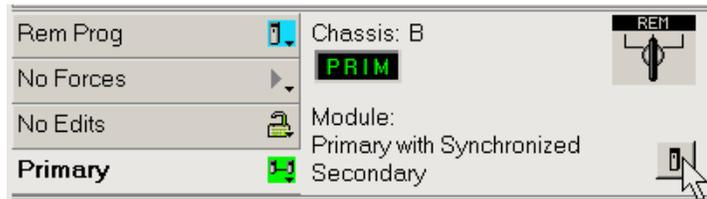
2. Either click Primary or Secondary, depending on the controller you are online with.



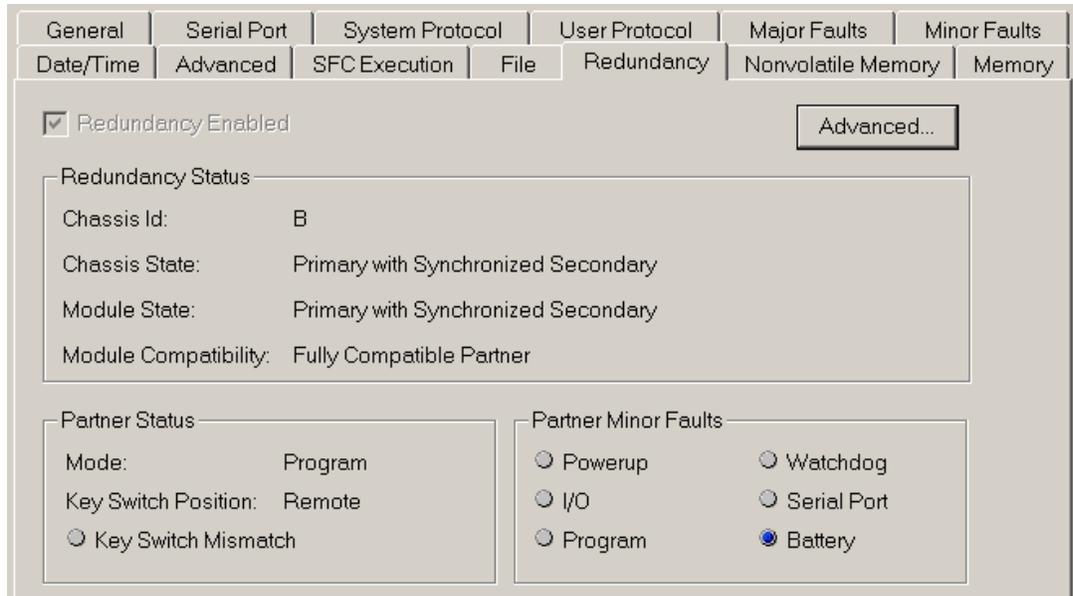
The redundant controller ID and status are displayed.



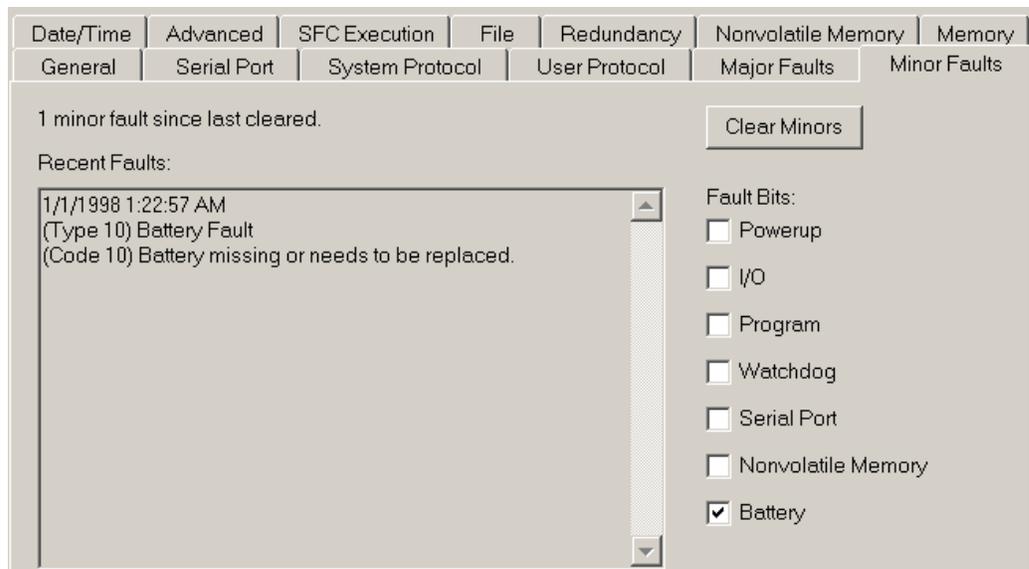
3. If further information is required, click Controller Properties.



4. Click the Redundancy tab.



5. If controller fault details are needed, click the Major Faults and Minor Faults tabs to view fault types and codes.



6. If necessary, reference these resources:

- [Redundant Controller Major Fault Codes](#)
- Logix5000 Controllers Major and Minor Faults programming manual, publication [1756-PM014](#) (describes all major and minor fault codes)

Redundant Controller Major Fault Codes

The fault codes listed and described in this table are specific to redundant controllers. For information about all controller major and minor fault codes, see the Logix5000 Controllers Major and Minor Faults Programming Manual, publication [1756-PM014](#).

Table 38 - Redundant Controller Major Fault Codes

Type	Code	Cause	Recovery Method
12	32	A disqualified secondary controller has had power cycled and no partner chassis or controller was found upon powerup.	<p>Verify that these conditions exist:</p> <ul style="list-style-type: none"> • A partner chassis is connected. • Power is applied to both redundant chassis. • Partnered controllers have the same: <ul style="list-style-type: none"> – Catalog number – Slot number – Firmware revision
12	33	An unpartnered controller has been identified in in the new primary chassis after a switchover.	<p>Use either of these methods:</p> <ul style="list-style-type: none"> • Remove the unpartnered controller and troubleshoot the cause of the switchover. • Add a partner controller to the secondary chassis, troubleshoot the cause of the switchover, and synchronize the system.
12	34	Prior to switchover, a mode switch mismatch was present. The old primary controller was in Program mode and its secondary partner's mode switch was in the Run position. Instead of the switchover transitioning the new primary controller to go to Run mode, the new primary controller transitions to a faulted state after the switchover.	<p>Use either of these methods:</p> <ul style="list-style-type: none"> • Change the mode switches from Run mode to Program mode and back to Run mode twice to clear the fault. <p>Make sure that the mode switch positions for both controllers in a partnered set match.</p> <ul style="list-style-type: none"> • Use RSLogix 5000 to go online with the controllers. Then, clear the faults and change the mode switch positions for both the controllers in the partnered set to Run.

Use the RMCT for Synchronization Attempts and Status

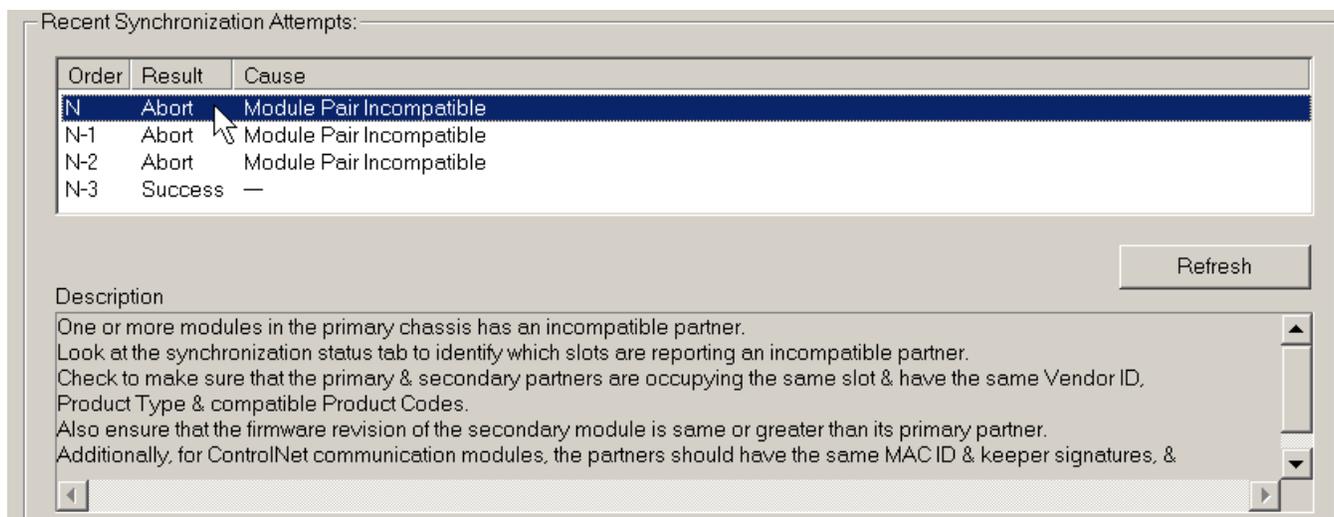
When troubleshooting your redundant system for anomalies with qualification and synchronization, check the Synchronization and Synchronization Status tabs of the RMCT.

Recent Synchronization Attempts

The Synchronization tab provides a log of the last four synchronization attempts. If a synchronization command was unsuccessful, the Recent Synchronization Attempts log indicates a cause.

For more information about resolving the synchronization conflict, click the attempt and view the Description in the lower box.

Figure 61 - Example of an Unsuccessful Synchronization Attempt



For more information about interpreting the Recent Synchronization attempts log, see [Recent Synchronization Attempts Log on page 118](#).

Module-level Synchronization Status

The Synchronization Status tab provides a module-level view of redundant chassis and can be used to identify what module pair may be causing a synchronization failure.

Depending on the type of synchronization failure, you may need to open the Synchronization Status tabs for the primary and secondary redundancy modules.

- If there is a difference between major revisions of the controllers/modules, the Compatibility column shows **Undefined**, as shown in this graphic.

Primary Chassis

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	0	1756-L73/A LOGIX5573	20.54	No Partner	Primary	Undefined
1	---	<empty>	---	---	---	---
2	0	1756-EN2T/A	5.8	No Partner	Primary	Undefined
3	0	1756-RM2 REDUNDANCY...	20.4	No Partner	Primary	Incompatible

Secondary Chassis

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	0	1756-L73/A LOGIX5573	19.53	No Partner	Secondary	Undefined
1	---	<empty>	---	---	---	---
2	0	1756-EN2T/A	5.8	No Partner	Secondary	Undefined
3	0	1756-RM2 REDUNDANCY...	20.4	Disqualified	Secondary	Full

- If there is a difference between minor revisions of the controllers, the Compatibility column shows **Incompatible**, as shown below.

Primary Chassis

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	0	1756-L73/A LOGIX5573	20.54	No Partner	Secondary	Incompatibility
1	---	<empty>	---	---	---	---
2	0	1756-EN2T/A	5.8	No Partner	Secondary	Undefined
3	0	1756-RM2 REDUNDANCY...	20.4	Disqualified	Secondary	Full

Secondary Chassis

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	0	1756-L73/A LOGIX5573	20.53	No Partner	Primary	Incompatibility
1	---	<empty>	---	---	---	---
2	0	1756-EN2T/A	5.8	No Partner	Primary	Undefined
3	0	1756-RM2 REDUNDANCY...	20.4	No Partner	Primary	Incompatible

Use the RMCT Event Log

When troubleshooting your redundant system, access the Event Log to determine the cause of an event, error, switchover, or major fault.

Interpret Event Log Information

Use this procedure to view and interpret Event Log information.

1. Open the RMCT and click the Event Log tab.

The screenshot illustrates the process of accessing the Event Log in the RMCT software. It shows a tree view of the system components, including Primary and Secondary Chassis, Backplane, and various modules. A context menu is open over a module, with 'Module Configuration...' selected. An arrow points down to the 'Event Log' tab in the software interface.

The 'Event Log' tab is active, showing controls for 'Auto-Update' (ON) and 'Partner Log' (OPEN). Below are two tables of event logs for Chassis A and Chassis B.

Chassis A						
Event	Log Time	S...	Module ...	Description	Classificati...	
324223	9/10/2009 16:33:45:1...	3	1756-RM 2	(11) Autoqual. Option Set to 'Cond...	Configurati...	
324222	9/10/2009 16:33:28:4...	3	1756-RM 2	(1A) Chassis Redundancy State c...	State Cha...	
324221	9/10/2009 16:33:28:4...	2	1756-CN...	(21) Equally Able To Control	State Cha...	
324220	9/10/2009 16:33:28:4...	2	1756-CN...	(14) Enter Qualification Phase 4	Qualification	
324219	9/10/2009 16:33:28:4...	3	1756-RM 2	(2E) Qualification Complete	Qualification	
324218	9/10/2009 16:33:28:4...	2	1756-CN...	(13) Enter Qualification Phase 3	Qualification	
324217	9/10/2009 16:33:27:4...	2	1756-CN...	(12) Enter Qualification Phase 2	Qualification	

Chassis B						
Event	Log Time	S...	Module ...	Description	Classificati...	
166498	9/10/2009 16:33:45:1...	3	1756-RM 2	(11) Autoqual. Option Set to 'Cond...	Configurati...	
166497	9/10/2009 16:33:28:4...	3	1756-RM 2	(1E) Chassis Redundancy State c...	State Cha...	
166496	9/10/2009 16:33:28:4...	2	1756-CN...	(31) Transition To Qualified Seco...	State Cha...	
166495	9/10/2009 16:33:26:8...	2	1756-CN...	(30) Transition To Qualifying Sec...	State Cha...	
166494	9/10/2009 11:54:01:4...	3	1756-RM 2	(91) Response to Open Bridge C...	Starts/Stops	

2. If an event occurred, open the Event Log for both chassis (A and B).
3. Locate the Event line that shows the qualification code, start date and time of the event, in the A chassis event log.

This is the last time the redundancy module was working properly.

Please note, multiple codes could be displayed if multiple errors occurred. Additionally, if a secondary redundancy module is not present, then a code may not be seen at all. See [Possible Qualification Status Indicators on page 211](#).

4. Then, locate the matching time entry in the B chassis event log. This will display the disqualification code on the Event line.

Chassis A

PwQS and start date and start time in Chassis A. This is the last time the redundancy module was working properly.

Event	Log Time	Slot	Module Na...	Description	Classific
10375	3/24/2012 08:53:44:735	0	1756-L73	(36) Partner Connection Closed	State C
10374	3/24/2012 08:53:44:735	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
10373	3/24/2012 08:53:44:734	0	1756-L73	(36) Partner Connection Closed	State C
10372	3/24/2012 08:53:44:731	1	1756-RM 2	(19) Chassis Redundancy State changed to PwDS	State C
10371	3/24/2012 08:53:44:729	2	1756-EN2T	(1) Network Transition to Not Attached	Synchr
10370	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
10369	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
10368	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
10367	3/24/2012 08:53:44:714	1	1756-RM2	(BD) SYS_FAIL_L Active in Partner RM	Failure
10366	3/24/2012 08:53:44:714	2	1756-EN2T	(F) Partner Connection Closed	State C
10365	3/24/2012 08:44:48:952	1	1756-RM 2	(1A) Chassis Redundancy State changed to PwQS	State C
10364	3/24/2012 08:44:48:831	2	1756-EN2T	(14) Enter Qualification Phase 4	Qualific
10363	3/24/2012 08:44:48:816	1	1756-RM2	(2E) Qualification Complete	Qualific
10362	3/24/2012 08:44:48:814	2	1756-EN2T	(13) Enter Qualification Phase 3	Qualific

Chassis B

QSWP and start date and start time in Chassis B. This is the last time the redundancy module was working properly, and by time, must match up with Chassis A.

Event	Log Time	Slot	Module Na...	Description	Classific
9945	3/24/2012 08:53:44:795	1	1756-RM2	(C2) Bridge Connection Deleted	Starts/5
9944	3/24/2012 08:53:44:775	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9943	3/24/2012 08:53:44:755	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9942	3/24/2012 08:53:44:735	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9941	3/24/2012 08:53:44:731	1	1756-RM 2	(1D) Chassis Redundancy State changed to DSwp	State CI
9940	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9939	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9938	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/5
9937	3/24/2012 08:53:44:715	2	1756-EN2T	(F) Partner Connection Closed	Synchr
9936	3/24/2012 08:53:44:714	1	1756-RM2	(45) SYS_FAIL_L Active	Failure
9935	3/24/2012 08:53:44:713	2	1756-EN2T	(1) Network Transition to Not Attached	Synchr
9934	3/24/2012 08:44:48:952	1	1756-RM2	(1E) Chassis Redundancy State changed to QSWP	State CI
9933	3/24/2012 08:44:48:815	2	1756-EN2T	(31) Transition To Qualified Secondary	State CI
9932	3/24/2012 08:44:47:222	2	1756-EN2T	(30) Transition To Qualified Secondary	State CI

- Work back in time (up the lines of preceding events), to locate the point that a switchover or disqualifying event occurred.

This is the end date and time of the event, and will be indicated on the Event line in the A chassis event log, with a disqualification code that the secondary has been disqualified, and a corresponding disqualification code in the B chassis event log. Again, note that if no secondary is present, you may not see any secondary disqualification codes in the event log at all. See [Possible Qualification Status Indicators on page 211](#).

Chassis A
 PwDS and end date and end time in Chassis A. This is the time the redundancy module experienced a disqualifying event or switchover.

Event	Log Time	Slot	Module Na...	Description	Classific
10375	3/24/2012 08:53:44:735	0	1756-L73	(36) Partner Connection Closed	State C
10374	3/24/2012 08:53:44:735	1	1756-RM2	(C2) Bridge Connection Deleted	Starts/E
10373	3/24/2012 08:53:44:734	0	1756-L73	(36) Partner Connection Closed	State C
10372	3/24/2012 08:53:44:731	1	1756-RM 2	[19] Chassis Redundancy State changed to PwDS	State C
10371	3/24/2012 08:53:44:729	2	1756-EN2T	(1) Network Transition to Not Attached	Synchr
10370	3/24/2012 08:53:44:716	1	1756-RM2	(C2) Bridge Connection Deleted	Starts/E
10369	3/24/2012 08:53:44:716	1	1756-RM2	(C2) Bridge Connection Deleted	Starts/E
10368	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
10367	3/24/2012 08:53:44:714	1	1756-RM 2	(BD) SYS_FAIL_L Active in Partner RM	Failure
10366	3/24/2012 08:53:44:714	2	1756-EN2T	(F) Partner Connection Closed	State C
10365	3/24/2012 08:44:48:952	1	1756-RM2	(1A) Chassis Redundancy State changed to PwQS	State C
10364	3/24/2012 08:44:48:831	2	1756-EN2T	(14) Enter Qualification Phase 4	Qualific
10363	3/24/2012 08:44:48:816	1	1756-RM 2	(2E) Qualification Complete	Qualific
10362	3/24/2012 08:44:48:814	2	1756-EN2T	(13) Enter Qualification Phase 3	Qualific

Preceding events that may indicate the cause of the switchover.

Chassis B
 DSwp and matching end date and end time in Chassis B. This is the time the redundancy module experienced a disqualifying event or switchover.

Event	Log Time	Slot	Module Na...	Description	Classific
9945	3/24/2012 08:53:44:795	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9944	3/24/2012 08:53:44:775	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9943	3/24/2012 08:53:44:755	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9942	3/24/2012 08:53:44:735	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9941	3/24/2012 08:53:44:731	1	1756-RM 2	[1D] Chassis Redundancy State changed to DSwp	State C
9940	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9939	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9938	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/E
9937	3/24/2012 08:53:44:715	2	1756-EN2T	(F) Partner Connection Closed	Synchr
9936	3/24/2012 08:53:44:714	1	1756-RM2	(45) SYS_FAIL_L Active	Failure
9935	3/24/2012 08:53:44:713	2	1756-EN2T	(1) Network Transition to Not Attached	Synchr
9934	3/24/2012 08:44:48:952	1	1756-RM 2	(1E) Chassis Redundancy State changed to QSwP	State C
9933	3/24/2012 08:44:48:815	2	1756-EN2T	(31) Transition To Qualified Secondary	State C
9932	3/24/2012 08:44:47:722	2	1756-EN2T	(30) Transition To Qualifying Secondary	State C

- Examine the range of time in between the start of the event and the end of the event to find the error that caused the disqualification.

IMPORTANT Be aware that this range of time can be very large depending on how much time has passed since the last disqualifying event.

Event	Log Time	Slot	Module Na...	Description	Classific
9945	3/24/2012 08:53:44:795	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9944	3/24/2012 08:53:44:775	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9943	3/24/2012 08:53:44:755	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9942	3/24/2012 08:53:44:735	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9941	3/24/2012 08:53:44:731	1	1756-RM 2	(1D) Chassis Redundancy State changed to DSwP	State CI
9940	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9939	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9938	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9937	3/24/2012 08:53:44:715	2	1756-EN2T	(F) Partner Connection Closed	Syncnrc
9936	3/24/2012 08:53:44:714	1	1756-RM 2	(45) SYS_FAIL_L Active	Failure
9935	3/24/2012 08:53:44:713	2	1756-EN2T	(1) Network Transition to Not Attached	Syncnrc
9934	3/24/2012 08:44:48:952	1	1756-RM 2	(1E) Chassis Redundancy State changed to QSwP	State CI
9933	3/24/2012 08:44:48:815	2	1756-EN2T	(31) Transition To Qualified Secondary	State CI
9932	3/24/2012 08:44:47:222	2	1756-EN2T	(30) Transition To Qualified Secondary	State CI

Event	Log Time	Slot	Module Na...	Description	Classific
9945	3/24/2012 08:53:44:795	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9944	3/24/2012 08:53:44:775	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9943	3/24/2012 08:53:44:755	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9942	3/24/2012 08:53:44:735	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9941	3/24/2012 08:53:44:731	1	1756-RM 2	(1D) Chassis Redundancy State changed to DSwP	State CI
9940	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9939	3/24/2012 08:53:44:716	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9938	3/24/2012 08:53:44:715	1	1756-RM 2	(C2) Bridge Connection Deleted	Starts/S
9937	3/24/2012 08:53:44:715	2	1756-EN2T	(F) Partner Connection Closed	Syncnrc
9936	3/24/2012 08:53:44:714	1	1756-RM 2	(45) SYS_FAIL_L Active	Failure
9935	3/24/2012 08:53:44:713	2	1756-EN2T	(1) Network Transition to Not Attached	Syncnrc
9934	3/24/2012 08:44:48:952	1	1756-RM 2	(1E) Chassis Redundancy State changed to QSwP	State CI
9933	3/24/2012 08:44:48:815	2	1756-EN2T	(31) Transition To Qualified Secondary	State CI
9932	3/24/2012 08:44:47:222	2	1756-EN2T	(30) Transition To Qualified Secondary	State CI

TIP You can also use the Log Time column to identify a significant event. Scan within a time range that corresponds to the time an event was reported or annunciated.

In addition, you can also attempt to identify events by finding differences between times logged. Such gaps in time often identify events that require troubleshooting. When troubleshooting by identifying gaps in the time entries, remember that gaps in months, days, or minutes may indicate a significant change to the system.

Not all events logged are indicative of an anomaly that needs to be corrected. For example, events classified as Minor Faults do not warrant corrective behavior unless they occur just before a switchover, major fault, or state change **and** can be identified as contributing to successive events.

- After you have located an event entry related to the anomaly you are troubleshooting, double-click the event to view Extended Event Information.

Event	Log Time	S...	Module ...	Description	Classification
166563	9/14/2009 15:26:53:7...	3	1756-RM 2	(7) Firmware error	Minor Fault
166562	9/14/2009 15:26:53:7...	3	1756-RM 2	(C) Port2 Communication error	Minor Fault
166561	9/14/2009 15:26:53:7...	3	1756-RM 2	(18) Chassis Redundancy State c...	State Changes
166560	9/14/2009 15:26:53:7...	3	1756-RM 2	(31) Switchover Complete	Switchover
166559	9/14/2009 15:26:53:7...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
166558	9/14/2009 15:26:53:7...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
166557	9/14/2009 15:26:53:7...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops

↓ Double-click to view more information.

Extended Information Definition - Chassis B

Event Information

Event Number: 166561 Log Time: 9/14/2009 15:26:53:707

Event Class: State Changes

Submitter Information

Module Type: 1756-RM 2 Slot No: 3

Serial (in Hex): 44AA7A

Event Details

Description: (18) Chassis Redundancy State changed to PwNS

Extended Data Definition

Extended Information Unavailable

The Description provides more information about the state change that occurred.

No recovery method is described. This indicates that action is not required in response to this event.

- View the Description and Extended Data Definitions.

The Description and Extended Data Definitions can be used to obtain further event information and may indicate a recovery method.

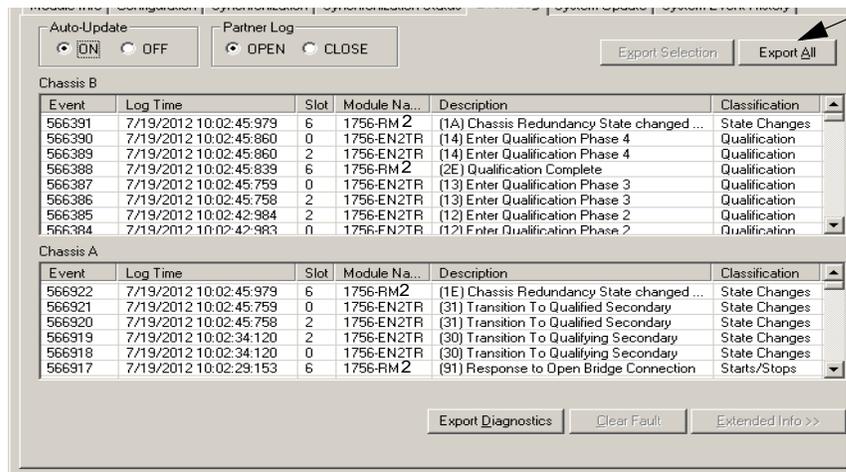
Table 39 - Possible Qualification Status Indicators

Status Code	Description
PwQS	Primary with qualified (synchronized) secondary partner
QSwP	Qualified (synchronized) secondary with primary partner
DSwP	Disqualified secondary with primary partner
DSwNP	Disqualified secondary with no partner
PwDS	Primary with disqualified secondary partner
PwNS	Primary with no secondary partner

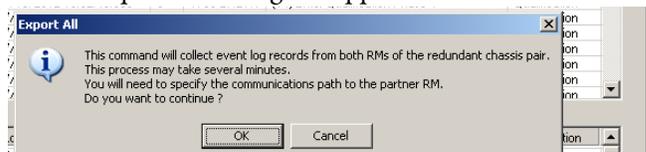
Export All Event Logs

To export event logs with the RMCT version 8.01.05, follow these steps.

1. Open the RMCT on the 1756-RM module in the primary chassis and click the Event Log tab.
2. Click Export All.

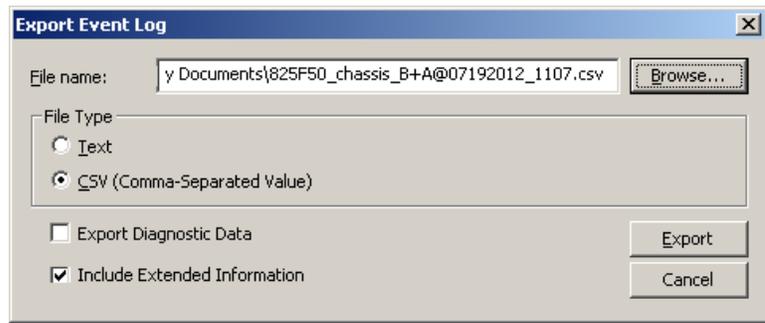


The Export All dialog box appears.



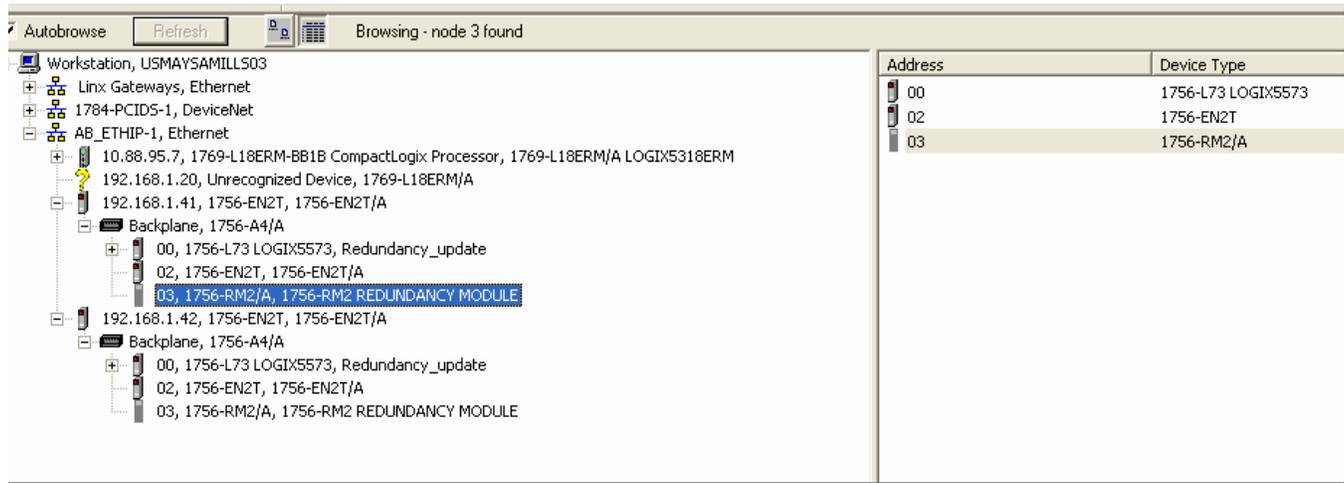
3. Click OK.

The Export Event Log configuration screen appears.



4. To change the file name or save location to something other than the default, select the Browse button.
5. Click Export.
6. Select the 1756-RM in the secondary chassis.

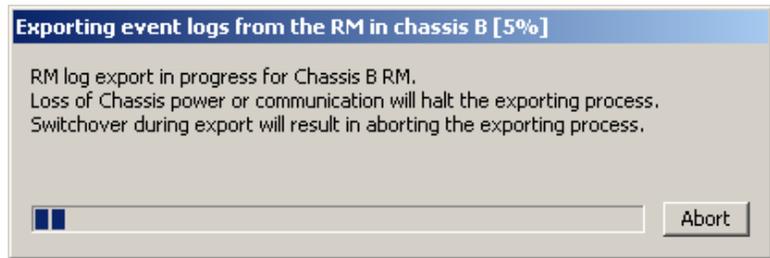
In the following example, chassis A is the secondary chassis.



The primary chassis exports first.

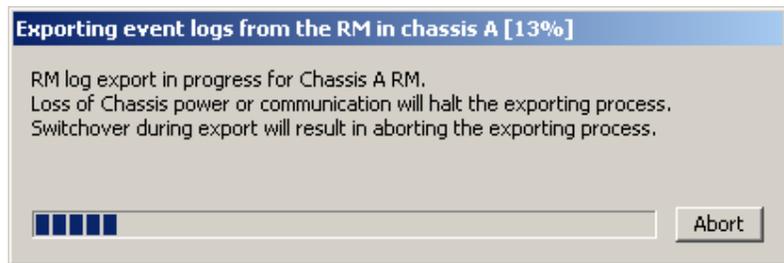
The status displays during export.

In the following example, chassis B is the primary chassis.



The secondary chassis then exports.

In the following example, chassis A is the secondary chassis.



A confirmation dialog box displays when the export completes.



7. Click OK.

Export Diagnostics

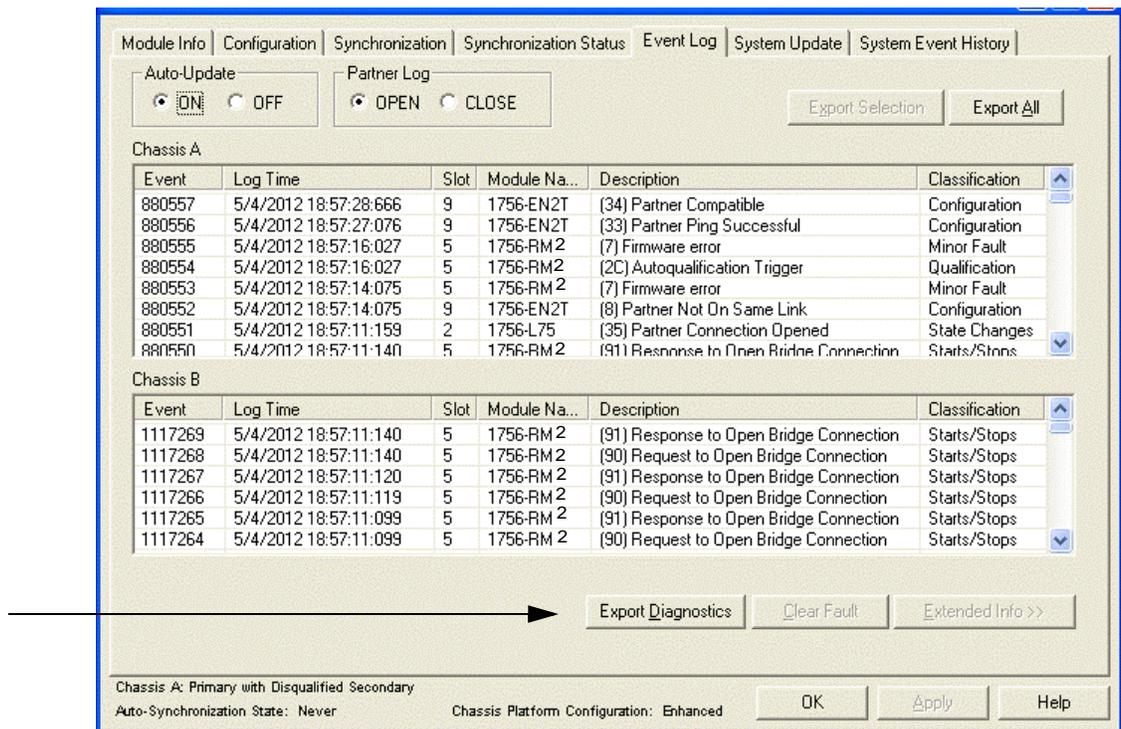
IMPORTANT Only Export Diagnostics when requested to do so by Rockwell Automation Technical Support.

You can also click Export Diagnostics in the event of a module fault in the 1756 redundancy module. Click Export Diagnostics to collect and save diagnostic data from the redundancy module and its partner, if an unrecoverable firmware fault occurs. A nonrecoverable fault is indicated by a red 'OK' light on the front of the redundancy module, and a fault message scrolling across the marquee display. When you click Export Diagnostics, information is recorded that can be used by Rockwell Automation engineering to determine the cause of the fault.

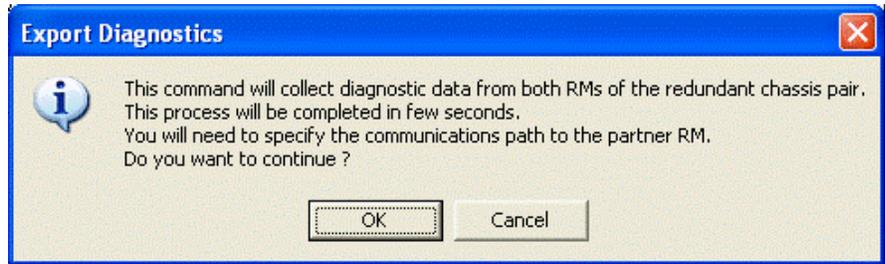
Because diagnostic information for the redundancy module and its redundancy partner are recorded, a communication path to the partner RM is also part of the process of obtaining the diagnostics.

Follow these steps.

1. Click Clear Fault if it is enabled, as it may first be necessary to clear any faults before using Export Diagnostics.
2. Click Export Diagnostics.

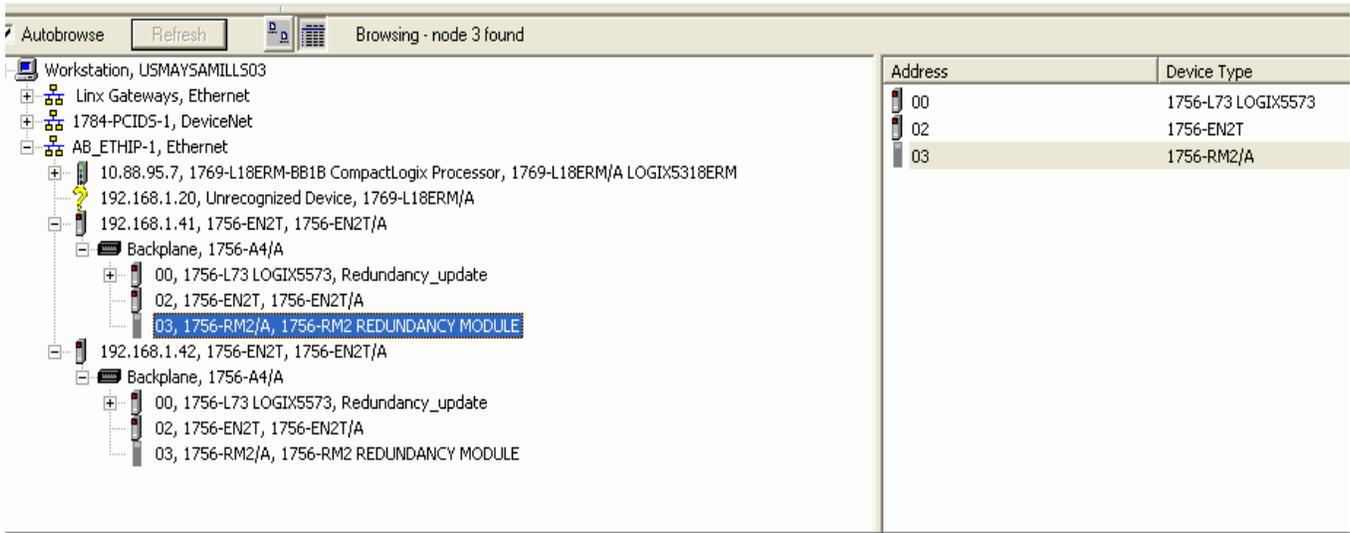


The Export Diagnostics dialog box appears, asking you to continue specifying a communication path.



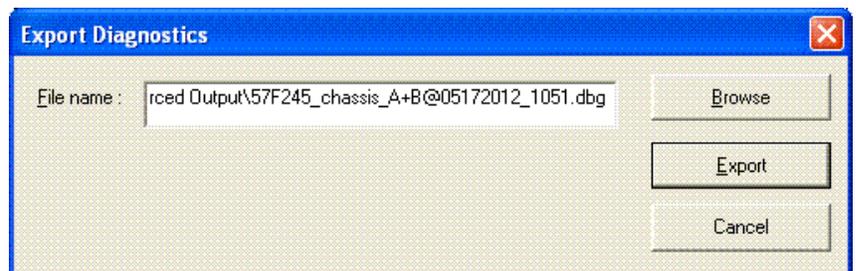
3. Click OK to specify the communication path via RSWho software.

The RSWho window appears.



4. Select the communication path to the partner or secondary module and click OK.

The Export Diagnostics dialog box will appear and prompt you to specify a location to save the export file.



5. Name and save the export file.
6. Click Export.

It may take several minutes to export all of the data.

The Export Diagnostic Complete dialog box appears once the export has completed.



7. Click OK.

Forward this diagnostics file to Rockwell Automation Technical Support only if requested to do so.

Contact Rockwell Automation Technical Support

If you tried to use the event logs to troubleshoot your redundant system and are unsuccessful, prepare to contact Rockwell Automation's Technical Support by exporting the event logs of **both** the primary and secondary redundancy modules. The technical support representative who assists you will use those files to help determine the cause of a switchover or other anomaly.

For more information about exporting the event logs, see [Export Event Log Data on page 124](#).

Keeper Status Causing Synchronize Failure

To determine if a keeper status anomaly is causing a synchronization failure, you can view the module status display of the ControlNet modules, or you can check the keeper status by using RSNetWorx for ControlNet software.

TIP

To avoid anomalies with the Keeper Status, always reset the ControlNet module configuration of a module being used as a replacement **before** inserting and connecting the module in a ControlNet network.

For more information about resetting the ControlNet module configuration, see [Automatic Keeper Crossloads on page 102](#).

Check the Module Status Display

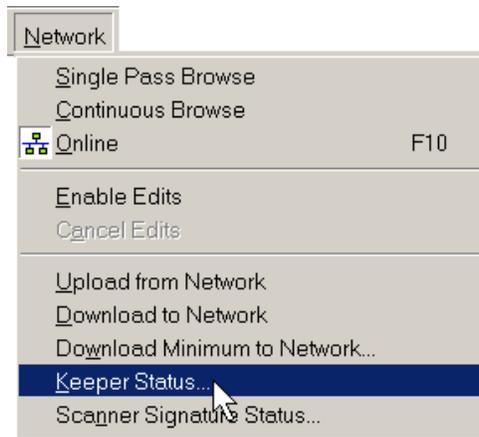
If the module status display of the ControlNet modules in the redundant chassis indicate these errors, you need to take corrective action:

- Keeper: Unconfigured
- Keeper: Unconfigured (data format changed)
- Keeper: Unconfigured (slot changed)
- Keeper: Unconfigured (net address changed)
- Keeper: Signature Mismatch
- Keeper: None Valid on Network

Check Keeper Status in RSNetWorx for ControlNet Software

To check the status of keepers on the ControlNet network, open RSNetWorx for ControlNet access the Keeper Status from the Network menu.

Figure 62 - Network Keeper Status



Valid Keepers and Signatures

This example shows a Keeper Status dialog box where the ControlNet network that is comprised of valid keepers and signatures.

Valid Keeper Status and Signatures

The screenshot shows a dialog box titled "Keeper Status" with a help icon and a close button. Below the title bar is a text area explaining that keeper signatures are used for network synchronization and that the dialog provides insights into mismatch messages. Below the text is a table with the following data:

Keeper Capable Node	Active Keeper	Valid Keeper	Keeper Signature
Offline File	N/A	N/A	0x4a8a4ced
01	YES	YES	0x4a8a4ced
06	NO	YES	0x4a8a4ced
07	NO	YES	0x4a8a4ced
09	NO	YES	0x4a8a4ced
10	NO	YES	0x4a8a4ced

Unconfigured Keeper

The example below shows the Keeper Status dialog box where a module has an unconfigured status. Besides the status shown, the module status display indicates Keeper: Unconfigured (node address changed).

This error results when the module's node address has been changed. After changing the node address, the module was used as a replacement and inserted into the redundant chassis.

Figure 63 - Keeper Status - Unconfigured

The screenshot shows the same "Keeper Status" dialog box as above, but with the row for module 10 highlighted with a red circle. The status for module 10 is "Unconfigured" instead of a signature.

Keeper Capable Node	Active Keeper	Valid Keeper	Keeper Signature
Offline File	N/A	N/A	0x4a8a4ced
01	YES	YES	0x4a8a4ced
06	NO	YES	0x4a8a4ced
07	NO	YES	0x4a8a4ced
09	NO	YES	0x4a8a4ced
10	NO	NO	Unconfigured

To correct this anomaly, do one of the following:

- Select the unconfigured module and click Update Keeper.
- Reschedule the ControlNet network.

Keeper Signature Mismatch

This example shows ControlNet modules in the redundant chassis that do not have the same keeper signatures. With this anomaly, the ControlNet module display indicates Keeper: Signature Mismatch.

This anomaly may result if a ControlNet module configured for the same node of another network is used to replace a ControlNet module with the same node address in the redundant chassis.

Figure 64 - Keeper Status - Signature Mismatch

ControlNet modules in the redundant chassis with different keeper signatures.

Keeper Capable Node	Active Keeper	Valid Keeper	Keeper Signature
Offline File	N/A	N/A	0x4a8a4ced
01	YES	YES	0x4a8a4ced
06	NO	YES	0x4a8a4ced
07	NO	YES	0x4a8a4ced
09	NO	YES	0x4a8a4ced
10	NO	NO	0xf3fd3d66

To **correct** this anomaly, do one of the following:

- Select the unconfigured module and click Update Keeper.
- Reschedule the ControlNet network.

Partner Network Connection Lost

If a partner network connection between a redundant chassis pair is lost, a state change or switchover may occur. These state changes may result:

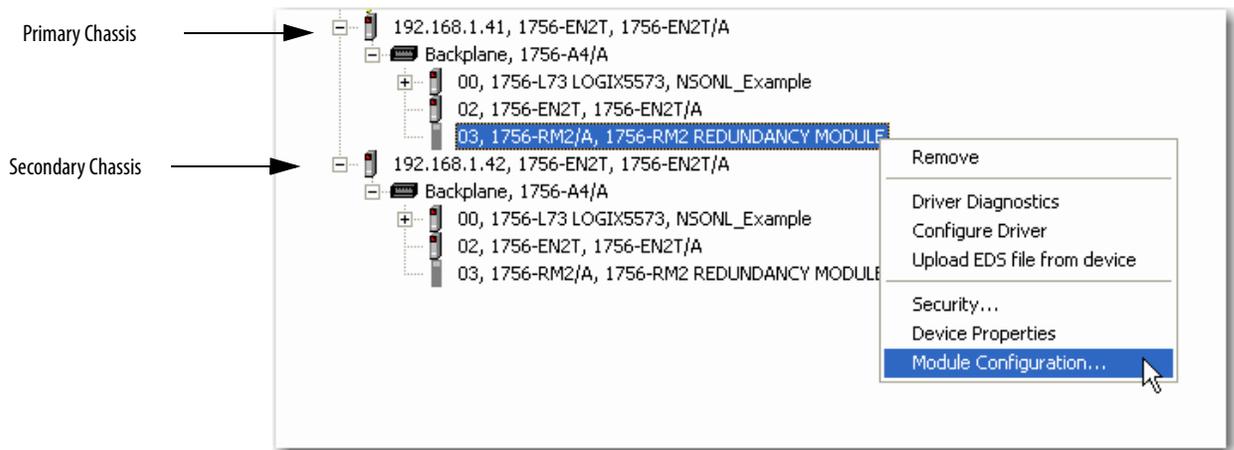
- Primary with qualified secondary changes to primary with disqualified secondary
- Qualified secondary with primary to disqualified secondary with primary

To use the Event Log to determine if a lost partner network connection caused a state change, complete these steps.

IMPORTANT This example shows a connection lost over a ControlNet network. You same steps apply if the connection is lost over an EtherNet/IP network.

1. Open RSLinx Classic software and access the RMCT of the primary redundancy module.

This is the chassis that was previously the secondary but is now the primary.



2. Locate the last event that indicates successful qualification and status.

Primary Chassis Event Log

Chassis B		Event	Log Time	S...	Module ...	Description	Classification
		168170	9/25/2009 10:27:08:2...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
		168169	9/25/2009 10:27:08:2...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
		168168	9/25/2009 10:27:08:2...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
		168167	9/25/2009 10:27:08:2...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
		168166	9/25/2009 10:27:08:2...	3	1756-RM 2	(C2) Bridge Connection Deleted	Starts/Stops
		168165	9/25/2009 10:27:08:1...	3	1756-RM 2	(BD) SYS_FAIL_L Active in Partner RM	Failure
		168164	9/25/2009 10:27:08:1...	3	1756-RM 2	(30) Switchover Attempted	Switchover
		168163	9/25/2009 10:11:52:2...	3	1756-RM 2	(32) Autoqual. State Change	Configuration
		168162	9/25/2009 10:11:52:2...	3	1756-RM 2	(F) Autoqual. Option Set to 'Always'	Configuration
		168161	9/25/2009 10:11:38:9...	3	1756-RM 2	(1E) Chassis Redundancy State changed...	State Changes
		168160	9/25/2009 10:11:38:9...	2	1756-CN...	(31) Transition To Qualified Secondary	State Changes
		168159	9/25/2009 10:11:24:3...	2	1756-CN...	(30) Transition To Qualifying Secondary	State Changes
		168158	9/25/2009 10:10:55:3...	3	1756-RM 2	(91) Response to Open Bridge Connection	Starts/Stops
		168157	9/25/2009 10:10:55:3...	2	1756-CN...	(10) Partner Connection Opened	Synchronization
		168156	9/25/2009 10:10:55:3...	3	1756-RM 2	(90) Request to Open Bridge Connection	Starts/Stops

A switchover is initiated.

Event indicates chassis state is as a qualified secondary.

3. Open the Event Log for the secondary chassis because the cause of the switchover is not apparent.

- Use the time of the switchover event found in the primary chassis to identify the corresponding event in the secondary chassis.

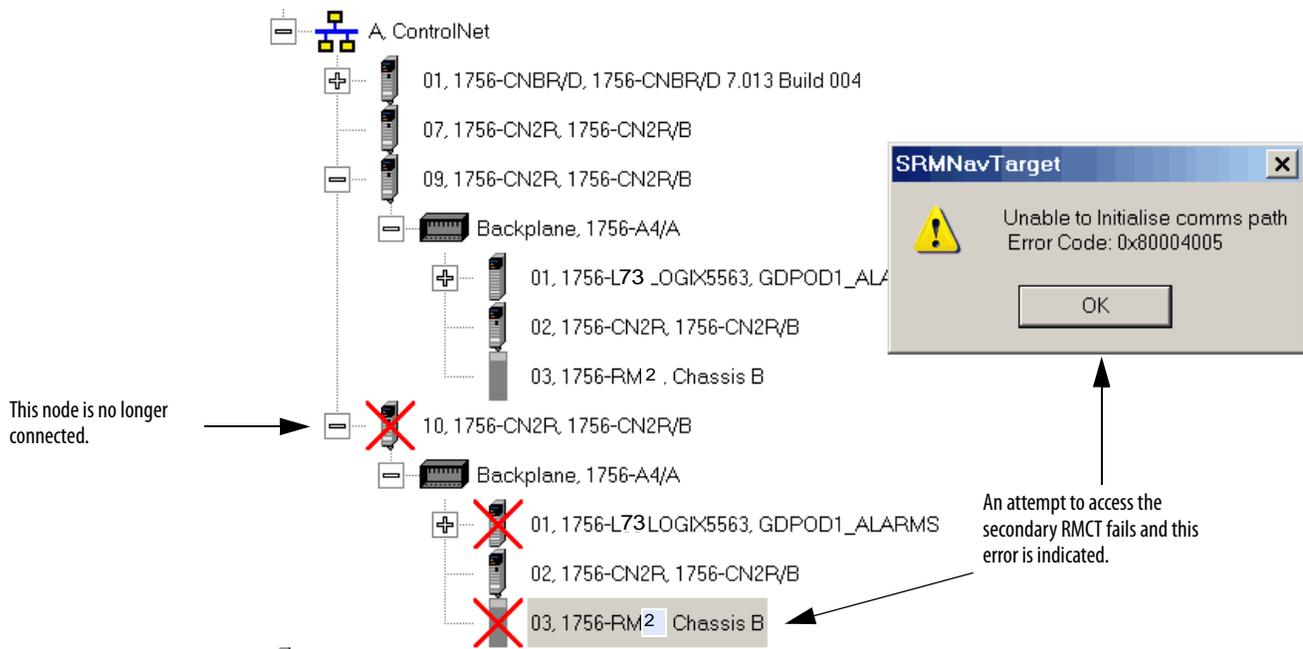
The switchover indicated in the primary chassis log occurred at 10:27:08.

Secondary Chassis Event Log

Chassis A					
Event	Log Time	S...	Module ...	Description	Classification
325816	9/25/2009 10:27:08.3...	3	1756-RM 2	(46) SYS_FAIL_L Inactive	Failure
325815	9/25/2009 10:27:08.2...	2	1756-CN...	(1) Network Transition to Not Attached	Synchronization
325814	9/25/2009 10:27:08.1...	3	1756-RM 2	(45) SYS_FAIL_L Active	Failure
325813	9/25/2009 10:27:08.1...	3	1756-RM 2	(30) Switchover Attempted	Switchover
325812	9/25/2009 10:27:08.1	2	1756-CN...	(2) Network Not Attached Warning	Synchronization
325811	9/25/2009 10:11:52.2...	3	1756-RM 2	(32) Autoqual. State Change	Configuration

The corresponding events in the secondary chassis log indicate that the network is not attached and that the SYS_FAIL_LActive backplane signal is active. Both these events indicate an error in the connection of the ControlNet module to the network.

- Confirm the ControlNet connection error by browsing the network in RSLinx Classic software.



To recover from a ControlNet network disconnection, take these actions:

- Check all ControlNet tap and trunkline connections. Correct any disconnections or other connection anomalies.
- If the Auto-Synchronization parameter is not set to Always, use the commands in the Synchronization tab of the RMCT to synchronize your chassis.

For more information about troubleshooting ControlNet network anomalies, see the ControlNet Modules in Logix5000 Control System User Manual, publication [CNET-UM001](#).

To recover from an EtherNet/IP network disconnection, take these actions:

- Check all EtherNet/IP network and switch connections.
- If the Auto-Synchronization parameter is not set to Always, use the commands in the Synchronization tab of the RMCT to synchronize your chassis.

For more information about troubleshooting EtherNet/IP network anomalies, see the EtherNet/IP Modules in Logix5000 Control System User Manual, publication [ENET-UM001](#).

Redundancy Module Connection Lost

To determine if the connection between the redundancy modules caused a switchover or state change, open the Event Log of the redundancy module that is currently the primary.

Chassis A					
Event	Log Time	S...	Module ...	Description	Classification
325924	9/25/2009 10:57:41:7...	1	1756-L63	(36) Partner Connection Closed	State Changes
325923	9/25/2009 10:57:41:6...	3	1756-RM2	(18) Chassis Redundancy State changed to PwNS	State Changes
325922	9/25/2009 10:57:41:6...	2	1756-CN...	(F) Partner Connection Closed	State Changes
325921	9/25/2009 10:57:41:6...	3	1756-RM2	(56) The partner RM has been disconnected	State Changes
325920	9/25/2009 10:57:41:6...	3	1756-RM2	(C) Port2 Communication error	Minor Fault
325919	9/25/2009 10:57:41:6...	3	1756-RM2	(C) Port2 Communication error	Minor Fault
325918	9/25/2009 10:45:44:9...	3	1756-RM 2	(1A) Chassis Redundancy State changed to PwQS	State Changes
Chassis B					
Event	Log Time	S...	Module ...	Description	Classification
168303	9/25/2009 10:45:44:9...	3	1756-RM2	(1E) Chassis Redundancy State changed to QSwP	State Changes
168302	9/25/2009 10:45:44:9...	2	1756-CN...	(31) Transition To Qualified Secondary	State Changes
168301	9/25/2009 10:45:30:3...	2	1756-CN...	(30) Transition To Qualifying Secondary	State Changes
168300	9/25/2009 10:45:25:3...	3	1756-RM2	(91) Response to Open Bridge Connection	Starts/Stops
168299	9/25/2009 10:45:25:3...	3	1756-RM 2	(90) Request to Open Bridge Connection	Starts/Stops
168298	9/25/2009 10:45:25:3...	3	1756-RM2	(91) Response to Open Bridge Connection	Starts/Stops

The Event Log clearly indicates that one of the redundancy modules has been disconnected. In addition, the dimmed secondary chassis log indicates that the module is not connected.

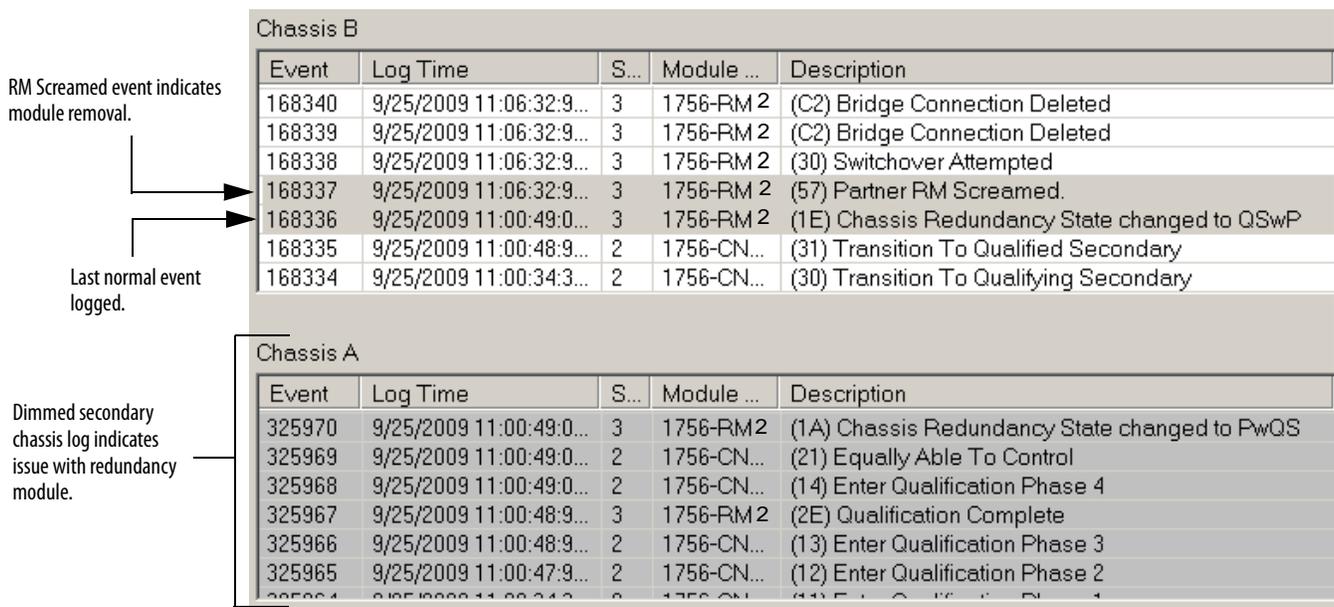
To resolve this anomaly, check the intermodule cable that connects the redundancy modules. Verify that it is properly connect and is not severed.

Also, if the Auto-Synchronization parameter of this system is not set to always, use the commands in the Synchronization tab to synchronize that chassis once the anomaly is resolved.

Redundancy Module Missing

To determine if a missing redundancy module caused a state change and switchover, access the Event Log of the chassis that is currently the primary chassis.

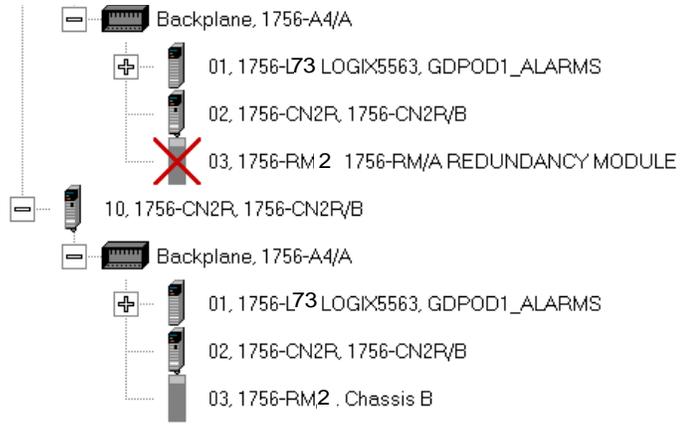
Figure 65 - Event Log with Partner RM Screamed Event



The Partner RM Screamed event is logged by the redundancy module just before it is disconnected. Depending on cause of the missing module, the Partner RM Screamed event may not be logged before the module is lost.

You can also browse to the redundancy module in RSLink Classic software to determine if it is connected to the network. A red X over the redundancy module indicates the module is not in the chassis.

Figure 66 - Missing Redundancy Module in RSLink Classic Software



To correct the missing module anomaly, first verify that the redundancy module is correctly installed in the chassis and it is properly powered. Then check the intermodule cable that connects the redundancy modules.

After you have verified that the module is installed and powered, you may need to synchronize the chassis by using the synchronization commands in the Synchronization tab. Use the synchronization commands if your Auto-Synchronization parameter for the chassis is not set to Always.

Qualification Aborted Due to a Nonredundant Controller

If you place a controller that is not enabled for redundancy into the redundant chassis, the qualification and synchronization fail. To determine if your synchronization failure is due to a nonredundant controller, complete these steps.

1. If not already open, open the RMCT of the primary module.
2. Click the Synchronization tab and view the Recent Synchronization Status Attempts log.

The log indicates there is a Module Configuration Error.

3. Select the aborted attempt to view the description

The screenshot shows the 'Synchronization' tab selected in the RMCT interface. Below the navigation tabs, there are buttons for 'Synchronize Secondary', 'Disqualify Secondary', 'Initiate Switchover', and 'Become Primary'. The 'Recent Synchronization Attempts' section contains a table with the following data:

Order	Result	Cause
N	Abort	Module Configuration Error
N-1	Abort	Module Configuration Error
N-2	Success	—
N-3	Abort	Module Pair Incompatible

The 'Description' section below the table provides the following details:

A module in the chassis returned an invalid response to a Synchronization request
 1. See Event Log for Slot Number of Module which rejected qualification
 2. Check module configuration and retry.

4. Click the Synchronization Status tab to check the compatibility between modules.

The screenshot shows the 'Synchronization Status' tab selected. It displays a table with the following columns: Slot, % Complete, Module Name, Module Revision, Secondary Readiness, State, and Compatibility. The data in the table is as follows:

Slot	% Complete	Module Name	Module Revision	Secondary Readiness	State	Compatibility
0	100	1756-L73/A LOGIX5573	20.54	Synchronized	Primary	Full
1	---	<empty>	---	---	---	---
2	100	1756-EN2T/A	5.8	Synchronized	Primary	Full
3	100	1756-RM2 REDUNDANCY...	20.4	Synchronized	Primary	Full

All of the modules are indicated as being fully-compatible.

5. Open RSLogix 5000 and go online with the primary controller in your system.
6. Open the controller properties and verify that Redundancy Enabled is checked.



If Redundancy Enabled is **not** selected, then take these actions:

- Do one of the following:
 - Remove the controllers that are not Redundancy Enabled.
 - Enable the controller for redundancy and make other program changes to accommodate redundancy.
- After removing or correcting the Redundancy Enabled setting, attempt to synchronize your redundant system again.

Controller Events

Occasionally, controller-related events may be logged in the RMCT Event Log. In some cases, the anomalies are strictly status updates and are not indicative of an anomaly that requires troubleshooting.

In other cases, the event description may indicate Program Fault Cleared, or a similar description of a resolved anomaly. If these types of events are not followed by state changes or switchovers, then they are not indicative of an anomaly that requires additional troubleshooting.

If an event logged for a controller in the redundant system is followed by a state change or switchover, use RSLogix 5000 software to go online with the controller and determine the cause of the fault. For more information about using RSLogix 5000 software to troubleshoot a fault, see the section titled [Use RSLogix 5000 Software to View Errors](#) on [page 201](#).

Status Indicators

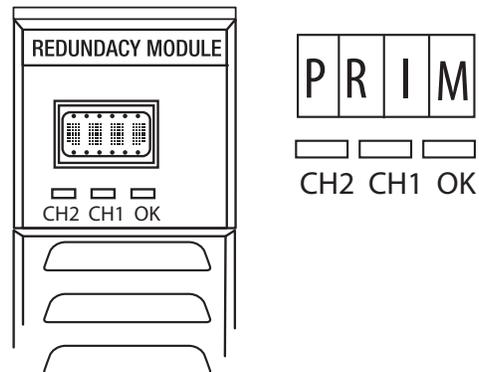
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Redundancy Module Status Indicators

The redundancy modules have these diagnostic status indicators.

1756-RM2/A and 1756-RM2XT Status Indicators

Figure 67 - Redundancy Module Status Indicators for 1756-RM2/A and 1756-RM2XT Modules



Module Status Display

The module status display provides diagnostic information.

Table 40 - Module Status Display

Module Status Display	Description
■ ■ ■ ■	Four-character display executing self-test at powerup. No action necessary.
Txxx	The redundancy module is executing a self-test at powerup. (xxx represents a hexadecimal test identification number.) Wait for self-test to finish. No action required.
XFER	Application firmware update is in progress. Wait for firmware update to finish. No action is required.
ERAS	Boot mode - Erasing current redundancy module firmware
PROG	Flash b mode - Updating redundancy module firmware. Wait for firmware update to finish. No action is required.
????	Resolving initial redundancy module state. Wait for state resolution to finish. No action is required.

Table 40 - Module Status Display

Module Status Display	Description
PRIM	Primary redundancy module. The module is operating as the primary module. No action required.
DISQ	Disqualified secondary redundancy module. Check the secondary partner module's type and revision.
QFNG	Qualifying secondary redundancy module. Redundant system status. No action is required.
SYNC	Qualified secondary redundancy module. Redundant system status. No action is required.
LKNG	Secondary redundancy module that is in process of locking for update.
LOCK	Secondary redundancy module that is locked for update.
Exxx	Major fault has occurred (xxx represents an error or fault code, with the two least-significant characters in decimal). Use the Error ID code to diagnose and address the error. For more information on error codes, see Redundancy Module Fault Codes and Display Messages on page 233 .
EEPROM Update Required	On-board EEPROM is empty. Replace the module.
BOOT Erase Error	Error in erasing NVS device while updating boot image. Cycle power to the module. If the error persists, replace the module.
BOOT Program Error	Error in writing in NVS device while updating boot image. Cycle power to the module. If the error persists, replace the module.
APP Erase Error	Error in erasing NVS device while updating application image. Cycle power to the redundancy module. If the error persists, replace the module.
APP Program Error	Error in writing in NVS device while updating application image. Cycle power to the redundancy module. If the error persists, replace the module.
CONFIG Erase Error	Error in erasing NVS device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
CONFIG Program Error	Error in writing in NVS device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
EEPROM Write Error	Error in writing in EEPROM device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
Application Update Required	The module is running boot firmware. Download the application firmware obtained from the respective redundancy bundle.
!CPT	A test line on the backplane is asserted. Check if the error message goes away after removing each module, one at a time. If error persists, cycle power to the chassis, or replace the chassis.
!Cpt	All modules in the chassis do not belong to the same standard or enhanced redundancy platform.
Untrusted Certificate Error	The 1756-RM2/A and 1756-RM2XT modules use signed firmware. This error appears when either the contents of the downloaded certificate or its signature for the downloaded firmware is invalid.

OK Status Indicators

The OK status indicator reveals the current redundancy module state.

Table 41 - OK Status Indicator

Indicator State	Description
Off	No power is applied to the redundancy module. If necessary, apply power.
Solid red	One of these conditions exists: <ul style="list-style-type: none"> The redundancy module is conducting a self-test during powerup. No action necessary. The redundancy module has experienced a major shutdown fault. Cycle power to clear the fault. If the major fault does not clear, replace the module.
Flashing red	One of these conditions exists: <ul style="list-style-type: none"> The redundancy module is updating its firmware. No action necessary. The redundancy module has been configured improperly. Check the module configuration and correct any issues. The redundancy module has experienced a major fault that may be cleared remotely using the RMCT.
Solid green	The redundancy module is operating normally. No action required.
Flashing green	The redundancy module is operating normally but is not communicating with the other redundancy modules in the same chassis. If necessary, establish communication with the other redundancy module.

CH1 and CH2 Status Indicators

The CH1 and CH2 status indicators reveal the following module states.

Table 42 - CH1 and CH2 Status Indicators

Indicator State	Description
Off	One of these conditions exists: <ul style="list-style-type: none"> No power RM major fault NVS update
Solid red	One of these conditions exists: <ul style="list-style-type: none"> No transceiver plugged in Faulted or failed transceiver detected Transceiver with incorrect or vendor ID detected
Intermittent red	For 1 s, then off, indicates powerup.
Flashing red	One of these conditions exists: <ul style="list-style-type: none"> Redundant channel error No cable connection
Intermittent green ⁽¹⁾	On for 256 ms for each packet received, then off. Active operating channel. (Channel used for data communication between the partner 1756-RM2/A modules.)
Flashing green ⁽¹⁾	Indicates that this channel is operating as the back-up channel and is ready to become the Active channel if the current Active channel fails.
Unknown	Operating state is not yet determined.
Active	Channel is operating normally as the active channel.

Indicator State	Description
Redundant	Channel is operating normally as the redundant channel.
Link Down	Channel is disconnected. Several causes could be: <ul style="list-style-type: none"> - The cable is disconnected, broken, or damaged - The signal is attenuated - The connector is loose - The partner 1756-RM2 module is powered down or in a major fault state
No SFP	No transceiver was detected. Several causes could be: <ul style="list-style-type: none"> - It has failed - It is loosely connected - It is not installed
SFP !Cpt	The transceiver is not supported by Rockwell Automation.
SFP Fail	The transceiver is in a failed state.

(1) May be present for either CH1 or CH2, but not both at the same time.

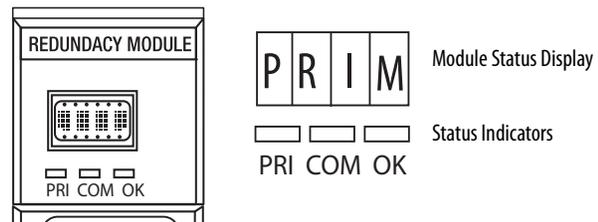
SFP Error Message

Use only Rockwell Automation approved small form pluggable (SFP).

When an incompatible SFP is installed in the 1756-RM2/A module, the CH1/CH2 status indicator shows solid red and the RMCT software displays the following error message in the status bar at the bottom of the screen: ‘SFP !Cpt.’

1756-RM/A and 1756-RM/B Status Indicators

Figure 68 - Redundancy Module Status Indicators for 1756-RM and 1756-RMXT Modules



Module Status Display

The module status display provides diagnostic information.

Table 43 - Module Status Display

Module Status Display	Description
■■■■	Four-character display executing self-test at powerup. No action necessary.
Txxx	The redundancy module is executing a self-test at powerup. (xxx represents a hexadecimal test identification number.) Wait for self-test to finish. No action required.
XFER	Application firmware update is in progress. Wait for firmware update to finish. No action is required.
ERAS	Boot mode - Erasing current redundancy module firmware.

Table 43 - Module Status Display

Module Status Display	Description
PROG	Boot mode - Updating redundancy module firmware. Wait for firmware update to finish. No action is required.
????	Resolving initial redundancy module state. Wait for state resolution to finish. No action is required.
PRIM	Primary redundancy module. The module is operating as the primary module. No action required.
DISQ	Disqualified secondary redundancy module. Check the secondary partner module's type and revision.
QFNG	Qualifying secondary redundancy module. Redundant system status. No action is required.
SYNC	Qualified secondary redundancy module. Redundant system status. No action is required.
LKNG	Secondary redundancy module that is in process of locking for update.
LOCK	Secondary redundancy module that is locked for update.
Exxx	Major fault has occurred (xxx represents an error or fault code, with the two least-significant characters in decimal). Use the Error ID code to diagnose and address the error. For more information on error codes, see Redundancy Module Fault Codes and Display Messages on page 233 .
EEPROM Update Required	On-board EEPROM is empty. Replace the module.
BOOT Erase Error	Error in erasing NVS device while updating boot image. Cycle power to the module. If the error persists, replace the module.
BOOT Program Error	Error in writing in NVS device while updating boot image. Cycle power to the module. If the error persists, replace the module.
APP Erase Error	Error in erasing NVS device while updating application image. Cycle power to the redundancy module. If the error persists, replace the module.
APP Program Error	Error in writing in NVS device while updating application image. Cycle power to the redundancy module. If the error persists, replace the module.
CONFIG Erase Error	Error in erasing NVS device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
CONFIG Program Error	Error in writing in NVS device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
EEPROM Write Error	Error in writing in EEPROM device while updating configuration log image. Cycle power to the redundancy module. If the error persists, replace the module.
Application Update Required	The module is running boot firmware. Download the application firmware obtained from the respective redundancy bundle.
!CPT	A test line on the backplane is asserted. Check if the error message goes away after removing each module, one at a time. If error persists, cycle power to the chassis, or replace the chassis.
!Cpt	All modules in the chassis do not belong to the same standard or enhanced redundancy platform.

OK Status Indicators

The OK status indicator reveals the current redundancy module state.

Table 44 - OK Status Indicator

Indicator State	Description
Off	No power is applied to the redundancy module. If necessary, apply power.
Solid red	One of these conditions exists: <ul style="list-style-type: none"> The redundancy module is conducting a self-test during powerup. No action necessary. The redundancy module has experienced a major fault. Cycle power to clear the fault. If the major fault does not clear, replace the module.
Flashing red	One of these conditions exists: <ul style="list-style-type: none"> The redundancy module is updating its firmware. No action necessary. The redundancy module has been configured improperly. Check the module configuration and correct any issues. The redundancy module has experienced a minor failure. Cycle power to clear the fault. If the major fault does not clear, replace the module.
Solid green	The redundancy module is operating normally. No action required.
Flashing green	The redundancy module is operating normally but is not communicating with the other redundancy module. If necessary, establish communication with the other redundancy module.

Communication Status Indicator

The communication status indicator indicates activity on the redundancy module communication between chassis in the redundant chassis pair.

Table 45 - Communication Status Indicator

Indicator State	Description
Off	One of these conditions exist: <ul style="list-style-type: none"> No power is currently applied to the module. Apply power to the module. There is no communication between redundancy modules in the redundant chassis pair. Diagnose the redundancy configuration to determine why no communication is taking place.
Red < 1 second	The module has been started and has established partner communication. No action required.
Solid red	The module has experienced a critical communication failure. Cycle power to clear the fault. If the major fault does not clear, replace the module.
Flashing green > 250 ms	Communication activity is present. No action required.

Chassis State Status Indicator

The Chassis State (PRI) status indicator identifies whether the chassis is primary. The PRI status indicator on the primary redundancy module remains solid green, and the PRI status indicator on the secondary redundancy module remains off.

Redundancy Module Fault Codes and Display Messages

Redundancy modules may experience any of these faults.

Table 46 - Module Fault Codes

Fault Type	Description
Minor Recoverable	This fault type results in these conditions: <ul style="list-style-type: none"> • The fault does not stop redundancy operations and provides you with a recovery mechanism. • The module may clear some minor recoverable faults on its own.
Minor Nonrecoverable	This fault type results in these conditions: <ul style="list-style-type: none"> • The fault does not stop redundancy operations. • No recovery mechanism is available.
Major Recoverable	The fault impacts redundancy operations, although the effect may not be immediate. For example, if the fault occurred in the secondary redundancy module, the secondary chassis will disqualify and will not be able to take over control if the primary redundancy module fails
Major Nonrecoverable	This fault type results in these conditions: <ul style="list-style-type: none"> • This is a critical fault. Redundancy operations will cease. • A switchover may occur. • No recover mechanism is available. • The module may need to be replaced.

When the redundancy module experiences a fault, indication of that fault type is presented in these methods:

- Event log
- Module Status Display

IMPORTANT This section describes a **subset of module fault codes** you may see in the event log or Module Status Display.

If you see a fault code not included in this chapter, contact Rockwell Automation for assistance in troubleshooting that fault.

Event Log When Redundancy Module Experiences Fault

The redundancy module logs the fault type in its event log in NVS memory. You access the event log through the RMCT to troubleshoot the fault yourself or with assistance from Rockwell Automation Technical Support for troubleshooting the fault.

Module Status Display

A character string scrolls across the Module Status Display to indicate the fault type. The character string displays the fault type in either of these ways:

- Two to four-character word abbreviations
- Alpha numeric codes

This table describes the two to four-character word abbreviations.

Table 47 - Major Fault Code Messages

1st Word	2nd Word	3rd Word	4th Word	Error Description
CFG	LOG	ERR		Configuration log error. No action is required.
COMM	RSRC	ERR		Communication resource error. Reset the redundancy module.
COMM	RSRC	ERR	PRT1	Port1 Communication resource error on Backplane. Reset the redundancy module and check the chassis.
COMM	RSRC	ERR	PRT2	Port2 Communication resource error on redundancy link. Complete these tasks: 1. Reset the module. 2. Check the cable.
COMM	ERR	PRT1		Port1 Communication error, Backplane communication. Check or replace the chassis.
COMM	ERR	PRT2		Port2 Communication error on the redundancy link. Check or replace the single-mode cable.
COMM	ERR			General Communication Error. No action is required.
DUPL	RM			Duplicate redundancy module. This module is not in control. Remove this redundancy module.
EVNT	LOG	ERR		Event Log Error. No action is required.
FMWR	ERR			Firmware error. Update the firmware.
HDW	ERR			Hardware failure. Replace the module.
OS	ERR			Operating system error. Replace the module.
RM	PWR	DOWN		The redundancy module Power Down, Module detected a DC_Fail condition. Check the other modules in the chassis.
WDOG	ERR			Watchdog time out. Reset the module.
WDOG	FAIL			Watchdog task failed its status check. Replace the module.

[Table 48](#) describes the alphanumeric codes.

The fault code is a four-character alphanumeric string. Valid characters are 0...9 and A through Z, except S and O. The first character is always E. Each firmware subsystem within the redundancy module is assigned a range of fault codes. Each subsystem assigns fault codes within its range.

Table 48 - Alphanumeric Error Codes

Valid Character String	Indication
E	Error.
X ¹	The subsystem in which the error was detected.
X ²	The subsystem function or group of functions in which the error was detected.
X ³	The specific error.

Range	Subsystem
E 0 __	Back-up Control Object
E 1 __	OS Board Support Package
E 2 __	Chassis Profile Object
E 3 __	Coordinated System Time Object
E 4 __	Device Object
E 5 __	Extended Log Object
E 6 __	Event Log Object
E 7 __	Back-up Communication Object
E 8 __	ICP Toolkit
E 9 __	Indicator Device Driver
E A __	RM State Machine
E B __	Event Log Device Driver

Range	Subsystem
E C __	Object Communication
E D __	Wall Clock Time Object
E E __	Non-maskable Interrupt Service Routine
E F __	Nonvolatile Storage Object
E G __	RM Fault Handler
E H __	Self Test Object
E I __	Workstation Display Object
E J __	Industrial Control Platform Object
E K __	RM Watchdog Manager
E L __	Instrumentation Object
E M __	File Object

If you encounter one of these error codes, record the Exxx code and contact Rockwell Automation Technical Support.

Recovery Messages

For certain faults, the module status display provides recovery instructions. Up to four, four-character words are displayed.

Table 49 - Recover Messages

Recovery Instruction Code	Description
RPLC MOD	Replace the module.
RSET MOD	Reset the module.
REMV MOD	Remove the module.
SEAT MOD	Reinsert the module into the chassis.

Notes:

Event Log Descriptions

This table lists and explains some of the most-commonly experienced event descriptions found in the Event Log of the RMCT. Use this table as a reference when determining if an event on your system requires additional troubleshooting.

Event Description	Description
Autoqualification trigger	Something happened that caused the system to try and synchronize again. Double-click the event to see what happened.
Blank memories rule	A check to choose a primary chassis if both chassis power up at the same time. Suppose that the controllers in one chassis don't have projects while the controllers in the other chassis do have projects. In that case, the other chassis becomes primary.
Chassis modules rule	A check to choose a primary chassis if both chassis power up at the same time. Suppose that one chassis has more modules than the other chassis. In that case, the chassis with the most modules gets the first chance to become primary. It becomes primary as long as the other chassis isn't more able to control the system.
Chassis redundancy state changed to...	The chassis changed to a different redundancy state. <ul style="list-style-type: none"> PwQS — Primary with qualified (synchronized) secondary partner QSwP — Qualified (synchronized) secondary with primary partner DSwP — Disqualified secondary with primary partner DSwNP — Disqualified secondary with no partner PwDS — Primary with disqualified secondary partner PwNS — Primary with no secondary partner PLU — Primary locked for update SLU — Secondary locked for update
Crossloading error	A module is not able to get some information to its partner.
Disqualified secondaries rule	A check to choose a primary chassis if both chassis power up at the same time. Suppose that the modules in one of the chassis powered down in a disqualified secondary state. In that case, the other chassis becomes primary.
Failed modules rule	A check to choose a primary chassis if both chassis power up at the same time. Suppose that a module in one of the chassis is faulted but its partner module in the other chassis is not faulted. In that case, the other chassis becomes primary.
Firmware error	The redundancy module has an anomaly.
Improper mode or mode switch position	A lock for update cannot be performed if the primary controller is faulted. A lock for update or locked switchover cannot be performed if the mode switch on either controller is not in the REM position.
Incompatible application	A lock for update cannot be performed if the project names or applications are not identical in the primary and secondary chassis.
Initial secondary PTP time synchronization failure	When PTP is enabled on the primary partner, the secondary partner must be PTP time synchronized as well or it will not synchronize. The initial secondary PTP synchronization attempt may fail before the automatic retry is successful. In this case, the event reports that initial failed attempt.
Invalid application	A lock for update cannot be performed if test edits or SFC forces exist in the application.
Module insertion	The 1756-RM now sees the module on the backplane. This means the module has either just powered up, just been put into the chassis, or just finished resetting. Double click the event to see the slot number of the module.
Module rejected lock for update command from 1756-RM module	A module (with a slot number specified in byte 0 of the extended status) rejected the lock-for-update command. See events from that module to determine the cause.
Module removal	The 1756-RM no longer sees a module on the backplane. This means that the module either experienced a nonrecoverable fault, was removed from the chassis, or was reset. Double-click the event to see the slot number of the module.

Event Description	Description
Modules chassis state rule	A check to choose a primary chassis if both chassis power up at the same time. Suppose that the modules in one chassis are already in a primary state. In that case, that chassis becomes primary.
NRC modules rule	A check to choose a primary chassis if both chassis power up at the same time. NRC stands for nonredundancy compliant. Suppose that a module in one of the chassis doesn't support redundancy and all the modules in the other chassis do support redundancy. In that case, the other chassis becomes primary.
Partner not on same link	A primary communication module cannot communicate with its partner across the network. For example, a 1756-CN2R/B communication module in the primary chassis cannot communication with its partner 1756-CN2R/B communication module in the secondary chassis. These conditions may result in this event: <ul style="list-style-type: none"> • A network anomaly, such as noise, a poor connection, or a termination anomaly, exists. • The secondary communication module is not connected to the same network as the primary or any network at all.
Powerdown time rule	A check to choose a primary chassis if both chassis power up at the same time. If the two chassis powered down more than one second apart, the last chassis to power down gets the first chance at being primary.
Primary became PTP time synchronized	The primary module is now PTP synchronized and an auto qualification was requested.
Program Fault	A controller has a major fault.
PTP not synchronized	A redundant controller's PTP clock is not synchronized or the partner controller pair is synchronized to different grandmasters.
PTP now synchronized	PTP is now synchronized on the module.
1756-RM OS error	The redundancy module has an anomaly.
1756-RM serial number rule	A check to choose a primary chassis if both chassis power up at the same time. This is the final tie-breaker. The 1756-RM with the lower serial number gets the first chance to become primary. It becomes primary as long as the other chassis isn't more able to control the system.
Standby secondaries rule	A check to choose a primary chassis if both chassis power up at the same time. Because standby isn't available yet, this check always ends in a tie.
SYS_FAIL_L Active	A module has a nonrecoverable fault or lost its connection to the network. When that happens, the SYS_FAIL signal becomes true. The backplane of the chassis has a SYS_FAIL signal. Each module in the chassis uses this signal to indicate an anomaly: <ul style="list-style-type: none"> • The signal is normally false (inactive), which means that all modules in the chassis are OK. • A module turns the SYS_FAIL signal true (active) when the module has a nonrecoverable fault or it losses its connection to the network. Look for later events to find out what happened: <ul style="list-style-type: none"> • If you see a Module Removal event shortly afterward, then a module has a nonrecoverable fault. Double-click the Module Removal event to see the slot number of the module. The SYS_FAIL signal may stay true until you cycle power or remove the faulted module. • If you see a SYS_FAIL_L Inactive event within a few hundred milliseconds, then a cable is probably disconnected or broken. A communication module pulses the SYS_FAIL signal when the module loses its connection to the network. Look for a Transition to Lonely event to see which module lost its connection.
The partner RM has been connected	The partner 1756-RM powered up or become connected by the fiber-optic cable.
The partner RM screamed	The partner 1756-RM lost power, has an unrecoverable fault, or was removed. An 1756-RM has circuits that hold power long enough for it to send a message to its partner over the fiber-optic interconnect cable. The 1756-RM sends the message even after you remove it from the chassis. This message is called a scream. The scream lets the partner 1756-RM tell the difference between a broken fiber-optic interconnect cable and the power loss or removal of the primary 1756-RM. <ul style="list-style-type: none"> • If the fiber optic cable breaks, then there isn't a switchover. • If the redundancy module loses power or is removed, then there is a switchover.
Transition to lonely	A communication module doesn't see any other devices on its network. This usually means that the network cable of the module is disconnected or broken. The event log shows Transition to Not Lonely when you reconnect the cable.
Unicast not supported	A unicast connection is configured in the redundant controller, and enhanced redundancy systems do not support Unicast.
Unknown event	The 1756-RM configuration tool may be an older version and must be updated.
WCT time change (> 1 second)	The clock of the 1756-RM changed. This happens when you: <ul style="list-style-type: none"> • use the RMCT to set the clock. • connect the redundancy module to another redundancy module that is already the primary. The redundancy module synchronizes its clock to that of the primary 1756-RM.

Upgrade from a Standard Redundancy System or to Another Enhanced Redundancy System

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Upgrade from a Standard Redundancy System

If you need to upgrade your standard redundancy system to an enhanced redundancy system, complete this procedure.

Before You Begin

Before you begin upgrading from a standard redundancy system to an enhanced redundancy system, consider these points:

- If the standard redundancy system uses a 1757-SRM redundancy module, you must replace it with a 1756-RM redundancy module.
- You must upgrade all ControlNet or EtherNet/IP communication modules.
- You must upgrade the firmware on all controllers.
- Depending on the enhanced redundancy system revision to which you are upgrading, you may need to upgrade software.

Upgrade System Components

IMPORTANT**Safely shut down system and controlled equipment.**

Be sure to place the system and controlled equipment in a state where they can be safely shut down prior to beginning this upgrade.

The available components to which you can upgrade when converting a standard redundancy system to an enhanced redundancy system depends on the enhanced redundancy system revision level.

You must complete these steps when upgrading system components. Each step is described in detail in the rest of this appendix:

- [Upgrade the System Software](#)
- [Upgrade the Controllers](#)
- [Replace Communication Modules](#)
- [Steps After System Components Upgrade](#)

Complete these steps before upgrading the necessary components to an enhanced redundancy system.

1. Verify that the standard redundancy system is offline.
2. Remove power from both the primary and secondary chassis.

Upgrade the System Software

Upgrading your system software requires you to make many considerations and decisions. Make sure you are fully aware of how your specific application will be affected when you upgrade system software:

- If you are upgrading to enhanced redundancy system, revision 16.081 or earlier, you are not **required** to upgrade any software.
- If you are upgrading to enhanced redundancy system, revision 19.052 or later, you must upgrade this software:
 - RSLogix 5000 software
 - RSLinx Enterprise communication software or RSLinx Classic communication software, depending on which RSLinx software you are using in the application

Due to potential changes to your application when upgrading to enhanced redundancy system, you may need to install any of the this software:

- FactoryTalk Alarms and Events
- FactoryTalk Batch
- RSNetWorx for ControlNet
- RSNetWorx for EtherNet/IP

Upgrade the Controllers

You may need to upgrade your controllers when upgrading to an enhanced redundancy system. This table describes which controllers are available for system upgrades.

Controllers Available in Standard Redundancy Systems	Controllers Available in Enhanced Redundancy Systems
1756-L61	All revisions
1756-L62	1756-L61
1756-L63	1756-L62
1756-L64	1756L63
	1756-L63XT
	1756-L64
	Revision 19.052 or later only
	1756-L65
	Revision 19.053 or later only
	1756-L72
	1756-L73
	1756-L74
	1756-L75
	Revision 20.054 or later only
	1756-L71

Replace Communication Modules

You must replace all communication modules when upgrading to any enhanced redundancy system revision. You must use enhanced communication modules in an enhanced redundancy system.

This table describes which controllers are available for system upgrades.

Communication Modules Available in Standard Redundancy Systems	Communication Modules Available in Enhanced Redundancy Systems
1756-CNB/D 1756-CNBR/D 1756-CNB/E 1756-CNBR/E	All revisions 1756-CN2/B 1756-CN2R/B 1756-CN2RXT/B
1756-ENBT (any series) 1756-EWEB (any series)	All revisions 1756-EN2T (any series) 1756-EN2TXT (any series) Revision 19.052 or later only 1756-EN2TR (any series) Revision 20.054 or later only 1756-EN2F (any series)

Replacing a 1756-EWEB Module

The 1756-EWEB communication module offers functionality that is not available on other EtherNet/IP communication modules. When you upgrade from a nonredundant system to an enhanced redundant system, your application loses functionality that is available only on the 1756-EWEB communication module.

These are examples of functionality no longer available after the conversion from a standard redundancy system to an enhanced redundancy system:

- Simple Network Time Protocol (SNTP) Client
- Web pages

You must account for this lost functionality in your RSLogix 5000 software project.

Updating Communication Settings

Make sure you set all network settings, for example, node addresses or IP addresses, required to your application in the new communication modules.

For more information on specific communication module series and firmware revision levels required in an enhanced redundancy system, see http://www.rockwellautomation.com/support/americas/index_en.html.

Steps After System Components Upgrade

Complete these remaining steps after upgrading the necessary components to an enhanced redundancy system

1. Apply power to the primary chassis.
2. Update and load the controller program.

IMPORTANT If you have an existing RSLogix 5000 program for the controller, update the program to reflect the new modules and firmware revisions. Updates required may include changes to tags, message paths, and controller properties, depending on your application.

3. If used, reschedule the ControlNet network.

For more information about rescheduling the ControlNet network, see [Update an Existing Scheduled Network on page 100](#).

4. Place the primary controller in Run mode.
5. Apply power to the secondary chassis.

If the Auto-Synchronization parameter is set to Always, the system begins qualification and synchronization automatically.

6. If your Auto-Synchronization parameter is set at Never or Conditional Disable, use the synchronization commands in the Synchronization tab of the RMCT to qualify and synchronize your system.

For more information about using the synchronization commands in the 1756-RMCT module, see [Commands in the Synchronization Tab on page 117](#).

You have completed the steps necessary to upgrade a standard system to an enhanced system.

IMPORTANT Before bringing your newly-upgraded system online and into production mode, test the system to verify that the changes made are suitable for your application.

Upgrade Ethernet Modules When Rotary Switches Are Set between 2...254

This section includes the procedure to upgrade your Ethernet communication modules when the modules rotary switches are set to 2...254 and you are unable to interrupt the primary.

IMPORTANT This procedure must be executed before steps 6...12 of [Upgrade by Using Redundancy System Update on page 250](#).

IMPORTANT This is a change from prior releases' upgrade procedures.

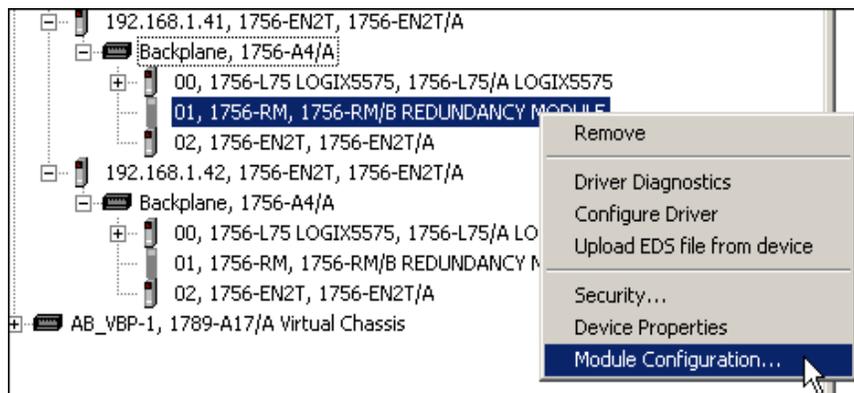
IMPORTANT Please note, **you must be physically present** at the location where the redundant chassis are located to do this upgrade.

IMPORTANT You can only upgrade from firmware revision 19.052 or later to firmware revision 20.054. These steps apply when upgrading from firmware revision 19.052 or later to firmware revision 20.054.

Before starting the following steps, complete [steps 1...5 on page 250](#).

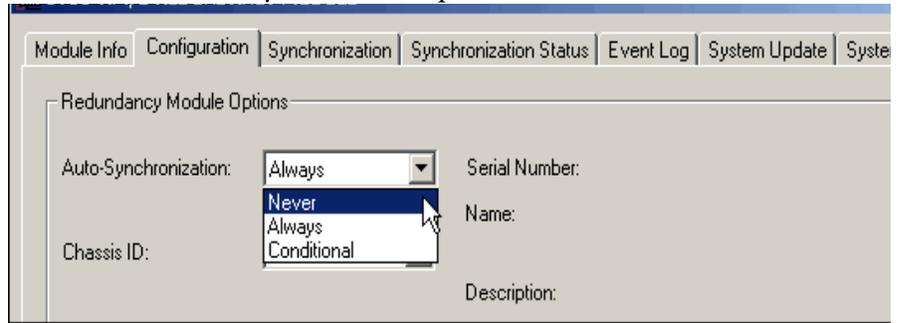
If your system is controlling a process and using rotary switches, follow these steps.

1. Set the mode switch of the primary and secondary controllers to REM.
If the redundant controllers in both chassis of the redundant chassis pair are not in Remote Program (REM) mode, the redundancy firmware upgrade cannot be completed.
2. Open RSLinx Classic software and browse to the redundancy module.
3. Right-click the redundancy module and choose Module Configuration.



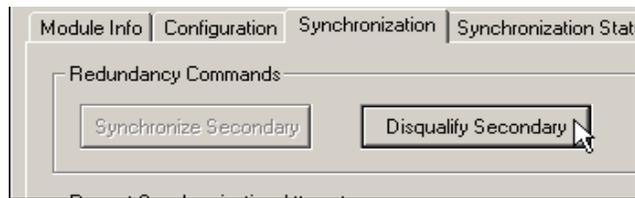
4. Click the Configuration tab.

5. From the Auto-Synchronization pull-down menu, choose Never.



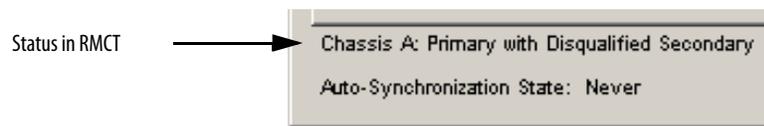
6. Click Apply, then click Yes.

7. Click the Synchronization tab.



8. Click Disqualify Secondary, then click Yes.

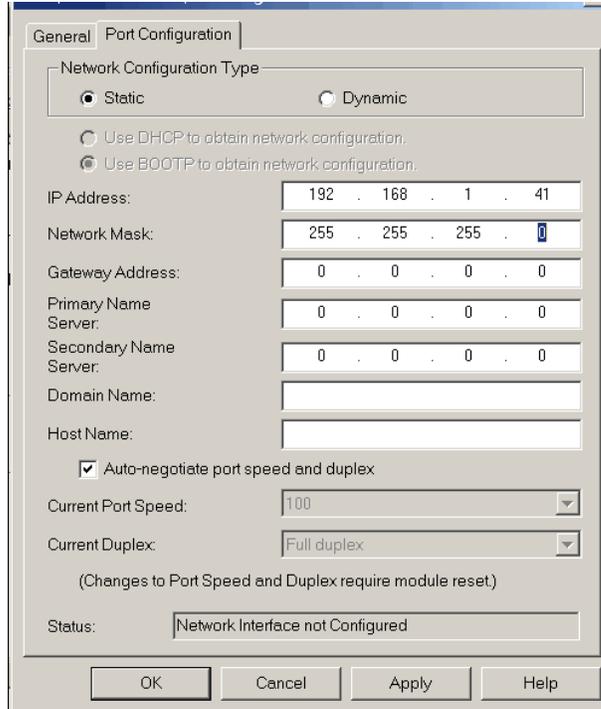
The secondary chassis is disqualified as indicated by the RMCT at the bottom-left of the RMCT and on the redundancy module's status display.



9. Click OK.

10. Make a note of the **primary** Ethernet module's Port Configuration including the following:

- IP Address
- Network Mask
- Gateway Address



11. Disconnect the Ethernet cable or cables from the secondary Ethernet module.

12. Remove the **secondary** Ethernet module from the secondary chassis.

Record the original rotary switch settings, as you need to set them back later.

Set the rotary switches to 999.

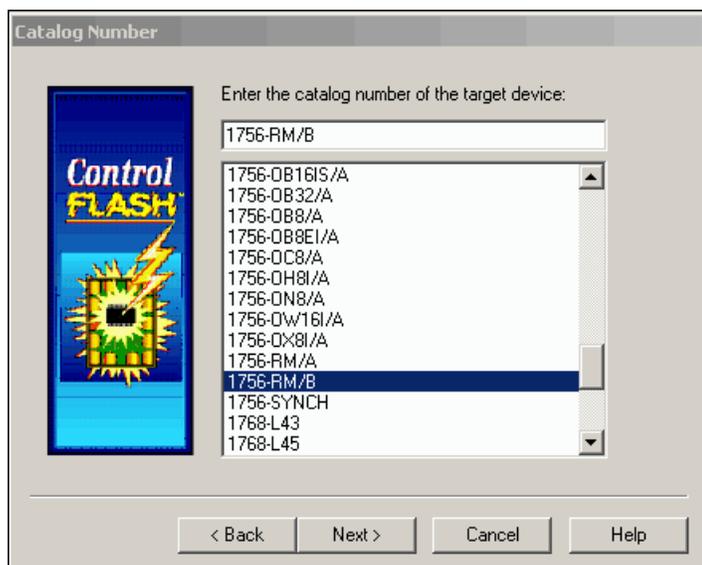
13. Reinsert the **secondary** Ethernet module into the secondary chassis.

14. Bridging across the backplane (or via the Ethernet module's USB port), configure the **secondary** Ethernet module's Port Configuration to match the **primary** Ethernet module's Port Configuration from [step 10](#).

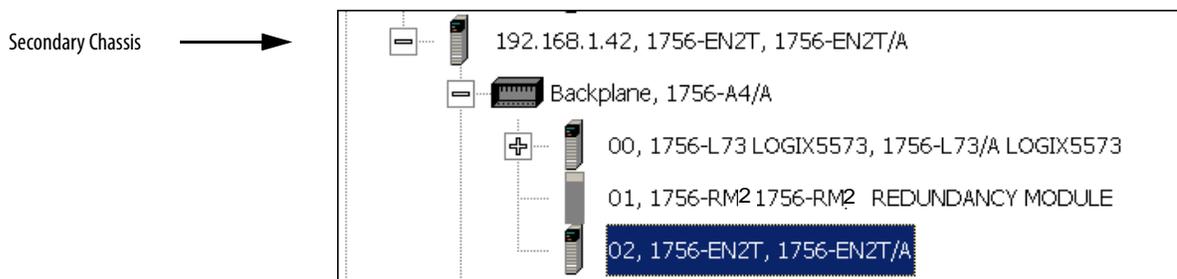
15. Update the **secondary** Ethernet module to firmware revision 5.008 by following these steps.

- a. Launch ControlFLASH software and click Next.

- b. Select the Ethernet module catalog number and click Next.

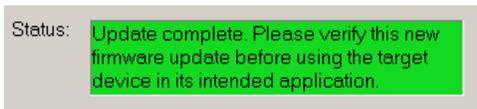


- c. Browse to the module and select it.



- d. Click OK.
 e. Select the firmware revision to upgrade to and click Next.
 f. Click Finish.

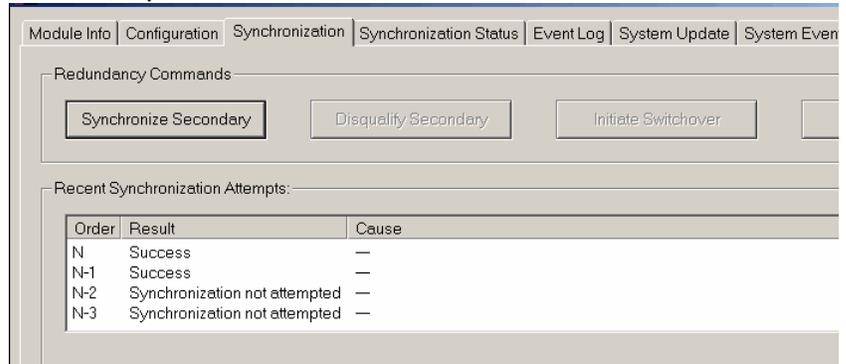
The firmware begins to update. When the update is complete, the Update status dialog box indicates completion.



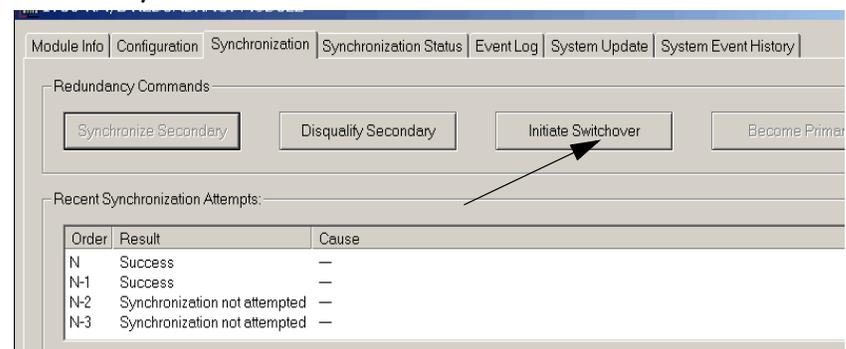
Wait for the update to complete.

16. After the update completes, reconnect the Ethernet cable or cables to the secondary Ethernet module and wait for communication to resume on the network.
17. Repeat [steps 10...16](#) for all Ethernet modules that have their rotary switches set between 2...254.

18. In RSLinx Classic software, browse in **this chassis** to the primary 1756-RM module.
19. Right-click to select Module Configuration to open the RMCT.
20. Click the Synchronization tab in the RMCT.

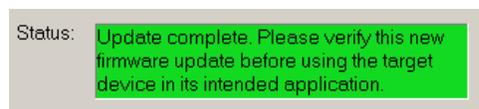


21. Click Synchronize Secondary, then click Yes.
22. After the redundant chassis pair synchronizes, click Initiate Switchover from the Synchronization tab in the RMCT, then click Yes.

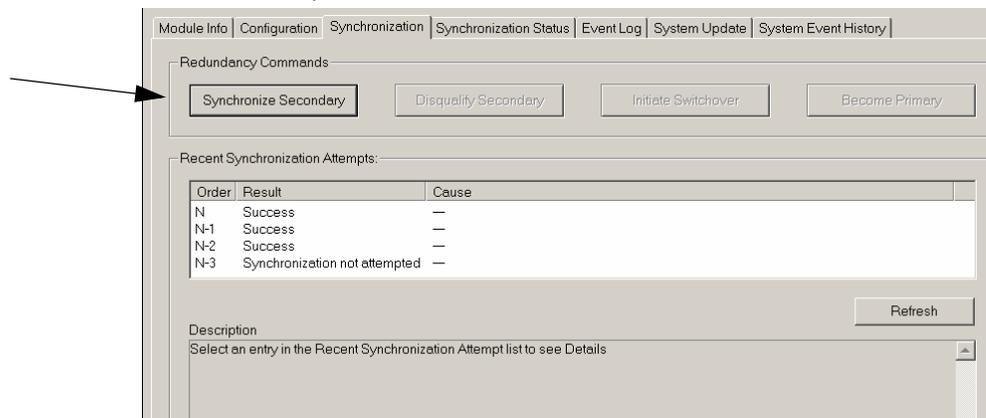


23. In RSLinx Classic software, select Module Configuration on the **new primary** Ethernet communication module.
24. Click the Port Configuration tab and change the Gateway address from 0.0.0.0 to 192.168.1.1.
25. Click Apply, then click OK.
26. Disconnect the Ethernet cable or cables from the secondary Ethernet module.
27. In ControlFLASH software, bridge across the backplane (or use the Ethernet module's USB port), and update the **new secondary** Ethernet module to firmware revision 5.008.

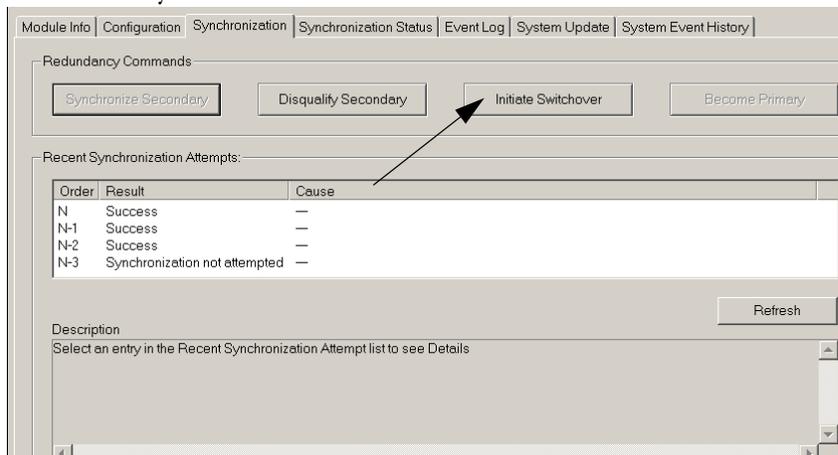
When the update is complete, the Update status dialog box indicates completion.



28. After the update completes, reconnect the Ethernet cable or cables to the secondary Ethernet module and wait for communication to resume on the network.
29. Repeat [steps 23...28](#) for all Ethernet modules that have their rotary switches set between 2...254.
30. In RSLinx Classic software, browse to the **primary 1756-RM** module.
31. Right-click to select Module Configuration to open the RMCT.
32. Click the Synchronization tab in the RMCT.



33. Click Synchronize Secondary, then click Yes.
34. After the redundant chassis pair synchronizes, select Initiate Switchover from the Synchronization tab in the RMCT, then click Yes.



35. Remove the **new secondary** Ethernet module from the chassis and reset the rotary switches back to their original setting from 999.
36. Reinsert the secondary Ethernet module back in the chassis and wait until network communication resumes.
37. Repeat [steps 35...36](#) for all Ethernet modules that have their rotary switches set between 2...254.

Upgrade by Using Redundancy System Update

You can upgrade an enhanced redundancy system revision to another while your process continues to run. This is known as Redundancy System Update (RSU).

IMPORTANT RSU is available only when upgrading from an **enhanced** redundancy system revision to another. You cannot use this process to upgrade from a **standard** redundancy system to an enhanced redundancy system.

IMPORTANT Any Ethernet communication modules that have the rotary switch set must first be updated using the [Upgrade Ethernet Modules When Rotary Switches Are Set between 2...254 on page 244](#)

IMPORTANT You can only upgrade from firmware revision 19.052 or later to firmware revision 20.054. These steps apply when upgrading from firmware revision 19.052 or later to firmware revision 20.054.

Complete these steps to upgrade your redundancy system from one **enhanced** redundancy system revision to another **enhanced** redundancy revision while your process continues to run.

1. [Step 1: Before You Begin](#)
2. [Step 2: Upgrade the Workstation Software](#)
3. [Step 3: Download and Install the Redundancy Firmware Bundle](#)
4. [Step 4: Upgrade the Redundancy Module Configuration Tool](#)
5. [Step 5: Add the EDS Files](#)
6. [Step 6: Prepare the Redundant Chassis for the Firmware Upgrade](#)
7. [Step 7: Upgrade the Primary Chassis Redundancy Module Firmware](#)
8. [Step 8: Upgrade the Secondary Redundancy Module Firmware and All Other Modules' Firmware in the Secondary Chassis](#)
9. [Step 9: Prepare the RSLogix 5000 Project for the Upgrade](#)
10. [Step 10: Lock the System and Initiate a Switchover to Upgrade](#)
11. [Step 11: Upgrade the New Secondary Chassis Firmware](#)
12. [Step 12: Synchronize the Redundant Chassis](#)

Step 1: Before You Begin

Consider these points before you begin upgrading your enhanced redundancy system to a new revision.

- During the upgrade procedures, you cannot use RSLogix 5000 software to change the mode of the controller. Instead, use the mode switch on the front of the controller.
- Leave RSNetWorx™ for ControlNet software closed or offline throughout this procedure. If the software is open or online, you see errors in the RSNetWorx for ControlNet software during the upgrade process.
- Remember the following when completing the tasks described in the rest of this section:
 - Do not make any changes to the RSLogix 5000 project other than those identified in these tasks.
 - Verify that no one will be or is making changes to the project.
 - Do not use a FactoryTalk Batch Server to change equipment phase-states when upgrading your enhanced redundancy system.

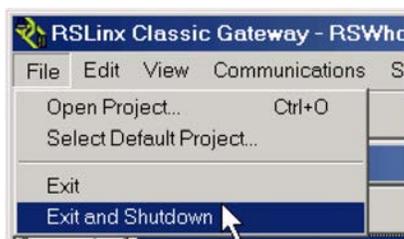
Step 2: Upgrade the Workstation Software

Before you download and upgrade software for your redundant system, use one of these methods to fully shut down RSLinx Classic software.

- Right-click the RSLinx Classic icon in the notification area of the screen and choose Shutdown RSLinx Classic.



- With RSLinx Classic software open, from the File menu, choose Exit and Shutdown.



Install the software required for your redundant system configuration. See [Software Requirements](#) on [page 49](#) for software versions required for use with this enhanced redundancy system revision.

Use the installation instructions or release notes provided with each software version for installation procedures and requirements.

Step 3: Download and Install the Redundancy Firmware Bundle

Download and install the redundancy firmware revision bundle from the Rockwell Automation Support website at: www.rockwellautomation.com/support/

Follow these steps.

1. Click the Downloads link on the Get Support Now menu.
2. Click Firmware Updates under Additional Resources.
3. Click Control Hardware.
4. Click the 1756-Lxx Enhanced Redundancy Bundle file.

The Flash Firmware Updates window appears.

5. Enter your Serial Number.
6. Click Qualify For Update.
7. Click Finish when the Qualified For Update window appears.
8. Download the zipped file.
9. Install the Redundancy Firmware Bundle.

Step 4: Upgrade the Redundancy Module Configuration Tool

The RMCT, version 8.01.05, is included in the enhanced redundancy system, revision 20.054_kit1 bundle. Once this bundle is installed, you can use the RMCT, version 8.01.05.

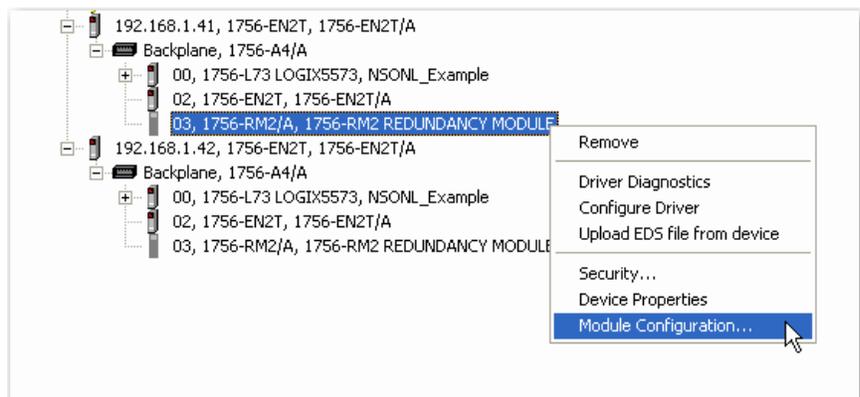
Verify Your RMCT Version

Complete these steps to check or verify the version of the RMCT you have installed.

1. Launch RSLinx Classic software.
2. Click RSWho.

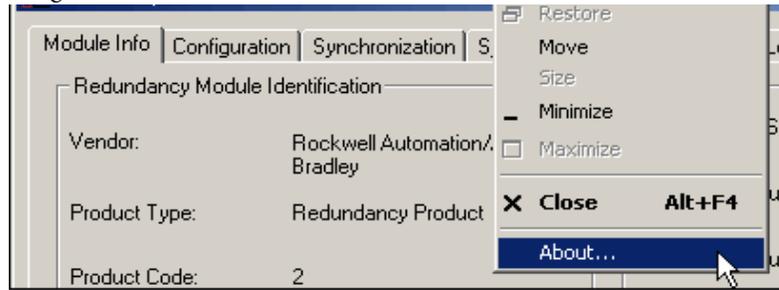


3. Right-click your redundancy module and choose Module Configuration.

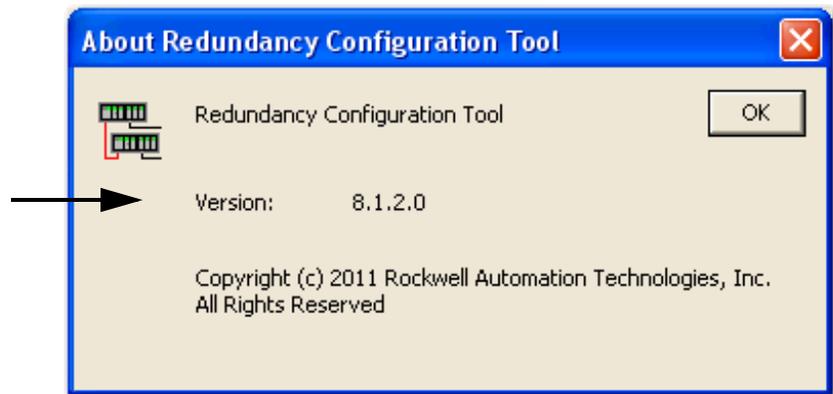


The Module Configuration dialog box opens.

4. Right-click the title bar and select About.



The About dialog box opens and indicates the RMCT version.



- TIP** The RMCT launches at the version that is compatible with the redundancy module firmware that is currently installed.
- If you upgrade your RMCT version but do not upgrade your redundancy module firmware revision compatible with the new RMCT version, the About dialog box may not reflect the new RMCT version.

Step 5: Add the EDS Files

If needed, obtain EDS files for modules in your system from the Rockwell Automation website at: <http://www.rockwellautomation.com/resources/eds/>.

Once you have downloaded the required EDS file, launch the EDS Hardware Configuration Tool by choosing Start > Programs > Rockwell Software > RSLinx Tools > EDS Hardware Installation Tool.

The tool then prompts you to Add or Remove EDS files.

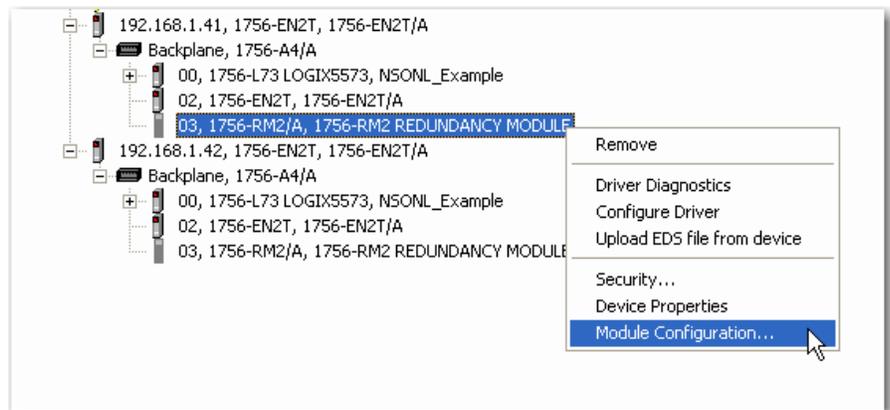
Step 6: Prepare the Redundant Chassis for the Firmware Upgrade

Complete these steps to prepare both the primary and secondary redundant chassis for redundancy firmware upgrades.

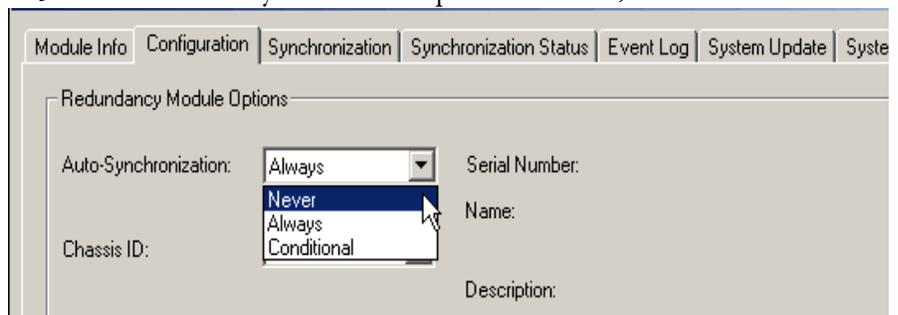
1. Set the mode switch of the primary and secondary controllers to REM.

If the redundant controllers in both chassis of the redundant chassis pair are not in Remote Program (REM) mode, the redundancy firmware upgrade cannot be completed.

2. Open RSLinx Classic software and browse to the redundancy module.
3. Right-click the redundancy module and select Module Configuration to open the RMCT.

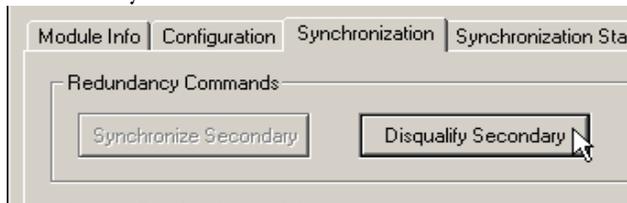


4. Click the Configuration tab in the RMCT.
5. From the Auto-Synchronization pull-down menu, choose Never.



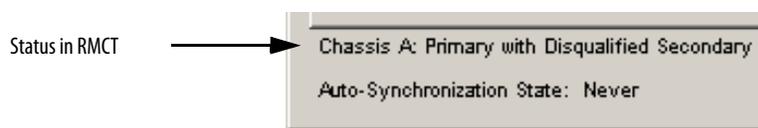
6. Click Apply, then click Yes.

- Click the Synchronization tab.



- Click Disqualify Secondary, then click Yes.

The secondary chassis is disqualified as indicated by the RMCT at the bottom-left of the RMCT and on the redundancy module's status display.



- Click OK and close the RMCT.

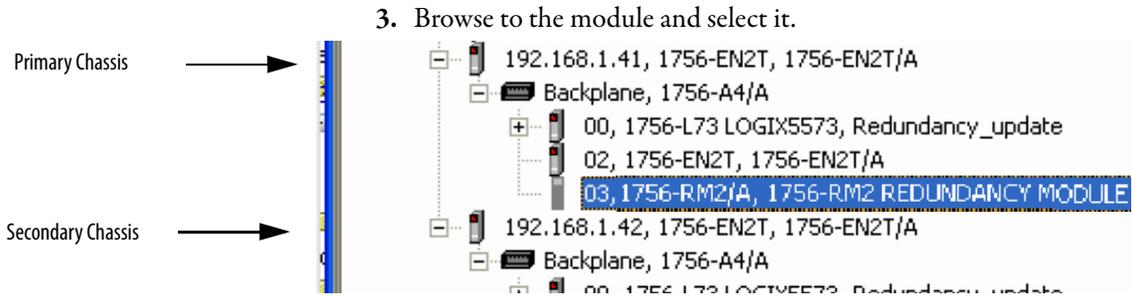
Closing the RMCT helps prevent a timeout from occurring when the redundancy module's firmware is upgraded.

Step 7: Upgrade the Primary Chassis Redundancy Module Firmware

Wait 45 seconds before you begin updating the 1756-RM firmware. During this time, the redundancy module conducts internal operations to prepare for an upgrade.

- Launch ControlFLASH software and click Next.
- Select the redundancy module catalog number and click Next.





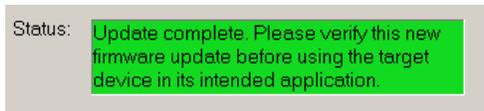
3. Browse to the module and select it.

4. Click OK.

5. Select the firmware revision to upgrade to and click Next.

6. Click Finish.

The firmware begins to update. When the update is complete, the Update status dialog box indicates completion.



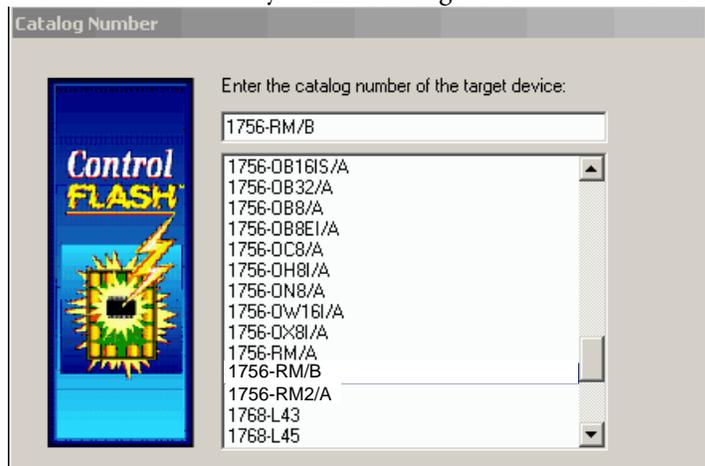
Step 8: Upgrade the Secondary Redundancy Module Firmware and All Other Modules' Firmware in the Secondary Chassis

Power on the secondary chassis. Wait 45 seconds before you begin updating the secondary chassis firmware. During this time, the redundancy module conducts internal operations to prepare for an upgrade.

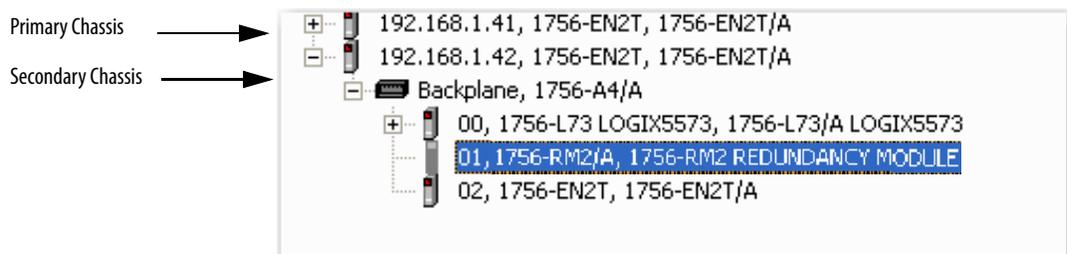
Complete these steps to upgrade the firmware in the secondary chassis.

1. Launch ControlFLASH software and click Next.

2. Select the redundancy module catalog number and click Next.

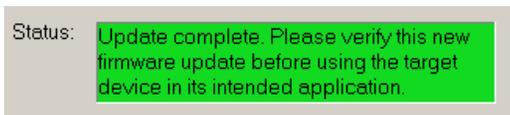


3. Browse to the module and select it.



4. Click OK.
5. Select the firmware revision to upgrade to and click Next.
6. Click Finish.

The firmware begins to update. When the update is complete, the Update status dialog box indicates completion.



7. If you are replacing or upgrading your controller hardware, remove the controller from the secondary chassis and replace it with the new controller.

Use this table to determine if your planned primary and secondary controllers can be used together in the redundant chassis.

Table 50 - Controller Compatibility

Primary Controller	Compatible Secondary Controller
1756-L61	1756-L61, 1756-L62, 1756-L63, 1756-L64, 1756-L65
1756-L62	1756-L62, 1756-L63, 1756-L64, 1756-L65
1756-L63	1756-L63, 1756-L64, 1756-L65
1756-L64	1756-L64, 1756-L65
1756-L65 ⁽¹⁾	1756-L65
1756-L71	1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75
1756-L72	1756-L72, 1756-L73, 1756-L74, 1756-L75
1756-L73	1756-L73, 1756-L74, 1756-L75
1756-L74	1756-L74, 1756-L75
1756-L75	1756-L75

(1) In the ControlLogix enhanced redundancy system, revision 19.052, the ControlLogix 1756-L65 controller's performance differs from that of the ControlLogix 1756-L64 controller.

IMPORTANT Controller compatibility is the same for the XT controllers as the standard controllers.

8. Complete steps 2...7 for each module in the secondary chassis, including a new controller, if applicable.

IMPORTANT Ethernet communication modules that have rotary switches set must have been previously updated using [Upgrade Ethernet Modules When Rotary Switches Are Set between 2...254 on page 244](#).

Once you have upgraded the firmware for each module in the secondary chassis, prepare the RSLogix 5000 project for the upgrade.

Step 9: Prepare the RSLogix 5000 Project for the Upgrade

Complete these steps to prepare the RSLogix 5000 program and controllers for the upgrade.

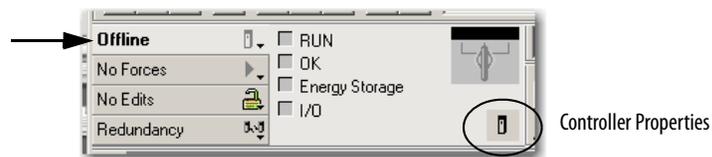
1. Launch RSLogix 5000 software and go online with the primary controller.
2. Verify that the watchdog time is set to a value that corresponds with the requirements of the enhanced redundancy system revision and your application.

See [Minimum Value for the Watchdog Time on page 177](#) for information about calculating the minimum watchdog time.

3. Cancel or assemble any pending test edits.
4. Remove all Sequential Function Chart (SFC) forces from the project.
5. Verify that no changes need to be made to the following:
 - I/O forces
 - I/O configuration

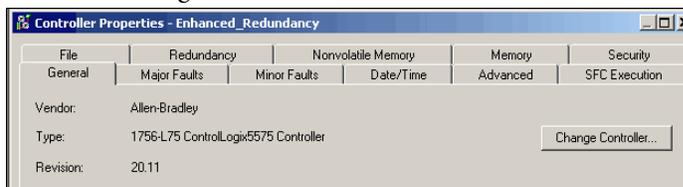
After this step, changes to I/O cannot be made until after the enhanced redundancy system revision upgrade is complete and both chassis are synchronized.

6. If you are upgrading an enhanced redundancy system, revision 16.81 or earlier, disable CST Mastership.
7. Configure the controllers and communication modules in the redundant chassis pair as necessary.
8. Save the project.
9. Go offline.



10. Click Controller Properties.

11. Click Change Controller.

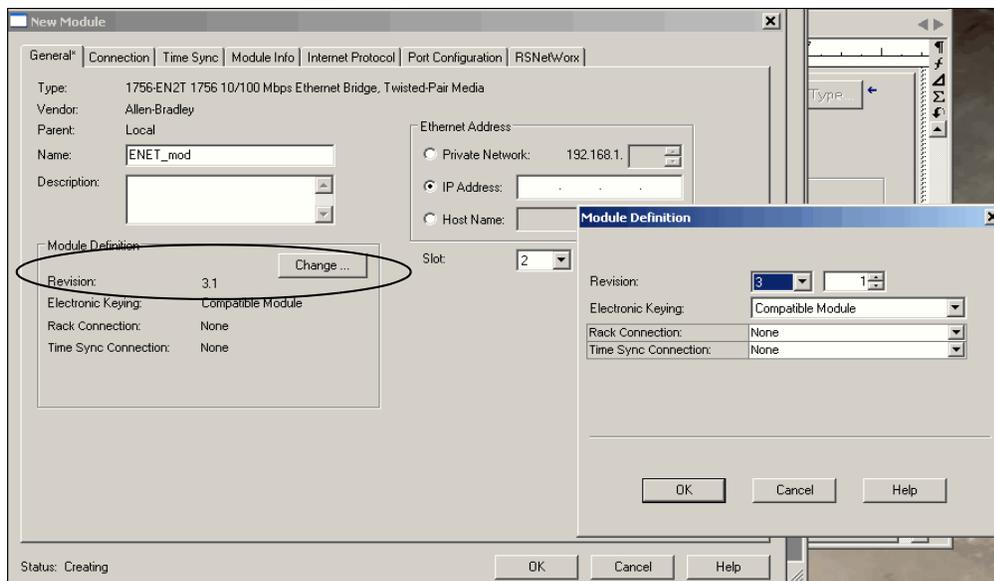


12. Specify the controller revision to which you are upgrading.

13. If you installed a new controller while upgrading the primary chassis firmware, specify the new controller catalog number.

14. Click OK.

15. Access the Module Properties for each communication module in the chassis and specify the module firmware revision to which you are upgrading.

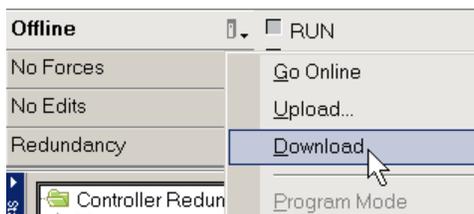


TIP If you are unable to specify the new revision, you may need to change the Electronic Keying parameter to Compatible Keying.

16. Save the project.

17. Download the project to the secondary controller.

The secondary controller is at the higher network address of the two available for the redundant chassis.



18. After the download is complete, go offline.

You are now ready to lock the system and initiate a locked switchover to update the primary chassis. Continue with [Step 10: Lock the System and Initiate a Switchover to Upgrade](#).

Step 10: Lock the System and Initiate a Switchover to Upgrade

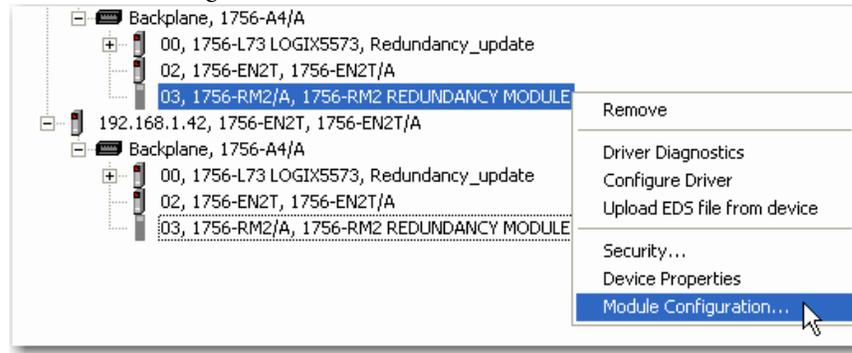
Once you have downloaded the RSLogix 5000 project you prepared, complete these steps to lock your system and initiate a switchover.

IMPORTANT

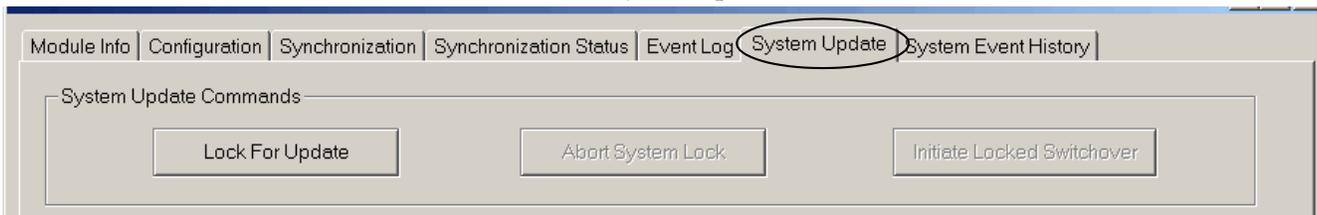
Remain offline while completing these steps.

- Once you have locked the system, do not abort the system lock. Aborting the system lock during this procedure clears the project from the secondary controller.
- Do not disconnect any communication cables while completing these steps.
- Completing a locked switchover causes SFC instructions to be reset to their initial state. This may result in SFC instructions executing twice.

1. Open the RMCT for the redundancy module in the primary chassis by right-clicking on the RM module in RSLinx Classic software and selecting Module Configuration.



2. Click the System Update tab.



3. Click Lock For Update, then click Yes.
4. Wait for the system to lock.

The System Update Lock Attempts log indicates when the system lock is complete.

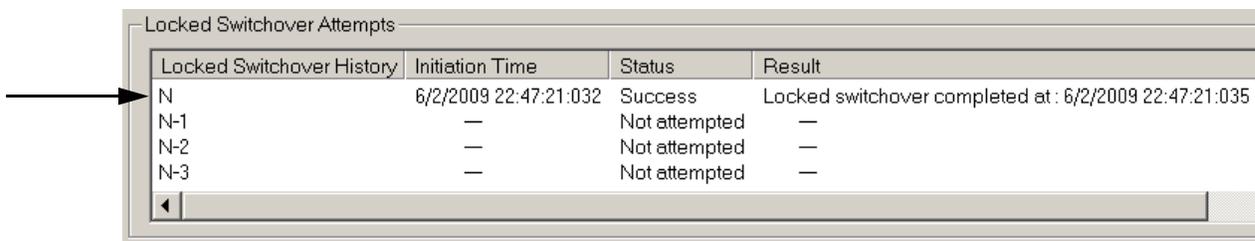


System Update Lock Attempts			
System Lock History	Initiation Time	Status	Result
N	6/2/2009 22:45:07:175	Locked	System locked at :6/2/2009 22:45:38:849
N-1	—	Not attempted	—
N-2	—	Not attempted	—
N-3	—	Not attempted	—

5. Click Initiate Locked Switchover, then click Yes.

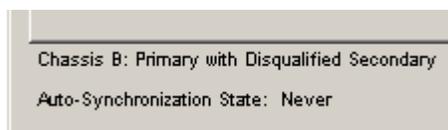


This step results in your secondary chassis assuming control and becoming the primary chassis. When the switchover is complete, the Locked Switchover Attempts log indicates success.



Locked Switchover Attempts			
Locked Switchover History	Initiation Time	Status	Result
N	6/2/2009 22:47:21:032	Success	Locked switchover completed at : 6/2/2009 22:47:21:035
N-1	—	Not attempted	—
N-2	—	Not attempted	—
N-3	—	Not attempted	—

In addition to the log, the text in chassis status row indicates the switchover state.



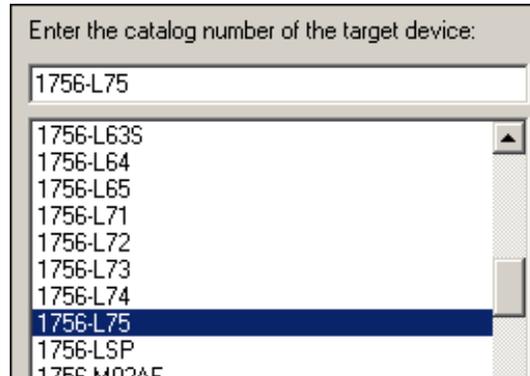
Once your locked switchover is complete, upgrade the firmware revisions for modules in the new secondary chassis.

IMPORTANT Following the locked switchover, secondary controllers no longer contain a user application and their configuration settings are reset to the factory-default settings. The new secondary controllers use the default settings and the components in the secondary chassis are upgraded and the system is synchronized.

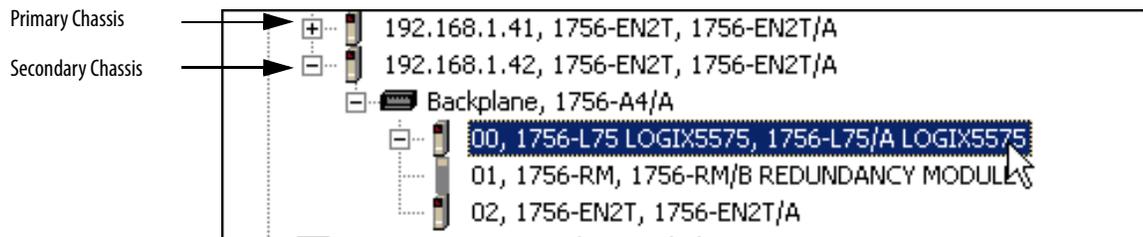
Step 11: Upgrade the New Secondary Chassis Firmware

Complete these steps to upgrade the firmware of all of the modules in the new secondary chassis, except for the redundancy module that was already upgraded as described in [Step 7: Upgrade the Primary Chassis Redundancy Module Firmware on page 255](#).

1. If you are replacing and upgrading your controller hardware, remove the controller from the secondary chassis and replace it with the new controller.
2. Launch ControlFLASH software and click Next.
3. Select the module catalog number and click Next.

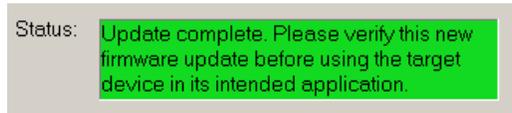


4. Browse to the module and select it.



5. Click OK.
6. Select the firmware revision to upgrade to and click Next.
7. Click Finish.

The firmware begins to update. When the updated is complete, the Update status dialog box indicates completion.



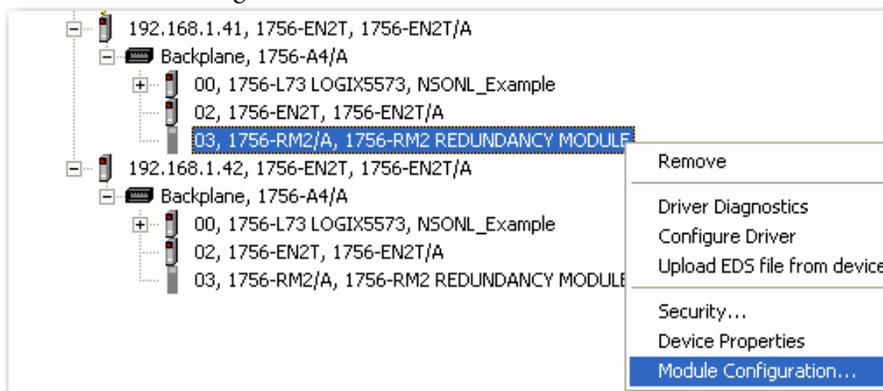
8. Complete steps [2](#) ... [7](#) for each module in the new secondary chassis, including the new controllers, if applicable.

Once you have upgraded the firmware for each of the modules in the new secondary chassis, continue by synchronizing the redundant chassis.

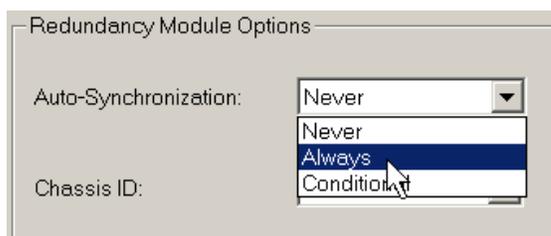
Step 12: Synchronize the Redundant Chassis

Complete these steps to synchronize the redundant chassis after firmware in both chassis have been upgraded to the same revision.

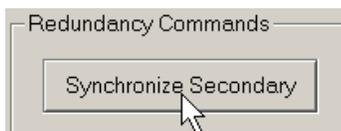
1. Launch the RMCT for the redundancy module in the primary chassis by right-clicking on the module in RSLinx Classic software and selecting Module Configuration.



2. From the Auto-Synchronization pull-down menu, choose the frequency that suits your application.



3. Click Apply, then click Yes.
4. Synchronize the chassis.



5. Set the redundancy module date and time according to your preference.
6. Click OK.
7. Close the RMCT.

Your redundant system firmware upgrade is now complete.

Replace 1756-RM/A or 1756-RM/B Redundancy Modules with 1756-RM2/A Redundancy Modules

If you need to replace your current redundancy modules with 1756-RM2/A modules, you can do so without initiating a switchover.

TIP For the following steps, 'redundancy' module is used when referring to the 1756-RM/A or 1756-RM/B modules.

Before executing these steps, review the most recent Redundancy Bundle release notes to determine the 1756-RM2 firmware revision and RMCT version needed. You can find this information at the Product Compatibility and Download Center at <http://www.rockwellautomation.com/support/downloads.html>.

1. Install the compatible version of the RMCT software.

You must shut down RSLinx Classic software to perform the installation, and then restart RSLinx Classic software after the installation is complete.

2. Set the Auto-Synchronization option in the Configuration tab of the RMCT to Never.
3. Using the RMCT, disqualify the redundant chassis pair (if not already disqualified).
4. Unplug the fiber cable on both of the redundancy modules.
5. Close any open RMCT sessions connected to the current redundancy modules being replaced.
6. Remove the redundancy module pair (in any order) from the redundant chassis.
7. Insert the 1756-RM2/A redundancy module pair (in any order) in the redundant chassis into the same slots as the redundancy modules.
8. If not already installed, install the EDS file for the 1756-RM2/A module by uploading it from the module by using RSLinx Classic software.

If needed, obtain the EDS file for the 1756-RM2/A module. Right click on the module in RSWho and select 'Upload EDS file from device.'

9. Update to the appropriate firmware revision in the primary and secondary 1756-RM2/A modules.
10. Reconnect the fiber cable on either CH1 or CH2 of the 1756-RM2/A redundancy module.
11. Optional: Connect a second fiber cable on the remaining channel if fiber redundancy is desired.
12. Wait for at least 45 seconds after connecting one of the fiber cables.
13. Launch the RMCT again for the newly-installed 1756-RM2/A modules.
14. Set the Auto-Synchronization option in the Configuration tab back to the original value or to a new desired value.
15. Using the RMCT, synchronize the system again (if it is not already qualified).

Convert from a Nonredundant System

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When converting from a nonredundant to a redundant system, first consider the following:

- You can use only RSLogix 5000 software versions 16, 19, or 20 in an enhanced redundancy system.
- The redundant chassis pair has controller, communication module and I/O module restrictions.

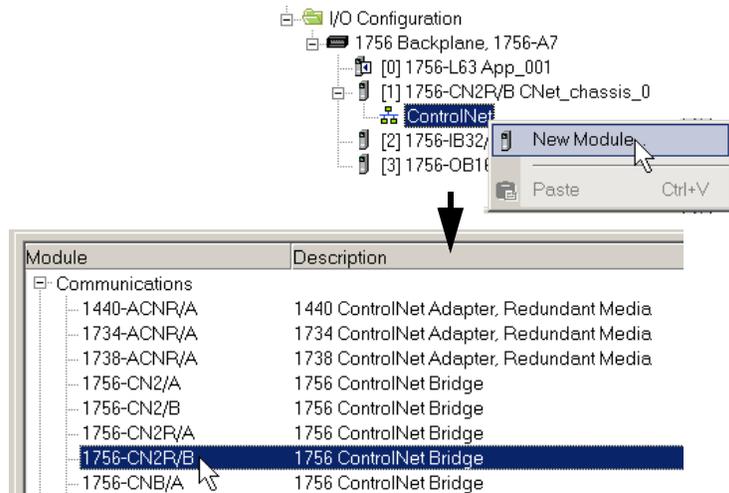
See [Chapter 1](#) for additional information.

Complete the tasks in this section to convert a nonredundant ControlLogix system to an enhanced redundancy system.

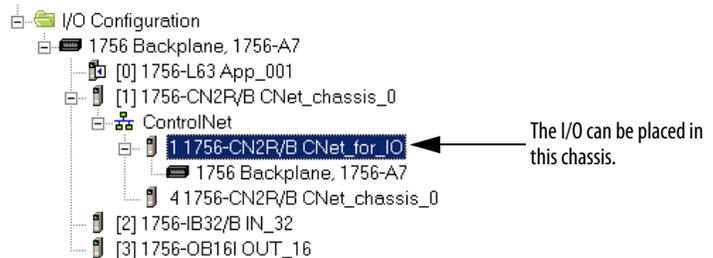
Update the Configuration in RSLogix 5000 Software

These steps provide an overview of the process required to update the I/O Configuration tree in RSLogix 5000 software.

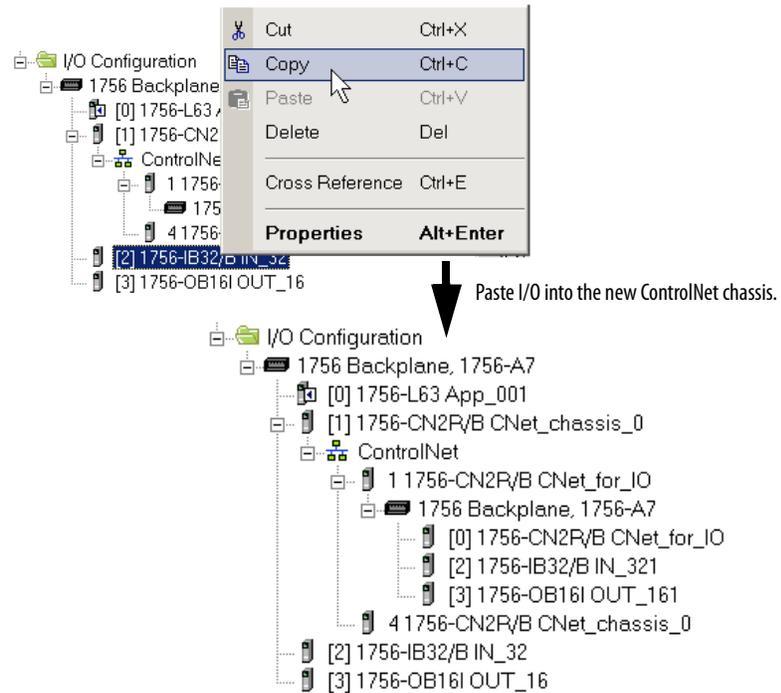
1. If you have I/O in the chassis with the controller, add a ControlLogix communication module to the appropriate network because I/O modules are not permitted in a redundant chassis.



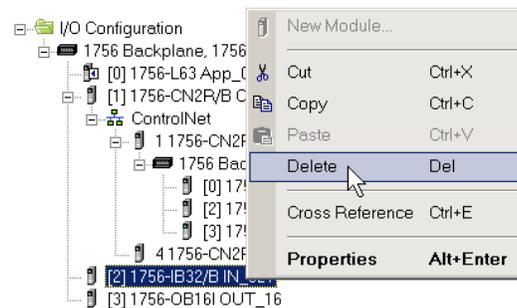
You can now move the I/O modules to the new chassis in the I/O Configuration tree.



- Copy the I/O modules and paste them into the chassis of the newly-added communication module.



- Delete the I/O modules from the controller chassis configuration.

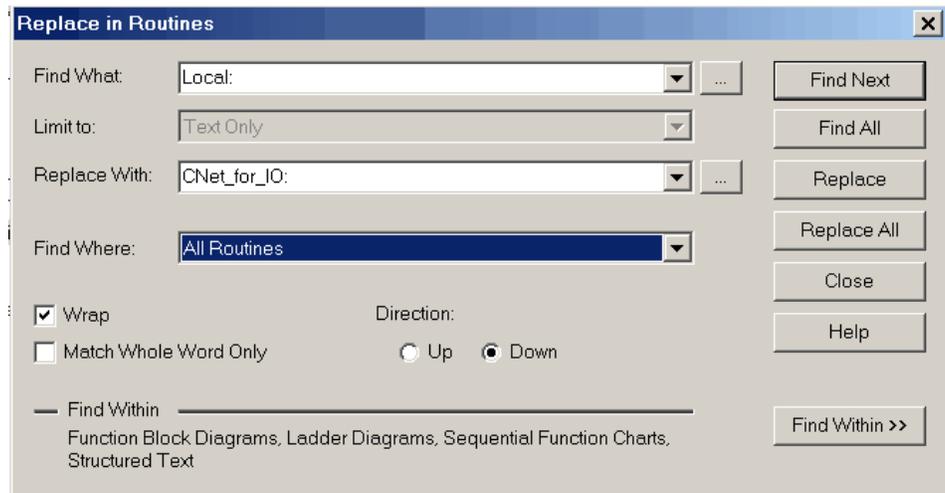


- Continue by completing the procedures to [Replace Local I/O Tags](#) and to [Replace Aliases to Local I/O Tags](#).

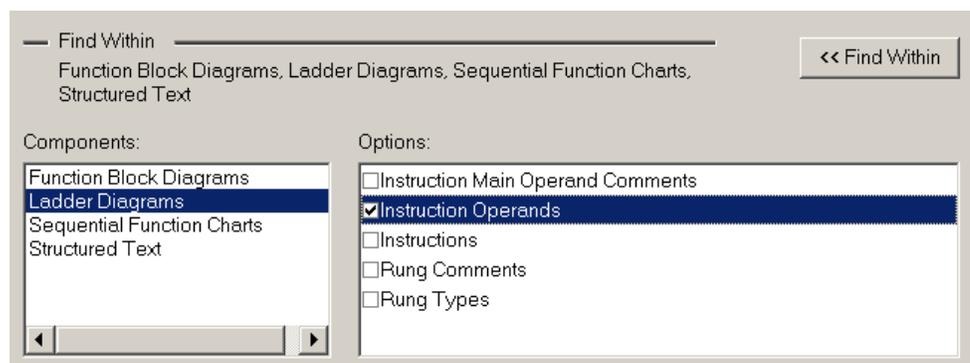
Replace Local I/O Tags

If you have moved I/O modules out of the local controller chassis and into the remote I/O chassis, complete these steps to find and replace the local I/O tags in your program.

1. Open the routine where the local I/O tags need to be updated.
2. Press CTRL+H to open the Replace in Routines dialog box.

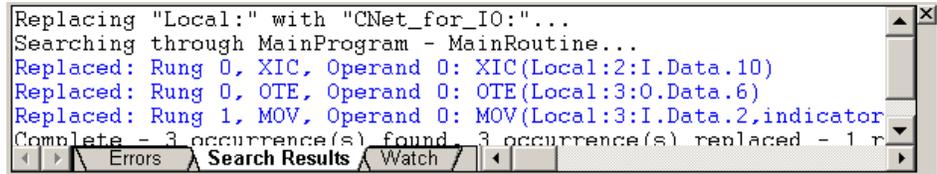


3. From the Find What pull-down menu, choose Local:.
4. From the Replace With pull-down menu, choose the name of the communication module where the remote I/O was placed.
5. From the Find Where pull-down menu, choose All Routines.
6. Click Find Within >>.
7. Select Ladder Diagrams.
8. Check Instruction Operands.



9. Click Replace All.

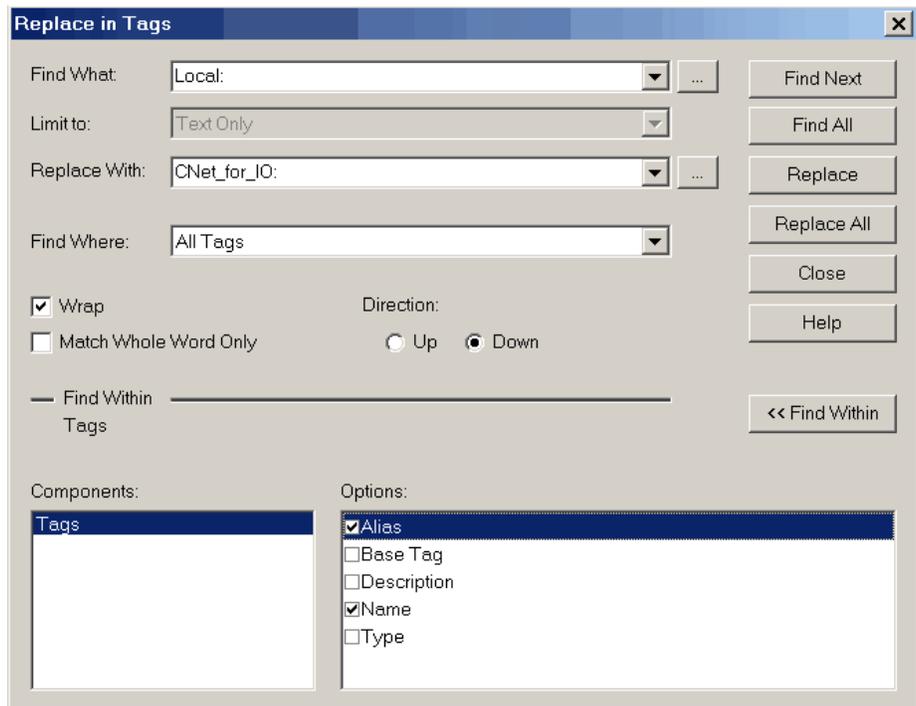
The find/replace is completed and the results are indicated in the Search Results tab.



Replace Aliases to Local I/O Tags

If your program uses alias tags for the I/O modules that you are moving, complete these steps to replace alias tags.

1. In RSLogix 5000 software, open the Controller Tags.
2. Press CTRL+H to open the Replace Tags dialog box.



3. From the Find What pull-down menu, choose Local:.
4. From the Replace With pull-down menu, choose the name of the communication module where the remote I/O was placed.
5. From the Find Where pull-down menu, choose All Tags.
6. Click Find Within >>.
7. Select Alias and click Replace All.

The Search Results tab indicates the changed tags.

Remove Other Modules from the Controller Chassis

If modules other than those listed below are in the controller chassis, you must remove them. You can use these modules in ControlLogix enhanced redundancy systems.

Table 51 - Components Available for Use in a Redundant Chassis Pair

Module type	Cat. No.	Description	Available with Enhanced System, Revision 20.054	Available with Enhanced System, Revision 19.053 or later	Available with Enhanced System, Revision 19.052 or later	Available with Enhanced System, Revision 16.081
Communication modules	1756-CN2/B	ControlLogix ControlNet bridge module	✓	✓	✓	✓
	1756-CN2R/B	ControlLogix redundant media ControlNet bridge module	✓	✓	✓	✓
	1756-CN2RXT	ControlLogix-XT ControlNet bridge module	✓	✓	✓	✓
	1756-EN2T	ControlLogix EtherNet/IP bridge module	✓	✓	✓	✓
	1756-EN2TR	ControlLogix EtherNet/IP 2-port module	✓	✓	✓	
	1756-EN2TXT	ControlLogix-XT EtherNet/IP bridge module	✓	✓	✓	✓
	1756-EN2F	ControlLogix EtherNet/IP 2-port fiber module	✓	✓		
Controllers	1756-L61, 1756-L62, 1756-L63, 1756-L64	ControlLogix controllers	✓		✓	✓
	1756-L63XT	ControlLogix-XT controller	✓		✓	✓
	1756-L65	ControlLogix controller	✓		✓	
	1756-L72, 1756-L73, 1756-L74, 1756-L75	ControlLogix controllers	✓	✓		
	1756-L71		✓			
	1756-L73XT	ControlLogix-XT controller	✓	✓		
Redundancy modules	1756-RM	ControlLogix redundancy module	✓		✓	✓
	1756-RMXT	ControlLogix-XT redundancy module	✓		✓	✓

Add an Identical Chassis

After you have configured your primary chassis with the modules listed above, add an identical chassis that contains the same modules with the same module-placement.

For more information about chassis configuration, see the section titled [Redundant Chassis on page 28](#).

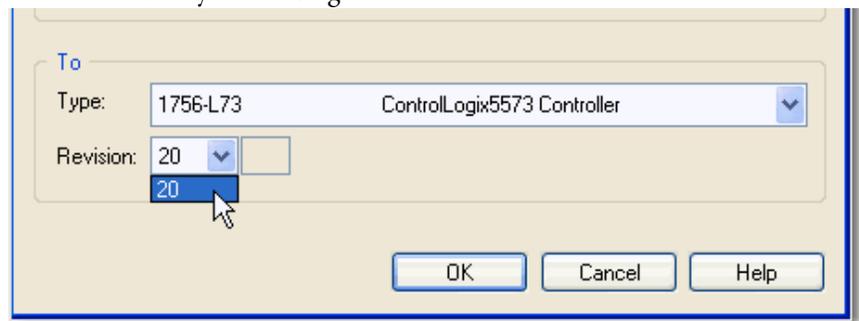
Upgrade to Enhanced Redundancy Firmware

Once you have made the appropriate changes to your system configuration and program, and have added the identical chassis, upgrade your system firmware.

For information about upgrading the redundant system firmware, see [Step 4: Update Redundant Chassis Firmware on page 67](#).

Update the Controller Revision and Download the Project

After you upgrade the firmware, use RSLogix 5000 software to access the controller properties and update the controller revision to match the redundancy firmware revision you are using.



Once you have updated the controller firmware revision and saved the changes, download the updated program to the controller.

Notes:

Redundancy Object Attributes

Use this table of redundancy object attributes as a reference when programming to obtain the status of your redundancy system.

For this information	Get this attribute	Data Type	GSV/SSV	Description		
				If	Then	
Redundancy status of the entire chassis.	ChassisRedundancyState	INT	GSV			
				16#2	Primary with synchronized secondary	
				16#3	Primary with disqualified secondary	
				16#4	Primary with no secondary	
				16#10	Primary locked for update	
Redundancy state of the partner chassis.	PartnerChassisRedundancyState	INT	GSV			
				16#8	Synchronized secondary	
				16#9	Disqualified secondary with primary	
				16#E	No partner	
				16#12	Secondary locked for update	
Redundancy status of the controller.	ModuleRedundancy State	INT	GSV			
				16#2	Primary with synchronized secondary	
				16#3	Primary with disqualified secondary	
				16#4	Primary with no secondary	
				16#6	Primary with synchronizing secondary	
				16#F	Primary locking for update.	
				16#10	Primary locked for update	
Redundancy state of the partner.	PartnerModuleRedundancyState	INT	GSV			
				16#7	Synchronizing secondary	
				16#8	Synchronized secondary	
				16#9	Disqualified secondary with primary	
				16#E	No partner	
				16#11	Secondary locking for update	
				16#12	Secondary locked for update	
Results of the compatibility checks with the partner controller.	CompatibilityResults	INT	GSV			
				0	Undetermined	
				1	No compatible partner	
				2	Fully compatible partner	

For this information	Get this attribute	Data Type	GSV/SSV	Description	
				If	Then
Status of the synchronization (qualification) process.	QualificationInProgress	INT	GSV	-1	Synchronization (qualification) is not in progress.
				0	Unsupported
				1 - 99	For modules that can measure their completion percentage, the percent of synchronization (qualification) that is complete.
				50	For modules that cannot measure their completion percentage, synchronization (qualification) is in progress.
				100	Synchronization (qualification) is complete.
Mode switch settings of the controller and its partner match or do not match.	ModeswitchAlarm	DINT	GSV		
				0	<ul style="list-style-type: none"> • The mode switches match OR • No partner is present.
				1	Mode switches do not match
Position of the mode switchmode switch of the partner.	Partnermode switch	DINT	GSV		Then the mode switch is in
				0	Unknown
				1	RUN
				2	PROG
				3	REM
Status of the minor faults of the partner (if the ModuleRedundancyState indicates that a partner is present).	PartnerMinorFaults	DINT	GSV		Means this minor fault
				1	Power-up fault
				3	IO fault
				4	Problem with an instruction (program)
				6	Periodic task overlap (watchdog)
				9	Problem with the serial port
				10	Low battery or issue with the energy storage module
Mode of the partner.	PartnerMode	DINT	GSV		
				16#0	Power up
				16#1	Program
				16#2	Run
				16#3	Test
				16#4	Faulted
				16#5	Run-to-program
				16#6	Test-to-program
				16#7	Program-to-run
				16#8	Test-to-run
				16#9	Run-to-test
				16#A	Program-to-test
				16#B	Into faulted
16#C	Faulted-to-program				

For this information	Get this attribute	Data Type	GSV/SSV	Description	
In a pair of redundant chassis, identification of a specific chassis without regard to the state of the chassis.	PhysicalChassisID	INT	GSV	If	Then
				0	Unknown
				1	Chassis A
				2	Chassis B
Slot number of the 1756-RM module in this chassis.	1756-RM SlotNumber	INT	GSV		
<ul style="list-style-type: none"> Size of the last crossload. Size of the last crossload if you had a secondary chassis. 	LastDataTransfer Size	DINT	GSV	This attribute gives the size of data that was or would have been crossloaded in the last scan in the number of DINT's (4-byte words). The secondary chassis does not have to be connected or online. If you do not have a secondary chassis, the number of DINT's that would have been crossloaded are indicated.	
<ul style="list-style-type: none"> Size of the biggest crossload. Size of the biggest crossload if you had a secondary chassis. 	MaxDataTransfer Size	DINT	GSV SSV	This attribute gives the biggest size of the LastDataTransfer Size attribute in DINTs (4-byte words). The secondary chassis does not have to be connected or online. If you do not have a secondary chassis, the largest number of DINTs that would have been crossloaded are indicated. If you need to reset this value, use an SSV instruction with a Source value of 0.	

Notes:

Enhanced Redundancy System Checklists

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ControlNet Checklist	279
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Chassis Configuration Checklist

✓	Requirement
	Chassis used for the redundant pair are the same size, for example, both are 1756-A7, 7-slot chassis.
	Only these modules are used in the redundant chassis: <ul style="list-style-type: none"> • ControlLogix controllers, catalog numbers 1756-L61, 1756-L62, 1756-L63, 1756-L63XT, 1756-L64, 1756-L65, 1756-L71, 1756-L72, 1756-L73, 1756-L73XT, 1756-L74, 1756-L75 • ControlNet communication modules, catalog numbers 1756-CN2/B, 1756-CN2R/B, 1756-CN2RXT • EtherNet/IP communication modules, catalog numbers 1756-EN2T, 1756-EN2TXT, 1756-EN2TR, 1756-EN2F • Redundancy modules, catalog numbers 1756-RM, 1756-RMXT, 1756-RM2/A, 1756-RM2XT
	Each chassis of the pair is comprised of identical modules that are of identical redundancy firmware revisions, series, and memory sizes. ⁽¹⁾
	Partner modules are placed in same slots of both chassis of the redundant pair (for example, the 1756-L63 is placed in slot 0 of both chassis).
	I/O modules are not placed in the redundant chassis.
	Seven or fewer communication modules of any type or combination are used in each redundant chassis.

(1) There are some exceptions to this requirement. For more information, see [Redundant Chassis on page 28](#).

Remote I/O Checklist

✓	Requirement
	I/O is not placed in redundant chassis.
	<p>I/O is connected to the redundant chassis by using one of these networking options:</p> <ul style="list-style-type: none"> • ControlNet connections to the same ControlNet network as the redundant controller chassis, without bridging. • EtherNet/IP connections to the same EtherNet/IP network as the redundant controller chassis, without bridging. If in the I/O tree of the redundancy controller, all I/O and consumed tag connections must be multicast connections. The I/O tree of the redundancy controller may contain produced unicast tags consumed by remote users. • A DeviceNet network connected through a 1756-DNB DeviceNet communication module in a remote, that is, nonredundant, chassis. • A universal remote I/O or Data Highway Plus network connected through the use of a 1756-DHRIO module in a remote (nonredundant) chassis.

Redundancy Module Checklist

✓	Requirement
	One redundancy module is placed in the same slot of each redundant chassis.
	<p>Series A and B redundancy modules are fully compatible. Therefore, you can use any combination of them in a partnered set, for example, a 1756-RM/A module in the primary chassis and a 1756-RM/B module in the secondary chassis. However, the best scan performance occurs when two Series B redundancy modules are used with 1756-L7x controllers.</p> <hr/> <p>IMPORTANT The scan time is slightly extended when you downgrade a Series B redundancy module to a Series A module in conjunction with a 1756-L7x controller in the redundant chassis pair. In this case, raise the task watchdog limits by a factor of ~2x before downgrading. Thereafter, you can re-tune the limits based on the updated scan time numbers.</p> <p>If your application uses 1756-L6x controllers in the redundant chassis pair, using a combination of Series A and Series B redundancy modules results in the same performance as if you use only a Series A redundancy module in the redundancy chassis pair, regardless of the primary or secondary redundancy state.</p> <hr/> <p>A fiber-optic cable connects the redundancy modules in the redundant chassis pair. These are catalog numbers of fiber-optic cable you can order from Rockwell Automation:</p> <ul style="list-style-type: none"> • 1756-RMC1 (1 m, 3.28 ft) • 1756-RMC3 (3 m, 9.84 ft) • 1756-RMC10 (10 m, 32.81 ft) <p>If necessary, you can make your own fiber-optic cable that is up to 4 km (13,123.36 ft) for the 1756-RM/B module or 10 km (32,808.40 ft) for the 1756-RM2 module.</p>

ControlLogix Controller Checklist

✓	Requirement
	Identical ControlLogix controllers are placed in the same slot of both chassis of the redundant pair.
	Partnered controllers are identical in redundancy firmware revision, and memory size.
	Within each redundant chassis, one or two (maximum) of these controllers are used: <ul style="list-style-type: none"> • 1756-L61, 1756-L62, 1756-L63, 1756-L63XT, 1756-L64⁽¹⁾, 1756-L65 • 1756-L71, 1756-L72, 1756-L73, 1756-L73XT, 1756-L74, 1756-L75 Do not combine 1756-L6x and 1756-L7x controllers in a redundant chassis.
	Each controller in the redundancy chassis has enough memory to store twice the amount of controller data and I/O memory. (See Knowledgebase ID 28972 for more information.)
	Eight controller connections are reserved for redundancy use.

(1) When using ControlLogix enhanced redundancy system, revision 16.081 or earlier, you cannot use two 1756-L64 controllers in the same chassis. You can, however, use a 1756-L64 controller in the same chassis as a 1756-L61, 1756-L62, or 1756-L63 controller.

ControlNet Checklist

✓	Requirement
ControlNet Module	
	Identical ControlNet modules are placed in the same slot of both chassis of the redundant pair.
	ControlNet modules are identical in redundancy firmware revision and in series.
	Only the 1756-CN2/B, 1756-CN2R/B, or 1756-CN2RXT ControlNet modules are used.
	Partnered ControlNet modules both have identical keeper information as explained in the ControlNet Modules in Logix5000 Control Systems User Manual, publication CNET-UM001 .
	Three connections of the ControlNet module are appropriately reserved for redundancy system use.
ControlNet Network	
	USB ports of communication modules in the redundant chassis are not used while the system is running (online).
	At least four ControlNet nodes are used on the ControlNet network. That is, at least two ControlNet nodes are on the ControlNet network in addition to the two ControlNet modules in the redundant chassis.
	These requirements apply to at least one ControlNet node: <ul style="list-style-type: none"> • It is not in the redundant chassis pair. • It uses a node address lower than the ControlNet node addresses of modules in redundant chassis pair. These requirements apply to all ControlNet communication modules available in an enhanced redundancy systems.
	ControlNet module partners in the redundant chassis have the following: <ul style="list-style-type: none"> • Node address switches set to the same address (for example, both modules' switches are set to node address 13). • Two consecutive node addresses reserved (for example, nodes 13 and 14) to accommodate a switchover. The primary ControlNet module can have an even or odd-numbered node address.
	The ControlNet network is scheduled by using techniques described in the ControlNet Modules in Logix5000 Control Systems User Manual, publication CNET-UM001 . ⁽¹⁾
	Devices on other communication networks are bridged to the ControlNet network appropriately.

✓	Requirement
ControlNet HMI	
	A ControlNet network or a ControlNet-to-EtherNet/IP gateway is used to connect to HMI because your system requires that HMI be updated immediately after a switchover.
	<ul style="list-style-type: none"> • PanelView Standard terminal, PanelView 1000e or 1400e terminal For an unscheduled network, ≤ 4 HMI terminals per controller are used. For a scheduled network, any amount of terminals within the limits of the ControlNet network are used. • PanelView Plus terminal, VersaView industrial computer running a Windows CE operating system RSLinx Enterprise software, version 5.0 or later, is used. Within each controller and communication module, five connections for each PanelView Plus or VersaView terminal are reserved. • FactoryTalk View SE software with RSLinx communication software, version 2.52 or later, RSView® 32 software, RSLinx Enterprise software, version 5.0 The number of RSLinx servers that a controller uses is limited to 1 . . . 4 (maximum).

(1) Unscheduled ControlNet networks can be used, however, certain use considerations must be made. See Chapter 5, [Configure the ControlNet Network on page 93](#).

EtherNet/IP Module Checklist

✓	Requirement
EtherNet/IP Module	
	Identical EtherNet/IP communication modules are placed in the same slot of both chassis of the redundant chassis pair.
	EtherNet/IP communication modules are one of these catalog numbers: <ul style="list-style-type: none"> • 1756-EN2T, 1756-EN2TXT, 1756-EN2TR, 1756-EN2F
EtherNet/IP Network	
	With firmware revision 19.052 and later, you can use an EtherNet/IP network for I/O and produced/consumed tags. With firmware revisions 16.081 and earlier, an EtherNet/IP network does not support I/O or produced/consumed tags.
	Enhanced redundancy systems support unicast produced tags. Unicast consumed tags are not supported in enhanced redundancy systems.
	USB ports of communication modules in the redundant chassis are not used while the system is running (online).
	IP addresses of devices on the EtherNet/IP network are static and IP address swapping is enabled. ⁽¹⁾

✓	Requirement
EtherNet/IP HMI	
	HMI Blind Time is the time during a switchover from primary to secondary, when tag data from the controller is unavailable for reading or writing. See HMI Blind Time Reduction on Ethernet During a Switchover on page 21 . IMPORTANT: This feature requires RSLinx Enterprise software, version 5.50.04 or later.
	<ul style="list-style-type: none"> • PanelView Standard terminal None (the use of the PanelView Standard terminal in a redundant system requires the same considerations as a nonredundant system). • PanelView Plus terminal, VersaView industrial computer running a Windows CE operating system RSLinx Enterprise software, version 3.0 or later, is used. Within each of the controllers and communication modules, five connections for each PanelView Plus or VersaView terminal are reserved. • FactoryTalk View SE software with RSLinx Enterprise software RSLinx Enterprise software, version 3.0 or later is used. IP address swapping is used. HMI and both redundant chassis are on the same subnet. • FactoryTalk View SE software with RSLinx software, version 2.x, RSView® 32 software, Any other HMI client software that uses RSLinx software, version 2.x The number of RSLinx servers that a controller uses is limited to 1..4 (maximum).

(1) Other IP address configurations are permitted, but require additional considerations. For more information, see [Use IP Address Swapping on page 77](#).

Project and Programming Checklist

In addition to the checklist below, see the [ControlLogix Controller Checklist on page 279](#).

✓	Requirement								
	The Redundancy Module Date and Time has been set by using the RMCT.								
	One project is created by using RSLogix 5000 software and is downloaded to the primary controller. ⁽¹⁾								
	Redundancy is enabled within the Redundancy tab of the Controller Properties dialog box.								
	Task configuration is either: <ul style="list-style-type: none"> • One continuous task within the project. <p style="margin-left: 20px;">or</p> <ul style="list-style-type: none"> • Multiple periodic tasks with only one task at the highest priority. Also, multiple tasks are structured so that the fewest possible separate tasks are used. 								
	The redundant controller program does not contain: <ul style="list-style-type: none"> • Event tasks. • Inhibited tasks. 								
	Programming specific to critical I/O that must be bumpless is placed in the highest-priority user task according to your task configuration. <table border="1" style="margin-left: 40px; width: 80%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 5px;">If you use this task structure</th> <th style="text-align: left; padding: 5px;">Then programming specific to bumpless I/O is in</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">One continuous task</td> <td style="padding: 5px;">The continuous task.</td> </tr> <tr> <td style="padding: 5px;">One continuous task and one or more periodic tasks</td> <td style="padding: 5px;">The highest-priority periodic task where only that one task is at the highest priority.</td> </tr> <tr> <td style="padding: 5px;">Multiple periodic tasks</td> <td style="padding: 5px;">The highest-priority periodic task where only that one task is at the highest priority.</td> </tr> </tbody> </table>	If you use this task structure	Then programming specific to bumpless I/O is in	One continuous task	The continuous task.	One continuous task and one or more periodic tasks	The highest-priority periodic task where only that one task is at the highest priority.	Multiple periodic tasks	The highest-priority periodic task where only that one task is at the highest priority.
If you use this task structure	Then programming specific to bumpless I/O is in								
One continuous task	The continuous task.								
One continuous task and one or more periodic tasks	The highest-priority periodic task where only that one task is at the highest priority.								
Multiple periodic tasks	The highest-priority periodic task where only that one task is at the highest priority.								
	For 1756-L6x controllers, the task watchdog is $(2 * \text{maximum_scan_time}) + 150$ ms when using ControlNet I/O and $(2 * \text{maximum_scan_time}) + 100$ ms when using Ethernet I/O, where maximum_scan_time is the maximum scan time for the entire task to complete when the redundant controllers are synchronized. To calculate watchdog time for 1756-L7x controllers, see Minimum Value for the Watchdog Time on page 177 .								

✓	Requirement
	<p>Scan time is minimized by using these techniques when possible:</p> <ul style="list-style-type: none"> • Unused tags are eliminated. • Arrays and user-defined data types are used instead of individual tags. • Redundancy data is synchronized at strategic points by using the Synchronize Data after Execution setting in the Program Properties dialog box. • Programming is written as compactly and efficiently as possible. • Programs are executed only when necessary. • Data is grouped according to frequency of use. • DINT tags are used instead of SINT or INT tags.
	For produced/consumed data, the communication module in the remote chassis that holds the consuming controller uses the Comm Format: None.
	Critical messages from a remote chassis to redundant chassis use cached connections.
	Active tags on scan per controller are less than 10,000 tags/second.

(1) Note that the project loaded on the primary controller is automatically crossloaded to the secondary controller when synchronization occurs.

Enhanced Redundancy Revision History

Changes to This Manual

With the availability of new controllers, modules, applications, and RSLogix 5000 software features, this manual has been revised to include updated information. This appendix briefly summarizes changes that have been made with each revision of this manual.

Reference this appendix if you need information to determine what changes have been made across multiple revisions. This may be especially useful if you are deciding to upgrade your hardware or software based on information added with previous revisions of this manual.

This table lists the publication revision, publication date, and changes made with the revision.

Table 52 - History of Changes

Publication Revision and Date	Topic
1756-UM535C-EN-P, July 2012	Updated features not supported
	Addend information about using signed and unsigned firmware
	Updated I/O modules in enhanced redundancy systems-revision 19.053 to the header for remote I/O module placement
	Added HMI Blind Time reduction on an EtherNet/IP network during a switchover
	Added information about enhanced communication modules and unicast connections
	Added restrictions when using firmware revision 19.052 versus 19.053
	Added the 1756-L71, 1756-L73XT controllers, 1756-EN2F module, and 1756-A7XT chassis to the table of components available for use in a redundant chassis pair
	Listed power supplies available for a redundant chassis pair
	Corrected revision 19.052 to 19.053
	Added 'or later' to revision 19.052 here, and throughout the manual
	Added 'or later' to revision 19.052 here, and throughout the manual, and chassis size to configuration requirements
	Added 1756-L71 controller for controller compatibility and updated revision information
	Rearranged EtherNet/IP and ControlNet networks sections; added 1756-EN2F module information
	Added remote chassis access restrictions using an EtherNet/IP network; added 'or later' to revision 19.052
	Added unicast functionality
	Added information about using a remote chassis access using a ControlNet network
Added additional information about 1715 Redundant I/O Systems	

Publication Revision and Date	Topic
	Added firmware requirements for revisions 20.054 and 19.053Enh
	Added information to enhanced redundancy module quick start
	Added EDS files information
	Added communication module installation and 1756-EN2F module information
	Updated controller installation information
	Updated redundancy module installation
	Updated fiber-optic communication cable connection
	Updated chassis firmware information
	Updated information on designating a primary and secondary chassis
	Updated information about conversion between nonredundant and redundant system
	Updated information to reset the redundant module
	Updated information on removing or replacing the redundant module
	Updated information about RPI being the same as a nonredundant chassis when using firmware revision 20.054 or later, and CPU usage information for Ethernet/IP communication modules
	Added information about unicast functionality in enhanced redundancy system remote controller
	Added socket support for the 1756-EN2F module for firmware revision 5.008 or later, and Unicast functionality with produced/consumed tags
	Updated information about downloading firmware bundle and determining RMCT version
	Updated information about 1756-L7x controller crossload time
	Added information about secured module mismatch
	Changed firmware revision information
	Updated MSG instructions information
	Updated minimum value for the Watchdog Time
	Changed firmware revision information
	Added memory usage slider
	Updated information for event log update
	Added information for Export diagnostics button
	Added 1756-L71 controller information
	Added 1756-EN2F module information
	Added how to upgrade Ethernet modules when rotary switches are set between 2...254
	Added how to upgrade from an enhanced redundancy system to another by using RSU
	Added software version 20 for an enhanced redundancy system
	Updated chassis configuration list to include 1756-L71 controller and 1756-EN2F communication module
	Updated information about produced unicast tags
	Updated information about I/O and multicast connections
	Updated controller checklist to add 1756-L71 controller
	Updated Watchdog time information

Publication Revision and Date	Topic
1756-UM535B-EN-P, December 2010	Updates to EtherNet/IP network use in enhanced redundancy systems
	Support for 1756-A4LXT to chassis
	Support for 1756-L65 controller
	Support for 1756-L7x controllers ⁽¹⁾
	Improved scan time with 1756-L7x controllers when compared to the scan time with 1756-L6x controllers
	Corrected MSG attribute value to set the date and time for a 1756-RM redundancy module
	Support for Partial Import online
	Support for controller logging
	Updated status indicator information
	Updated system checklists

(1) Subsequent to revision B of this manual's release, the revision 19.052 firmware was replaced with revision 19.053 firmware for the 1756-L7x controllers.

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