Replacement Guidelines: Logix 5000 Controllers

ControlLogix 5570 to ControlLogix 5580
ControlLogix 5570 Redundant to ControlLogix 5580 Redundant
GuardLogix 5570 to GuardLogix 5580
CompactLogix 5370 to CompactLogix 5380
Compact GuardLogix 5370 to Compact GuardLogix 5380
CompactLogix 1768-L4 to CompactLogix 5380
Compact GuardLogix 1768-L4 to Compact GuardLogix 5380
CompactLogix 1769-L3 to CompactLogix 5380

Allen-Bradley
by ROCKWELL AUTOMATION

Reference Manual

Original Instructions

Important User Information

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

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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

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

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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

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

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

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

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

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

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

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

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Notes:

This manual is intended to offer guidelines when you replace the following:

- ControlLogix® 5570 controller with a ControlLogix 5580 controller.
- Guidelines that reference a ControlLogix 5570 controller also apply to a ControlLogix 5560 controller.
- ControlLogix® 5570 redundant controller with a ControlLogix 5580 controller enabled for redundancy.
- GuardLogix® 5560 or GuardLogix 5570 controller with a GuardLogix 5580 controller.
- CompactLogix™ 5370 L3 controller with a CompactLogix 5380 controller
- Compact GuardLogix 5370 L3 controller with a Compact GuardLogix 5380 SIL 2 or SIL 3 controller
- CompactLogix 1769-L3 controller with a CompactLogix 5380 controller
- CompactLogix 1768-L4 controller with a CompactLogix 5380 controller
- Compact GuardLogix 1768-L4 controller with a Compact GuardLogix 5380 controller

Summary of Changes

This manual contains new and updated information as indicated in the following table.

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Notes:

Before You Begin a Migration

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Migration Services	15

This publication features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5580 controllers	ControlLogix® 5580 and GuardLogix® 5580 controllers
5380 controllers	CompactLogix™ 5380, Compact GuardLogix 5380 SIL 2, and Compact GuardLogix 5380 SIL 3 controllers
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers
1769-L3 controllers	CompactLogix 1769-L31, 1769-L32C, 1769-L32E, 1769-L35CR, 1769-L35E controllers
1768-L4 controllers	1768 CompactLogix and 1768 Compact GuardLogix L4 controllers

This publication provides a reference to controller capabilities and how the 5580/5380 controller capabilities differ from the 5570/5370 controllers.

IMPORTANT Any user or third-party developer of communications software to a ControlLogix or CompactLogix controller must fully follow the Logix 5000™ Data Access Programming Manual, 1756-PM020.

Beginning with Logix controller families 5380 and 5580, the full implementation and enforcement of the CIP™ specification standard for ANSI Extended Symbolic 0x91 is required, as documented in the above referenced publication and the ODVA CIP specification.

Any custom or 3rd party communications software, which previously only supported ANSI Extended Symbolic 0x61, will need to be updated to communicate to these new controllers.

Previous Logix controller families CompactLogix L1, L2, L3, 5370 and ControlLogix 5550, 5560, 5570 continue to support both the 0x91 CIP Standard and the older, no longer in use, 0x61.

Considerations

Throughout this manual, the following apply:

- All specifications and guidelines in this publication also apply to conformal coated catalog numbers of the controllers mentioned in this publication. Catalog numbers followed by a "K" indicate a conformal coating option.
- Guidelines that reference a ControlLogix 5570 controller also apply to a ControlLogix 5560 controller.
- There are references to controller project versions. Controller project versions 20 or earlier are created in RSLogix 5000® software. Controller project versions 21 or later are created in the Studio 5000 Logix Designer® environment, referred to as the Logix Designer application throughout this publication.
- Not all controllers are available with all versions of RSLogix 5000 software or the Logix Designer application.

  For example, CompactLogix 5370 L3 controllers are available in RSLogix 5000 software, version 20 and the Logix Designer application, version 21 or later.
- Unless otherwise indicated, the graphics that are used throughout manual are the same for 5380 and 5580 controllers.

Product compatibility information and release notes are available online within the Product Compatibility and Download Center at http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page.

New and Future Features

The following table indicates the Studio 5000 Logix Designer environment version in which product features are available.

Table 1 - New and Future Features

Feature	ControlLogix Controllers		CompactLogix Controllers	
	ControlLogix 5570 GuardLogix 5570	**ControlLogix 5580 GuardLogix 5580**	**CompactLogix 5370 L3 Compact GuardLogix 5370 L3**	**CompactLogix 5380 Compact GuardLogix 5380**
Hardware support	No new controllers in versions 28, 29, or 30	New controllers in version 28: • 1756-L83E • 1756-L85E	New controllers in version 28: • 1769-L30ERMS • 1769-L33ERMS • 1769-L36ERMS	New controllers in version 28: • 5069-L320ER • 5069-L340ERM
		New controllers in version 29: • 1756-L81E • 1756-L82E • 1756-L84E		New controllers in version 29: • 5069-L306ER, 5069-L306ERM • 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM • 5069-L320ERM • 5069-L330ER, 5069-L330ERM • 5069-L340ER • 5069-L350ER
		New controllers in version 31: • 1756-L81ES • 1756-L82ES • 1756-L83ES • 1756-L84ES		New controllers in version 30: • 5069-L350ERM • 5069-L380ERM • 5069-L3100ERM
			New controllers in version 31: • 1769-L37ERM • 1769-L37ERMS • 1769-L38ERM • 1769-L38ERMS • 1769-L38ERMO • 1769-L38ERMOS	New controllers in version 31: • 5069-L306ERS2 • 5069-L306ERMS2 • 5069-L310ERS2 • 5069-L310ERMS2 • 5069-L320ERS2 • 5069-L320ERMS2 • 5069-L330ERS2 • 5069-L330ERMS2 • 5069-L340ERS2 • 5069-L340ERMS2 • 5069-L350ERS2 • 5069-L350ERMS2 • 5069-L380ERS2 • 5069-L380ERMS2 • 5069-L3100ERS2 • 5069-L3100ERMS2
				New controllers in version 32: • 5069-L306ERMS3 • 5069-L310ERMS3 • 5069-L320ERMS3 • 5069-L330ERMS3 • 5069-L340ERMS3 • 5069-L350ERMS3 • 5069-L380ERMS3 • 5069-L3100ERMS3
		New controllers in version 33: • 1756-L81E-NSE, 1756-L82E-NSE, 1756-L83E-NSE, 1756-L84E-NSE, 1756-L85E-NSE • 1756-L81EXT, 1756-L82EXT, 1756-L83EXT, 1756-L84EXT, 1756-L85EXT • 1756-L81EP, 1756-L83EP, 1756-L85EP		New controllers in version 33: • 5069-L320ERP • 5069-L340ERP

Table 1 - New and Future Features (continued)

Feature	ControlLogix Controllers		CompactLogix Controllers	
	ControlLogix 5570 GuardLogix 5570	**ControlLogix 5580 GuardLogix 5580**	**CompactLogix 5370 L3 Compact GuardLogix 5370 L3**	**CompactLogix 5380 Compact GuardLogix 5380**
1 Gbps Ethernet port	Not applicable	Single embedded Ethernet port that supports up to 1 Gbps communication rate	Not supported	Dual, embedded Ethernet ports that each support up to 1 Gbps communication rate
EtherNet/IP™ modes: • Dual-IP mode • DLR/Linear mode	Not applicable	Not supported	DLR/Linear mode in all versions that support CompactLogix 5370 L3 controllers	CompactLogix 5380 Controllers Version 28 or later - DLR/Linear mode CompactLogix 5380 Controllers Version 29 or later - Dual-IP mode and DLR/Linear Compact GuardLogix 5380 Controllers Version 31or later - Dual-IP mode and DLR/Linear
Instruction-based alarms (ALMA, ALMD)	All versions	Version 29 or later	All versions	Version 29 or later
Tag-based Alarms	Not applicable	Version 31 or later	Not applicable	Version 31 or later
Integrated Motion on EtherNet/IP	All versions	Version 28 or later	All versions[4]	Version 28 or later[4]
SERCOS motion	All versions	Version 31 or later	Not supported	Not supported
Analog motion	All versions	Version 31 or later	Not supported	Future
Integrated safety SIL 2/PLd	Version 28 or later for ControlLogix 5570 controllers only, along with components of the ControlLogix system that are type-approved and certified for use in SIL 2 applications, according to IEC 61508. [2] For more information, see the Using ControlLogix in SIL 2 Applications Safety Reference Manual, publication 1756-RM001.	Version 31 or later with these GuardLogix 5580 controllers: • 1756-L81ES • 1756-L82ES • 1756-L83ES • 1756-L84ES Achieve SIL 2/PLd with the use of a primary safety controller, the safety task, and safety I/O.	Not supported	Version 31 or later with these Compact GuardLogix 5380 controllers: • 5069-L306ERS2 • 5069-L306ERMS2 • 5069-L310ERS2 • 5069-L310ERMS2 • 5069-L320ERS2 • 5069-L320ERMS2 • 5069-L330ERS2 • 5069-L330ERMS2 • 5069-L340ERS2 • 5069-L340ERMS2 • 5069-L350ERS2 • 5069-L350ERMS2 • 5069-L380ERS2 • 5069-L380ERMS2 • 5069-L3100ERS2 • 5069-L3100ERMS2 Achieve SIL 2/PLd with the use of the SIL2/PLd capable safety controller, the safety task, and safety I/O.
Integrated safety SIL 3/PLe	Version 28 or later with these GuardLogix 5570 controllers and safety partner: • 1756-L71S and 1756-L7SP • 1756-L72S and 1756-L7SP • 1756-L73S and 1756-L7SP	Version 31 or later with these GuardLogix 5580 controllers and safety partner: • 1756-L81ES • 1756-L82ES • 1756-L83ES • 1756-L84ES • 1756-L8SP	Version 28 or later with these Compact GuardLogix 5370 L3 controllers: • 1769-L30ERMS • 1769-L33ERMS • 1769-L36ERMS • 1769-L36ERMOS • 1769-L37ERMS • 1769-L37ERMOS • 1769-L38ERMS • 1769-L38ERMOS	Version 32 or later with these Compact GuardLogix 5380 controllers: • 5069-L306ERMS3 • 5069-L310ERMS3 • 5069-L320ERMS3 • 5069-L330ERMS3 • 5069-L340ERMS3 • 5069-L350ERMS3 • 5069-L380ERMS3 • 5069-L3100ERMS3 Achieve SIL 3/PLe with the use of the SIL3/PLe capable safety controller, the safety task, and safety I/O.
PanelView™ 5000 graphic terminal support	Version 27 or later	Version 29 or later	Version 27 or later	Version 29 or later

Table 1 - New and Future Features (continued)

Feature	ControlLogix Controllers		CompactLogix Controllers	
	ControlLogix 5570 GuardLogix 5570	**ControlLogix 5580 GuardLogix 5580**	**CompactLogix 5370 L3 Compact GuardLogix 5370 L3**	**CompactLogix 5380 Compact GuardLogix 5380**
Redundancy	ControlLogix 5570 controllers - Versions 19, 20, 24, and 30 or later ControlLogix 5560 controllers - Versions 16, 19, and 20	Version 33 or later for ControlLogix 5580 controllers(3)	Not supported	Not supported
PhaseManager™	All versions	Version 32 or later	All versions	Version 32 or later
SequenceManager™	Version 28 or later	Future	Version 28 or later	Future
Drive-based CIP Safety™ stopping functions (STO(1), monitored/timed SS1)	Version 30 or later	Version 31 or later	Version 30 or later	Version 31 or later
Controller-based CIP Safety stopping and monitoring functions (SS1, SS2, SOS, SLS, SLP, SDI)	Not applicable	Version 31 or later	Not applicable	Version 31 or later
Secured Data Exchange	Version 30 or later	V32 or later	Version 30 or later	Future
Controller-based Audit Log	Version 30 or later	V32 or later	Version 30 or later	Future
Controller Change Detection	Version 30 or later	V32 or later	Version 30 or later	Future
Emulate	All versions	Future	All versions	Future

(1) Only the GuardLogix 5570, GuardLogix 5580, Compact GuardLogix 5370, and Compact GuardLogix 5380 controllers support the CIP Safety protocol that is needed for the Safe Torque Off (STO) function.

(2) This type of SIL 2 application is not supported by ControlLogix 5580 controllers.

(3) ControlLogix 5580 controllers enabled for redundancy experience no reduction in memory from a standard use ControlLogix 5580 controller.

(4) Not all CompactLogix 5370 L3 or CompactLogix 5380 controllers support Integrated Motion on an EtherNet/IP network.

Integrated Architecture Tools

The Integrated Architecture® system can help you plan and configure a system, and migrate system architectures. For more information, go to Product Selection and Configuration on the Rockwell Automation website.

Migration Services

Rockwell Automation can help you in the following ways:

- To get the most out of your current equipment.
- To determine your next steps.
- To plan for the transition to newer technology.

You can migrate all at once or use our unique, phased approach. The phased approach helps you minimize the costs, risks, and complexities that are present when you manage legacy products and systems. Regardless of the migration approach that you take, Rockwell Automation has the tools and the experience to guide you through the transition.

For more information, see Migration Solutions Brochure, publication MIGRAT-BR002.

Notes:

Replacement Considerations with ControlLogix 5580 and GuardLogix 5580 Systems

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This chapter describes features and functions that are associated with the ControlLogix® 5580 and GuardLogix® 5580 controllers.

This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5580 controllers	ControlLogix 5580 and GuardLogix 5580 controllers
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers

It is not an exhaustive list of the features and functions available with the controllers. Instead, the list indicates what is new or changed in the controller at this release:

- Embedded 10/100/1000 Mbps Ethernet port
- Higher performance and capacity including:
  - Motion Processing: 256 total axes
  - Total I/O packets processing: 128,000 pps
  - 320 unconnected message buffers
  - 256 simultaneous cached message instructions in the running state
  - Support for up to 300 EtherNet/IP™ nodes
- Support for Compact 5000™ I/O over an EtherNet/IP network
- Change Ethernet port speed without a module reset

Minimum Requirements

The 5580 controllers have these minimum requirements.

ControlLogix Controllers Minimum Requirements

Requirement, Minimum	ControlLogix 5570 Controller	ControlLogix 5580 Controller
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17 Series A, Series B, and Series C	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17 0 °C < Ta < +60 °C (+32 °F < Ta < +140 °F) for Series C Chassis 0 °C < Ta < +50 °C (+32 °F < Ta < +122 °F) for Series B Chassis
Programming Software	Studio 5000 Automation Engineering & Design Environment®, Version 21.00.00 or later RSLogix 5000® Software Version 20.00.00 or later	Studio 5000 Logix Designer® Application Version 28.00.00 or later

GuardLogix Controllers Minimum Requirements

Requirement, Minimum	GuardLogix 5570 Controller	GuardLogix 5580 Controller
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17 Series A, Series B, and Series C	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17 **Operating in SIL 2/PL d Configuration:** 0 °C < Ta < +60 °C (+32 °F < Ta < +140 °F) for Series C Chassis Note: If operating above +55 °C (+131 °F), modules greater than 6.2 W shall not be installed in slots adjacent to the controller. **Operating in SIL 3/PL e Configuration:** 0 °C < Ta < +60 °C (+32 °F < Ta < +140 °F) for Series C Chassis 0 °C < Ta < +50 °C (+32 °F < Ta < +122 °F) for Series B Chassis
Programming Software	Studio 5000 Automation Engineering & Design Environment, Version 21.00.00 or later RSLogix 5000® Software Version 20.00.00 or later	Studio 5000 Logix Designer Application Version 31.00.00 or later

Product Comparison

This section compares:

- ControlLogix 5580 controllers to ControlLogix 5570 controllers
- GuardLogix 5580 controllers to GuardLogix 5570 controllers

ControlLogix Controllers

The ControlLogix 5580 controllers operate similarly to the ControlLogix 5570 controllers, with these differences.

Table 2 - Technical Specifications

Attribute	ControlLogix 5570 Controller	ControlLogix 5580 Controller
Memory	4…32 MB user memory	1756-L81E, 1756-L81E-NSE, 1756-L81EXT, 1756-L81EP: 3 MB 1756-L82E, 1756-L82E-NSE, 1756-L82EXT: 5 MB 1756-L83E, 1756-L83E-NSE, 1756-L83EXT, 1756-L83EP: 10 MB 1756-L84E, 1756-L84E-NSE, 1756-L84EXT: 20 MB 1756-L85E, 1756-L85E-NSE, 1756-L85EXT, 1756-L85EP: 40 MB
I/O Memory	0.98 MB	Not applicable(4)
Compact 5000 I/O modules supported	Not supported	Full support
Embedded Ethernet	Not applicable	10/100/1000 Mbps
Ethernet nodes	Controller connections: a total of 500 connections used for Ethernet I/O and Ethernet Messaging.	Logix Designer application, version 28: • 1756-L83E: 100 EtherNet/IP nodes, max • 1756-L85E: 300 EtherNet/IP nodes, max Logix Designer application, version 29: • 1756-L81E: 60 EtherNet/IP nodes, max • 1756-L82E: 80 EtherNet/IP nodes, max • 1756-L83E: 100 EtherNet/IP nodes, max • 1756-L84E: 150 EtherNet/IP nodes, max • 1756-L85E: 300 EtherNet/IP nodes, max Logix Designer application, version 30 or later(5): • 1756-L81E, 1756-L81E-NSE, 1756-L81EXT, 1756-L81EP: 100 EtherNet/IP nodes, max • 1756-L82E, 1756-L82E-NSE, 1756-L82EXT: 175 EtherNet/IP nodes, max • 1756-L83E, 1756-L83E-NSE, 1756-L83EXT, 1756-L83EP: 250 EtherNet/IP nodes, max • 1756-L84E, 1756-L84E-NSE, 1756-L84EXT: 250 EtherNet/IP nodes, max • 1756-L85E, 1756-L85E-NSE, 1756-L85EXT, 1756-L85EP: 300 EtherNet/IP nodes, max
I/O Capacity (Class 0/1) - packets/second (1) (2)	Not applicable	• 128,000 without CIP Security™ • 40,000 with integrity • 20,000 with integrity and confidentiality
Message Rate Capacity HMI/MSG (Class 3) - messages/second (1) (2)	Not applicable	• 2000 without CIP Security • 1500 with integrity • 900 with integrity and confidentiality
Unconnected message buffers	20 outgoing buffers, configurable to 40 4 incoming buffers	320 - Any combination of outgoing or incoming unconnected buffers.
Concurrent cached message instructions in the running state	32, drawn from the 500 total connections supported by the controller.	256 dedicated buffers.
HMI and Messaging (Class 3)	Drawn from the 500 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	• SERCOS interface • Analog options (encoder input, LDT input, SSI input) • EtherNet/IP network	• EtherNet/IP network • SERCOS interface(6) • Analog options (encoder input, LDT input, SSI input)(6)

Table 2 - Technical Specifications (continued)

Attribute	ControlLogix 5570 Controller	ControlLogix 5580 Controller
Motion axes	128, any combination of these supported axis types: • CIP™ • Consumed • Virtual • Position loop drives • Servo • Servo drive • Generic	256, any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives
Axes/ms over backplane	8	19
Axes/ms over EtherNet/IP port	Not applicable	32 when you use the built-in EtherNet/IP port at 1 Gbps. Rockwell Automation recommends that you use the built-in EtherNet/IP port for high-performance motion applications.
Voltage and current ratings	800 mA @ 5.1V DC 5.0 mA @ 1.2V DC	1.2 A @ 5.1V DC 5.0 mA @ 1.2V DC
Energy storage module	• 1756-ESMCAP capacitor energy storage module (removable) • 1756-ESMNSE capacitor energy storage module (removable) • 1756-ESMNRM capacitor energy storage module (nonremovable)	Embedded in controller, nonremovable
Weight, approx	0.25 kg (0.55 lb)	0.394 kg (.868 lb)
Wire category(3)	3 - on USB port	3 - on USB port 2 - on Ethernet port
Wire size	Not applicable	Ethernet cabling and installation according to IEC 61918 and IEC 61784-5-2
Reset Button	Not applicable	A stage 1 reset clears the user application program and memory, but retains the controller IP address. A stage 2 reset returns the controller to out-of box settings (including firmware), and clears all network settings.

(1) I/O numbers are maximums; they assume no HMI/MSG. HMI/MSG numbers are maximums, they assume no I/O. Maximums assume the processor is the target, not the originator. Packet rates vary depending on packet size. For more details, see Troubleshoot EtherNet/IP Application Technique, publication ENET-AT003, and the EDS file for a specific catalog number.

(2) For information on integrity and confidentiality, see the CIP Security with Rockwell Automation Products Application Technique, publication SECURE-AT001.

(3) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(4) The 5580 controllers allocate memory as needed, so there is no dedicated I/O memory space.

(5) ControlLogix NSE, ControlLogix-XT, and ControlLogix Process controllers available with Logix Designer application, version 33 or later.

(6) With Studio 5000 Logix Designer Application Version 31.00.00 or later.

GuardLogix Controllers

The GuardLogix 5580 controllers operate similarly to the GuardLogix 5570 controllers, with some differences.

Table 3 - Features and Specifications

Attribute	GuardLogix 5570 Controller	GuardLogix 5580 Controller
Instruction-based alarms (ALMA, ALMD)	Yes	Yes
Tag based alarms	Not applicable	Yes
PanelView™ 5000	Not supported	Full support

Table 3 - Features and Specifications (continued)

Attribute	GuardLogix 5570 Controller	GuardLogix 5580 Controller
User and Safety Memory	1756-L71S: 2 MB + 1 MB Safety 1756-L72S: 4 MB + 2 MB Safety 1756-L73S: 8 MB + 4 MB Safety	1756-L81ES: 3 MB + 1.5 MB Safety 1756-L82ES: 5 MB + 2.5 MB Safety 1756-L83ES: 10 MB + 5.0 MB Safety 1756-L84ES: 20 MB + 6.0 MB Safety
I/O Memory	0.98 MB	Not applicable(3)
1756 ControlLogix Digital Safety I/O modules supported	Not supported	Full support with Studio 5000 Logix Designer Application, version 32.00.00 or later, with Add-on Profile.
Compact 5000 I/O modules supported	Not supported	Full support
Embedded Ethernet	Not applicable	10/100/1000 Mbps
Ethernet nodes(1)	Controller connections: a total of 500 connections used for Ethernet I/O and Ethernet Messaging.	• 1756-L81ES: 100 EtherNet/IP nodes, max • 1756-L82ES: 175 EtherNet/IP nodes, max • 1756-L83ES: 250 EtherNet/IP nodes, max • 1756-L84ES: 250 EtherNet/IP nodes, max
Ethernet performance	Not applicable	Ethernet I/O (Class 0/1): 128,000 packets per second Ethernet Messaging (Class 3): 2000 messages per second(4)
Unconnected message buffers	20 outgoing buffers, configurable to 40 4 incoming buffers	320 - Any combination of outgoing or incoming unconnected buffers.
Concurrent cached message instructions in the running state	32, drawn from the 500 total connections supported by the controller.	256 dedicated buffers.
HMI and Messaging (Class 3)	Drawn from the 500 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	• SERCOS interface • Analog options (encoder input, LDT input, SSI input) • EtherNet/IP network	• SERCOS interface • Analog options (encoder input, LDT input, SSI input) • EtherNet/IP network
Drive Safety Instructions with Kinetix® 5700 ERS4 Drives	Not applicable	Yes
Networked Safe Torque Off for Drives (CIP Mode/IO Mode)	Full support	Full support
Networked Safe Torque Off for Kinetix (CIP Mode)	Full support	Full support
Motion axes	100, any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives • Servo • Servo drive Generic	256, any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives
Axes/ms over backplane	8	19
Axes/ms over EtherNet/IP port	Not applicable	32 when you use the built-in EtherNet/IP port at 1 Gbps. Rockwell Automation recommends that you use the built-in EtherNet/IP port for high-performance motion applications.
Voltage and current ratings	800 mA @ 5.1V DC 5.0 mA @ 1.2V DC	1.2 A @ 5.1V DC 5.0 mA @ 1.2V DC
Energy storage module	• 1756-ESMCAP capacitor energy storage module (removable) • 1756-ESMNSE capacitor energy storage module (removable) • 1756-ESMNRM capacitor energy storage module (nonremovable)	Embedded in controller, nonremovable
Weight, approx	0.25 kg (0.55 lb)	0.394 kg (.868 lb)

Table 3 - Features and Specifications (continued)

Attribute	GuardLogix 5570 Controller	GuardLogix 5580 Controller
Wire category[2]	3 - on USB port	3 - on USB port 2 - on Ethernet port
Wire size	Not applicable	Ethernet cabling and installation according to IEC 61918 and IEC 61784-5-2
Reset Button	Not applicable	• A controller stage 1 reset clears the user application program and memory, but retains the controller IP address. • A controller stage 2 reset returns the controller to out-of box settings (including firmware), and clears all network settings. On a GuardLogix 5580 controller, the stage 2 reset also clears safety settings and the safety signature/safety locked state. • The Safety Partner reset returns the 1756-L8SP Safety Partner to the out-of box settings (including firmware). • In a SIL 3 application, when you reset the GuardLogix Controller you must also reset the 1756-L8SP Safety Partner.

(1) For more information on Ethernet nodes, see Nodes on an EtherNet/IP Network on page 28.

(2) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

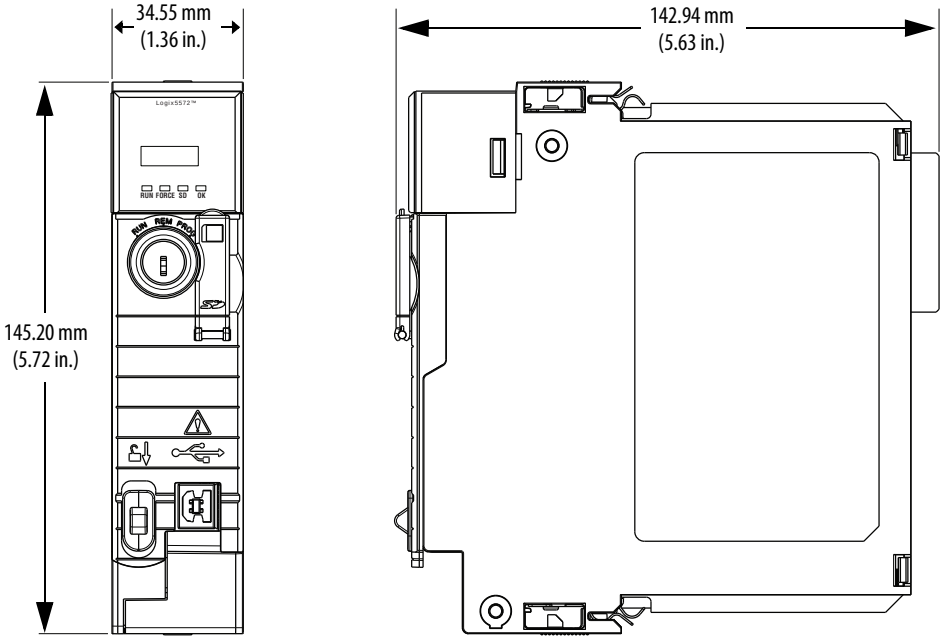
(3) The 5580 controllers allocate memory as needed, so there is no dedicated I/O memory space.

(4) Data size = 32-bits / 1-DINT

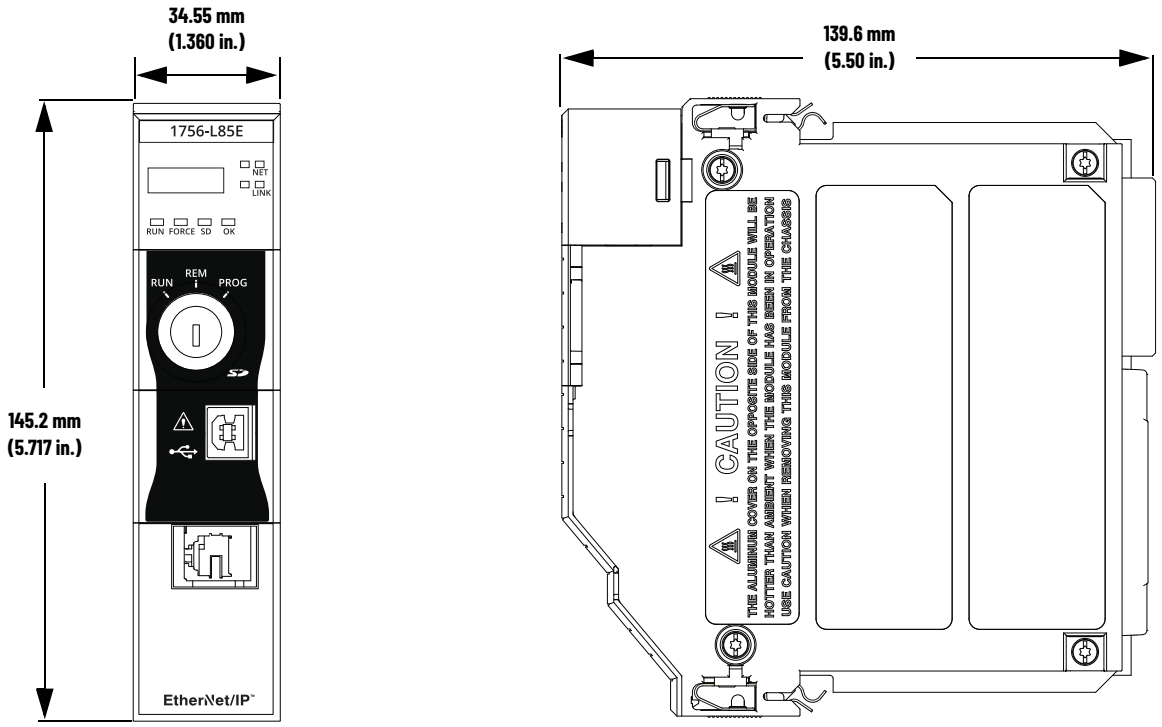
Controller Dimensions

This section shows dimensional differences.

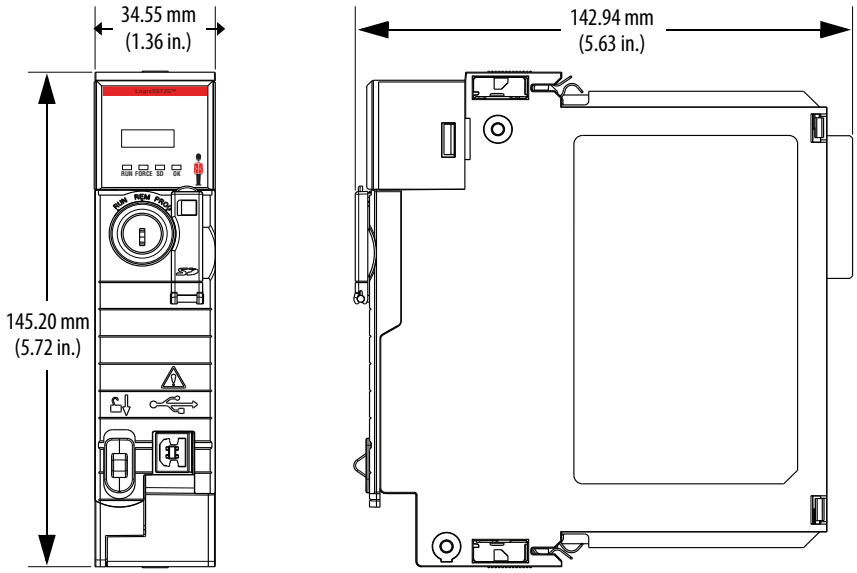
ControlLogix 5570 Dimensions



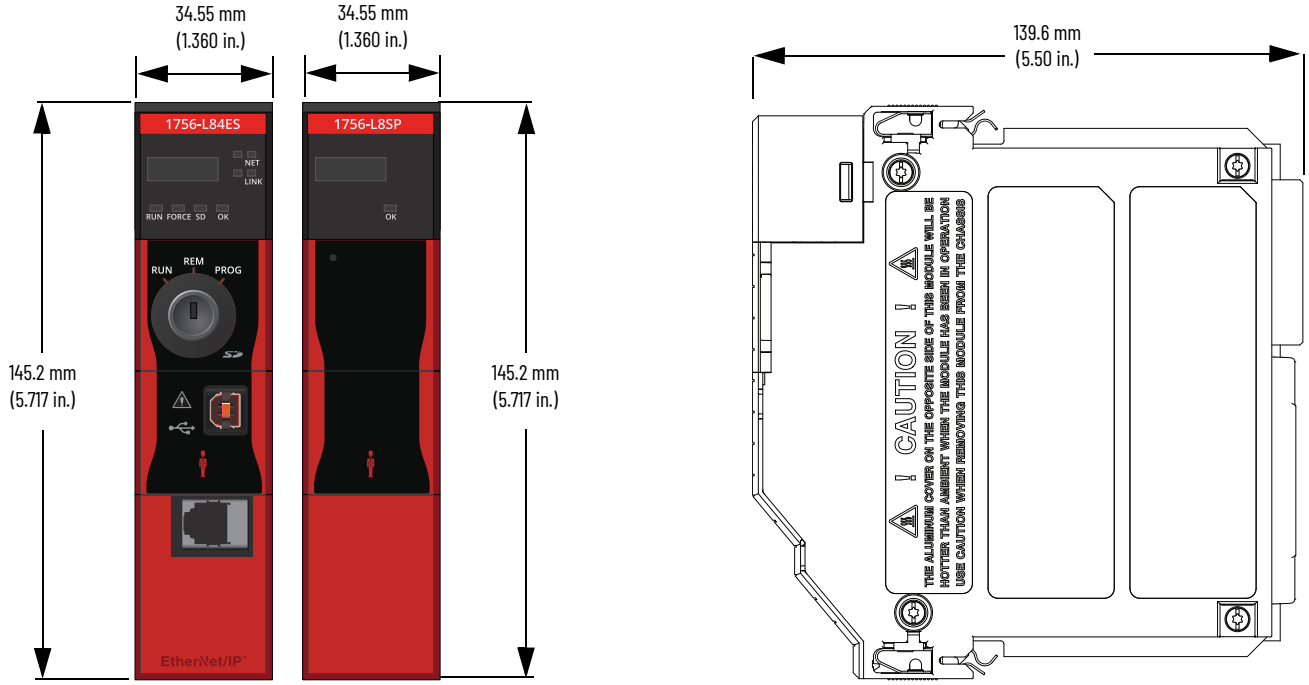
ControlLogix 5580 Dimensions



GuardLogix 5570 Dimensions



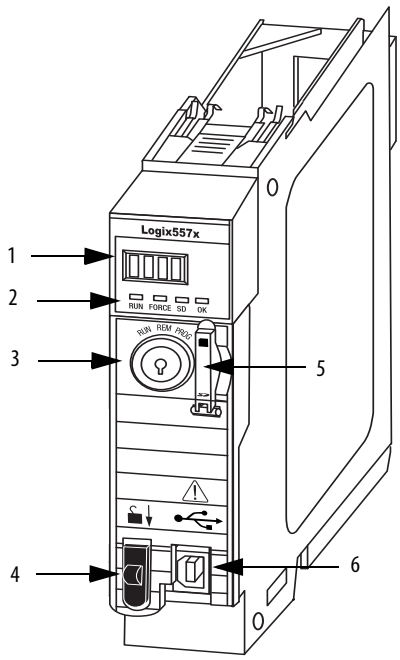
GuardLogix 5580 Dimensions



Connectors and Status Indicators

This section shows the front plate differences. For more information on the status indicators and reset button, see Chapter 8, Diagnostics and Status Indicators with ControlLogix Systems on page 151.

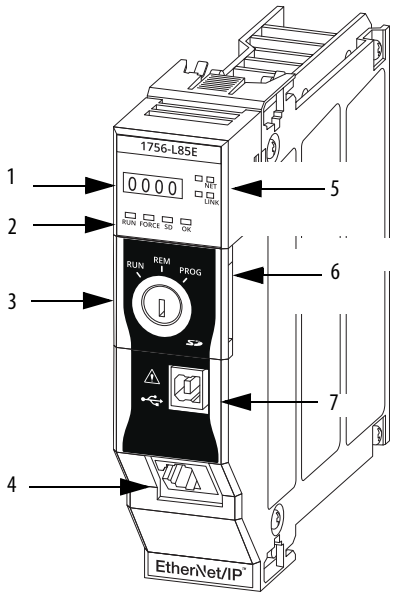
ControlLogix 5570



Item	Description
1	4-character Display
2	Status Indicators
3	REM RUN PROG Keyswitch
4	Energy Storage Module Release
5	SD Card slot behind the door(1)
6	USB Port

(1) The door opens from top to bottom.

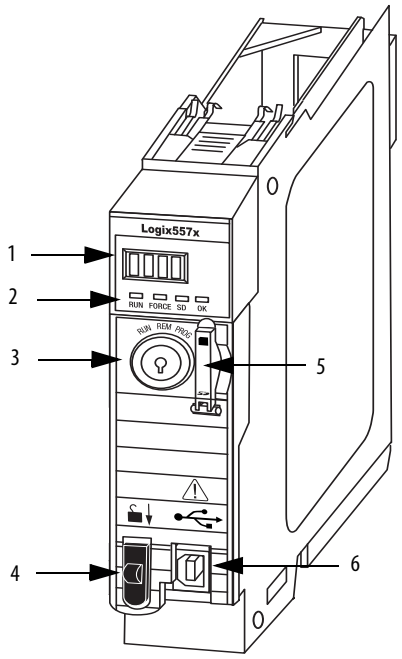
ControlLogix 5580



Item	Description
1	4-character Display
2	Status Indicators
3	REM RUN PROG Keyswitch
4	Ethernet Port
5	Ethernet Status Indicators
6	SD Card slot and Reset button are behind the door.(1)
7	USB Port

(1) First remove the key, then open the door from right to left.

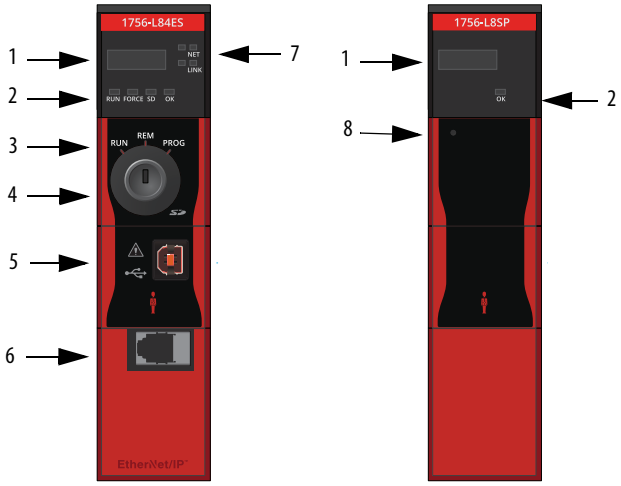
GuardLogix 5570



Item	Description
1	4-character Display
2	Status Indicators
3	REM RUN PROG Keyswitch
4	Energy Storage Module Release
5	SD Card slot behind the door(1)
6	USB Port

(1) The door opens from top to bottom.

GuardLogix 5580 and Safety Partner



Item	Description
1	4-character display
2	Status Indicators
3	REM RUN PROG Keyswitch
4	SD card slot and Reset Button behind the door(1)
5	USB Port
6	Ethernet Port
7	Ethernet Status Indicators
8	Safety Partner Reset Button

(1) First remove the key, then open the door from right to left.

Project Size

The size of the .ACD file does not reflect the size of your project that downloads to the controller. The .ACD file contains multiple components. Not all components are downloaded to the controller.

Configure the Controller

You must consider how to best use controller resources when ControlLogix controllers communicate over an EtherNet/IP network. There are limitations concerning how much EtherNet/IP communication the controller supports.

Consider the following:

- Connections
- Ethernet Nodes

Connections Overview

A Logix 5000™ controller provides connection resources whenever communications are established between two devices.

Connections are used when the system contains the following conditions or activities:

- I/O modules, communication modules, and adapters are present in the I/O configuration of the user project
- Produced or Consumed tags are configured in the user project
- Connected Messages are executed in the user application
- External devices, programming terminals, or HMIs communicate with the controller

You must track the number of connections that are used when you configure a ControlLogix 5570 control system.

Nodes on an EtherNet/IP Network

When used in a Logix Designer application project, version 28 or later, 5580 controllers offer a simplified method for counting controller resources.

When you configure a 5580 control system, you simply count the number of Ethernet nodes that you include in the I/O configuration section of your Logix Designer application project.

On the Controller Properties dialog box, the Logix Designer application project displays the updated number of nodes that are used as you add Ethernet nodes to the project.

To see an example of how the project displays the node count, see Figure 3 on page 33. Table 4 lists the EtherNet/IP node limits for 5580 controllers.

Table 4 - 5580 Controller EtherNet/IP Node Guidelines

Cat. No.	Maximum Number of EtherNet/IP Nodes Supported			
	Logix Designer Application, Version 28	Logix Designer Application, Version 29	Logix Designer Application, Version 30	Logix Designer Application, Version 31 or later
1756-L81E	Not applicable	60	100	100
1756-L81ES	Not applicable			100
1756-L82E	Not applicable	80	175	175
1756-L82ES	Not applicable			175
1756-L83E	100	100	250	250
1756-L83ES	Not applicable			250
1756-L84E	Not applicable	150	250	250
1756-L84ES	Not applicable			250
1756-L85E	300	300	300	300

Devices Included in the Node Count

Any devices that you add directly to the I/O configuration section are counted toward the node limits of the controller. The following are example devices that must be counted:

- Remote communication adapters
- Devices with an embedded EtherNet/IP port, such as I/O modules, drives, and linking devices
- EtherNet/IP devices that are connected to a communication module in the local chassis
- Remote controllers when a produce/consume connection is established between the two controllers
- HMI devices that are included in the I/O configuration tree
- Third-party devices that are directly connected to the EtherNet/IP network

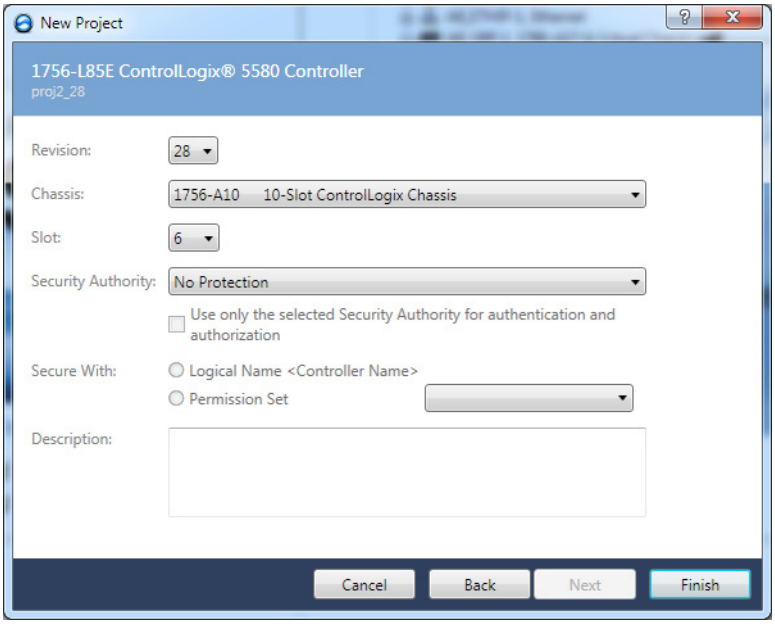
Devices Excluded from the Node Count

Ethernet devices that exist on the EtherNet/IP network but are not added to the I/O configuration of the project do not count as nodes. These items are not added to the I/O configuration and are not considered nodes:

- Computer
- EtherNet/IP communication modules that reside in the local chassis with the controller
- HMI that is not added to the I/O configuration section
- MSG instruction
- Standard Ethernet devices for which the controller uses a socket interface to communicate

New Project Dialog Box

When you create a project with a 5580 controller, the Module Definition dialog box appears. The dialog box provides standard controller settings, along with additional security settings. The information that is entered in this dialog box displays on the Controller Properties General tab and Security tab.



Controller Properties

This table compares the Controller Properties Tab.

Controller Properties Tab	Comments
General	Same functionality as 5570 controllers.
Major Faults	Same functionality as 5570 controllers.
Minor Faults	Same functionality as 5570 controllers.
Date/Time	Same functionality as 5570 controllers.
Advanced	New parameter to enable Minor Overflow fault reporting. See Advanced Tab on page 31
SFC Execution	Same functionality as 5570 controllers.
Project	Same functionality as 5570 controllers.
Redundancy	Same functionality as 5580 controllers for version 33 or later.
Nonvolatile Memory	Same functionality as the 5570 controllers.
Memory (Logix Designer application, version 28) Capacity (Logix Designer application, version 29 and later)	The tabs indicate the same information but are named differently between the Logix Designer application versions. Indicates data usage. Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. See Memory Tab on page 32 or Capacity Tab on page 33.
Internet Protocol	New for 5580 controllers. See Internet Protocol Tab on page 35.
Port Configuration	New for 5580 controllers. See Port Configuration Tab on page 36.
Security	Now has additional security parameters. See Security Tab on page 37.
Alarm Log	Not available for 5580 controllers in version 28. Available in version 29 or later with the same functionality as the 5570 controllers.

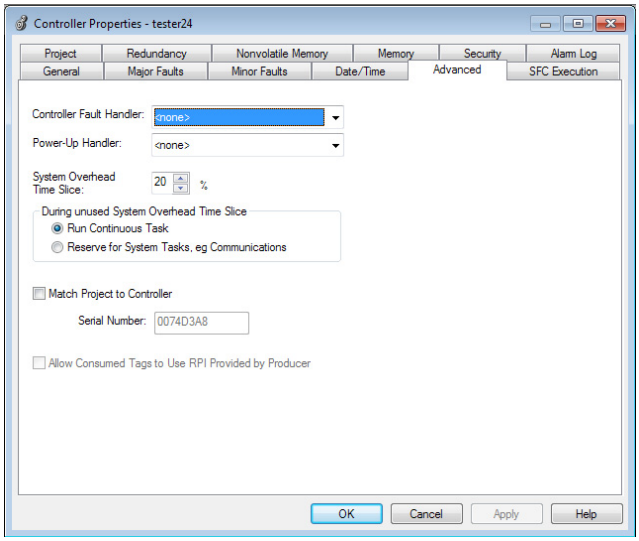
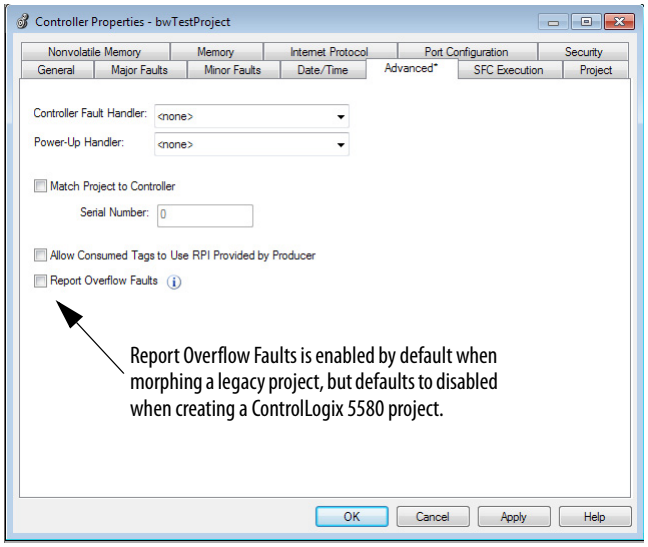
Advanced Tab

The Advanced tab provides a way to assign the Controller Fault Handler and Power-up Handler. You can also match a project to a specific controller by serial number.

- Report Overflow Faults is a new parameter that lets you control Minor Overflow fault reporting. When you create a project, the default setting is disabled. When you import or open a legacy project, the default setting is enabled. For more information, see Minor Fault on Overflow on page 128.

- System Overhead Time Slice is no longer required for 5580 controllers, and the parameter is removed.

Figure 1 - Controller Properties Dialog Box - Advanced Tab

5570 Controllers Example	5580 Controllers Example
	

Memory Tab

In the Logix Designer application, version 28 or earlier, the Memory tab indicates data usage.

- **5570 controllers** - Data usage is indicated with two values. The tab shows I/O memory and Data and Logic memory separately.

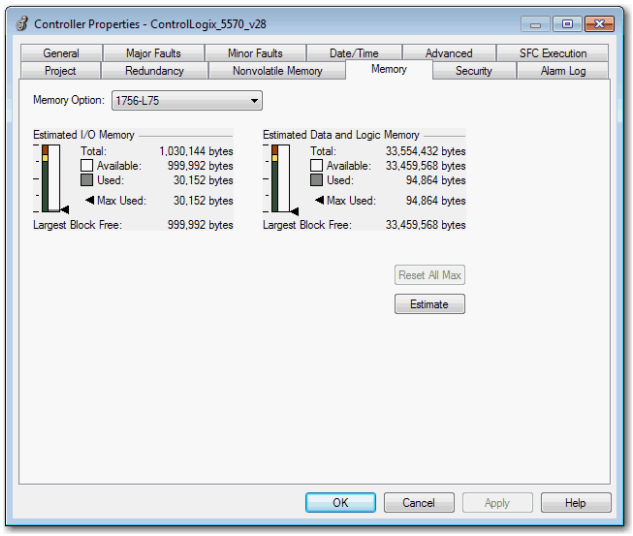
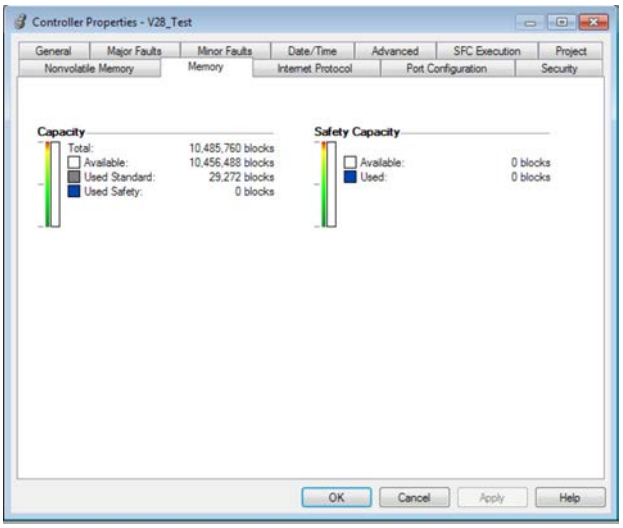
  As you change the project, you can click Estimate to see the estimated memory usage and remaining available memory.

- **5580 controllers** - Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage.

  As you change the project, the data values are automatically updated to indicate the estimated memory usage and remaining available memory.

IMPORTANT Programmatic access to memory is not supported for 5580 controllers, see Controller Memory Usage on page 114.

Figure 2 - ControlLogix Controller Properties Dialog Box - Memory Tab

ControlLogix 5570 Version 28 Example	ControlLogix 5580 Version 28 Example
	

Capacity Tab

In the Logix Designer application, version 29 or later, the Capacity tab indicates data usage.

- **5570 controllers** - Data usage is indicated with two values. The tab shows I/O memory and Data and Logic memory separately. GuardLogix 5570 controllers also show the Safety memory.

  As you change the project, you can click Estimate to see the estimated memory usage and remaining available memory.

- **5580 controllers** - Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. The tab also shows the number of Ethernet nodes that are used. GuardLogix 5580 controllers also show the Safety capacity.

  As you change the project, the data values are automatically updated to indicate the estimated memory usage and remaining available memory. The number of Ethernet nodes is also updated automatically.

  As you change the project, the data values are automatically updated.

Figure 3 - ControlLogix Controller Properties Dialog Box Version 29 or later- Capacity Tab

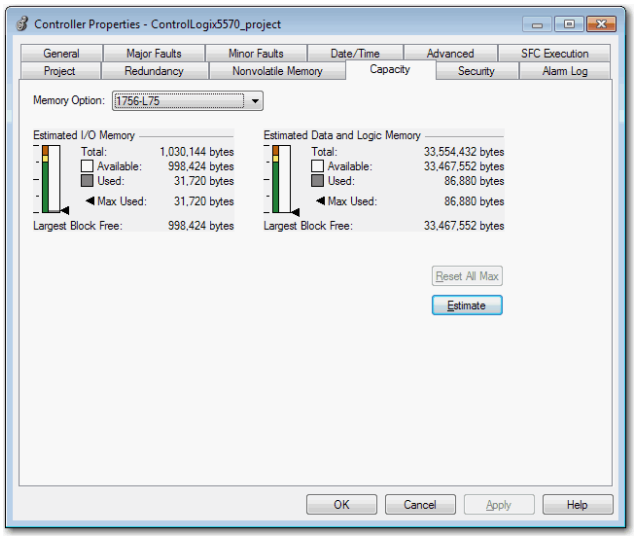
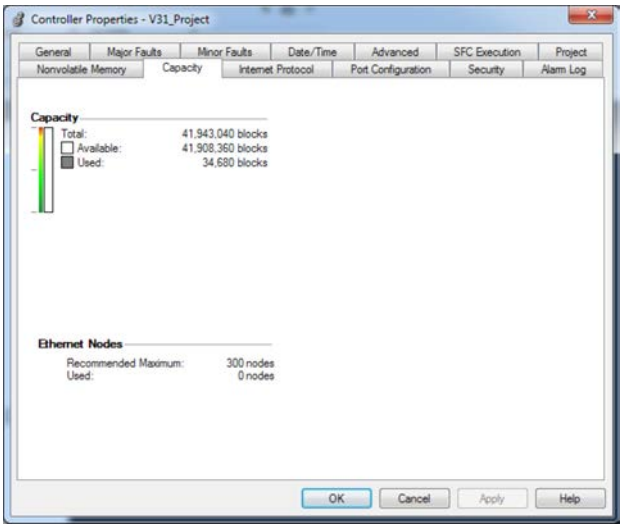
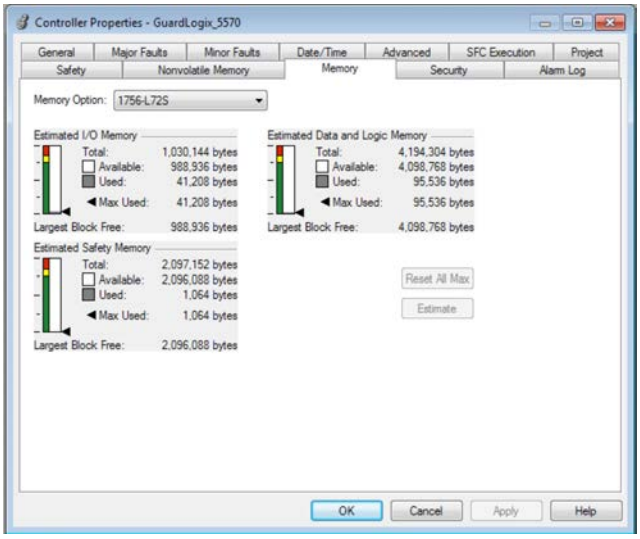
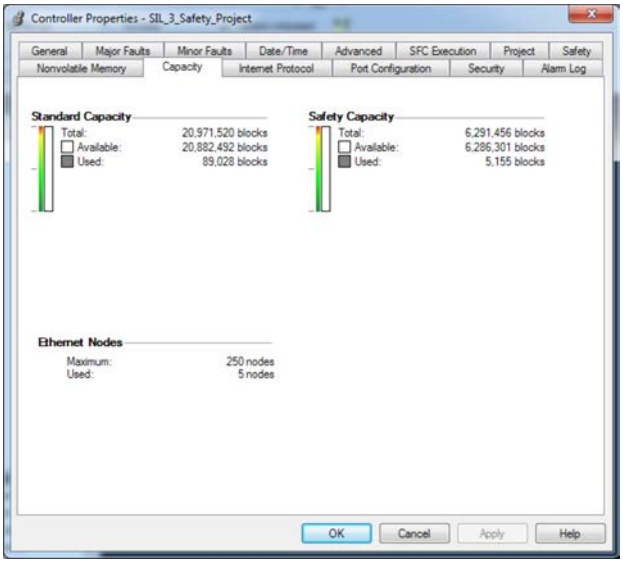
ControlLogix 5570 Example	ControlLogix 5580 Example
	

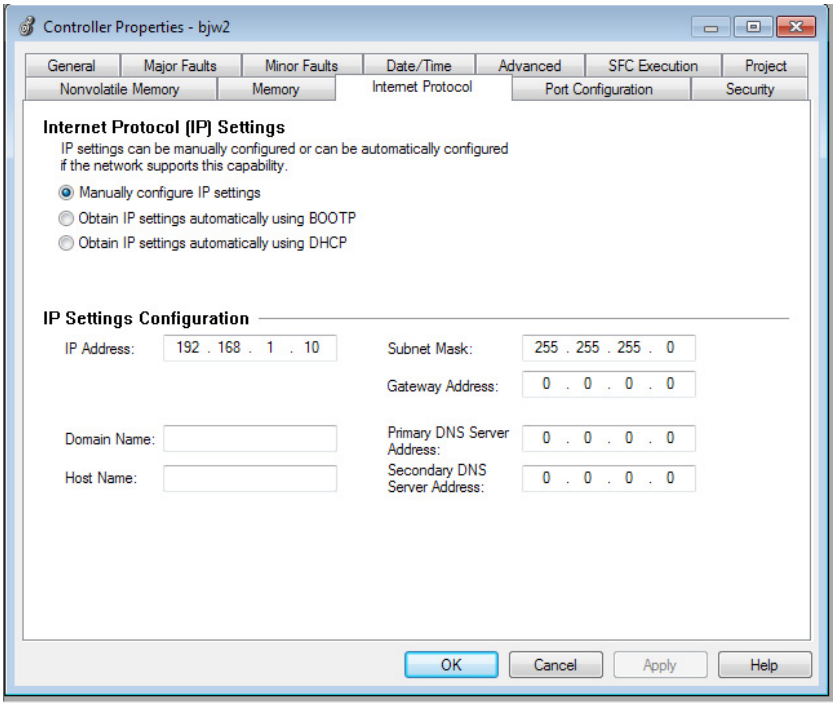
Figure 4 - GuardLogix Controller Properties Dialog Box - Capacity Tab

GuardLogix 5570 Version 28 Example	GuardLogix 5580 Version 31 or later Example
	

Internet Protocol Tab

When online with the controller, the Internet Protocol tab lets you configure the IP Settings. These settings are not available offline.

Figure 5 - Controller Properties Dialog Box - Internet Protocol Tab - Online



When online, configurable settings include the following:

- Source of IP Settings (DHCP, BOOTP, or manual configuration)
- Physical Module IP Address
- Subnet Mask
- Gateway Address
- Domain Name
- Host Name, Primary DNS Server Address
- Secondary DNS Server Address

Port Configuration Tab

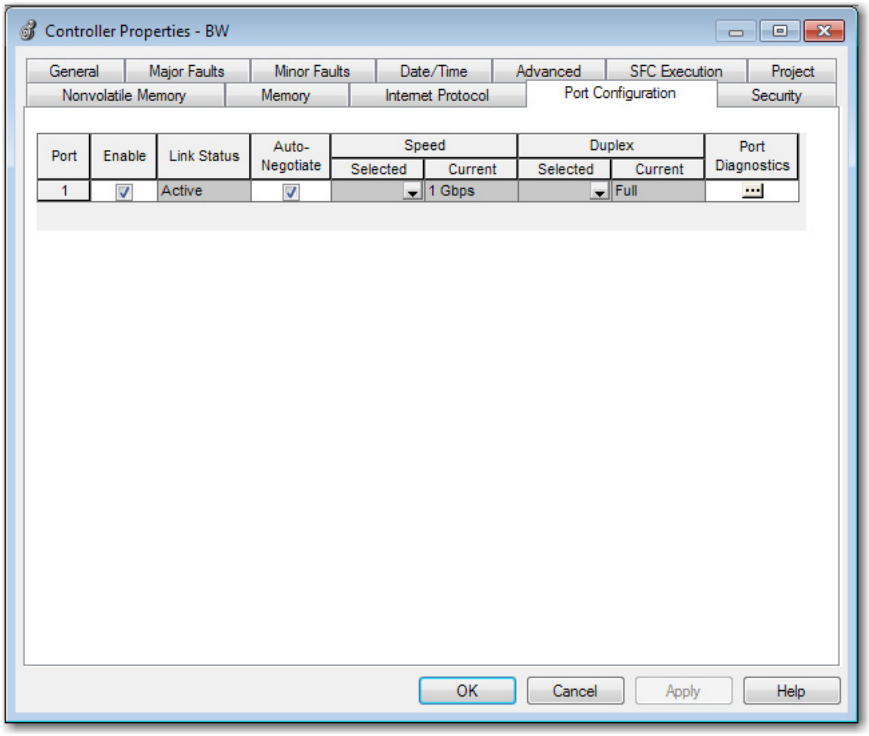
When online, the Port Configuration tab lets you view and configure the Ethernet port settings:

- View Link Status
- Enable/Disable the Ethernet port
- Configure Auto-Negotiate
- Configure Selected Speed up to 1 Gbps (or set to auto-negotiate)
- View Current Speed
- Configure Selected Duplex

  The 5580 controllers only support full-duplex.
- View Current Duplex
- Access the Port Diagnostics dialog

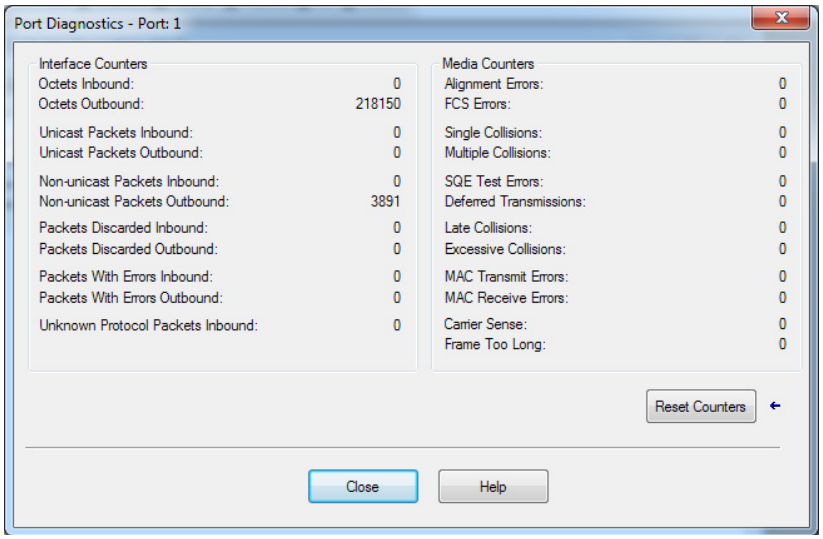
You can change the Port Configuration parameters without resetting the controller.

Figure 6 - Controller Properties Dialog Box - Port Configuration Tab



Port Diagnostics

On the Port Configuration category, click the Port Diagnostics button to view information for the Ethernet port. For parameter descriptions, see the ControlLogix 5580 and GuardLogix 5580 Controllers User Manual, publication 1756-UM543.

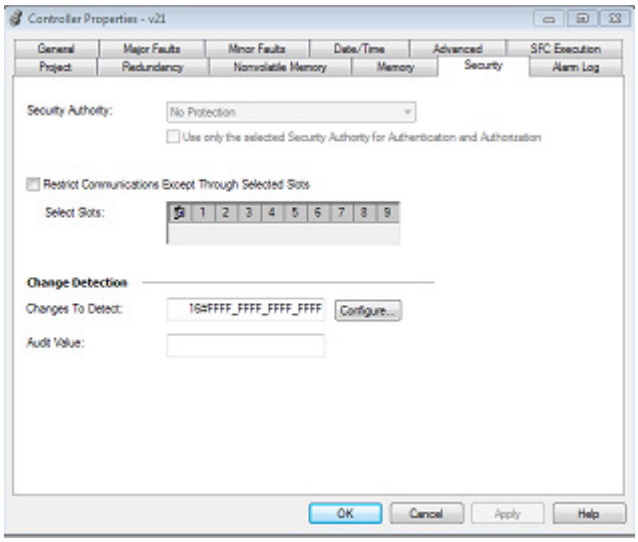
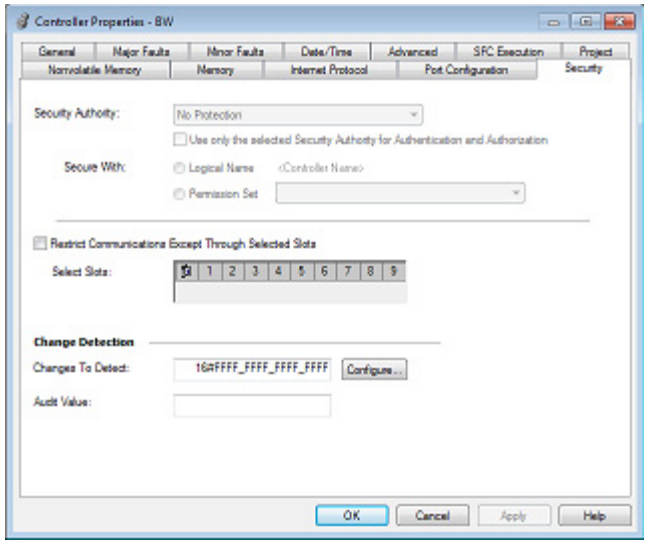


Security Tab

The Security Tab lets you see the controller security settings, for example, the Security Authority choice. Security settings are configured when you create the project.

With the Logix Designer application, version 28 or later, the 5580 controllers support additional parameters in the Security Authority section.

Figure 7 - Controller Properties Dialog Box - Security Tab

5570 Controllers Example	5580 Controllers Example
	

Controller Reset

You can clear the program from memory on the 5570 controllers. On 5580 controllers, you can clear the program from memory and reset the controller to factory default settings.

5570 Controllers

Clearing the program from the on-board NVS memory on the 5570 controllers and the 1756-L7SP Safety Partner, involves removing the Energy Storage Module.

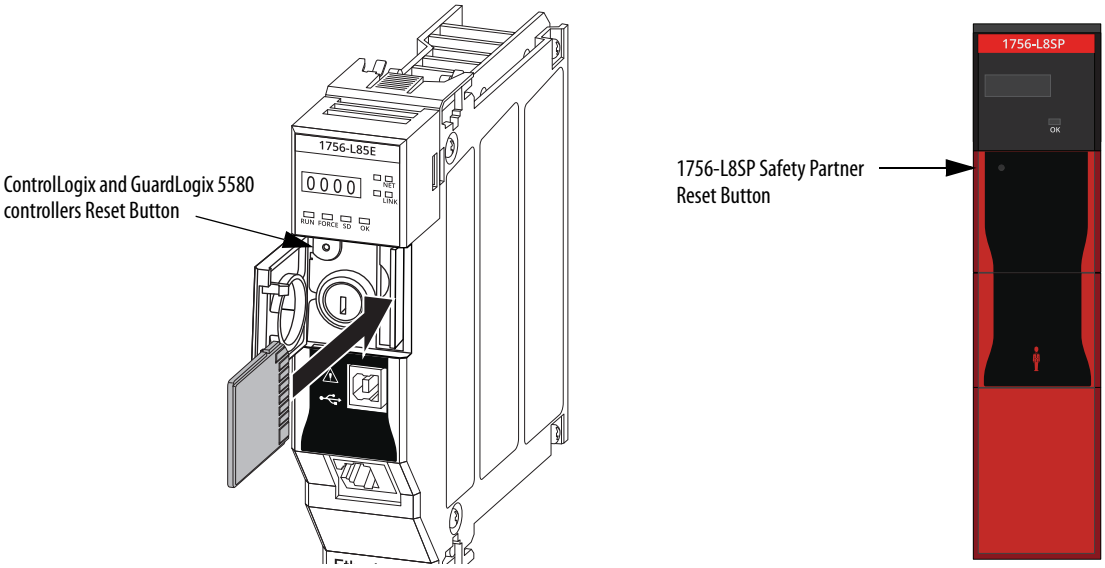
For information on how to perform this procedure, see Knowledgebase Article *1756-L7x: Clearing Memory/Resetting Processor to Factory Default*.

IMPORTANT When you clear the program on a GuardLogix 5570 Controller, you must also clear the 1756-L7SP Safety Partner.

5580 Controllers

You can clear the program from memory and reset the 5580 controllers and the 1756-L8SP Safety Partner with the reset button.

For information on how to use the reset button, see the ControlLogix 5580 and GuardLogix 5580 Controllers User Manual, publication 1756-UM543.



WARNING: When you press the reset button while power is on, an Electric 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.

IMPORTANT In a SIL 3 application, when you reset the GuardLogix 5580 Controller you must also reset the 1756-L8SP Safety Partner.

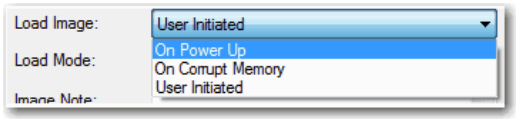
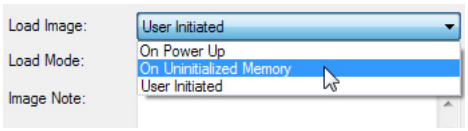
SD Card Behavior

The controller has changed some behaviors when loading a project from the SD card into a controller. These changes facilitate a better workflow for easier commissioning of brand new out of box controllers. All Logix 5000 controllers ship from the factory with firmware revision 1.x.

With 5580 controllers, the Load Image setting On Uninitialized Memory is available. This setting replaces the On Corrupt Memory setting that is available with 5570 controllers.

The general behavior is the same for both settings. The only difference is the controller behavior when it is in the out-of-box condition, as described in Table 5.

You can install an SD card that uses On Uninitialized Memory in an out-of the box controller, that is, one that uses firmware revision 1.x. In this case, at power-up the image loads both the controller firmware and controller application.

5570 Controllers Example	5580 Controllers Example
	

When you use an SD card with an image in an out-of-box controller (firmware revision 1.x), at power-up that controller updates its firmware to the revision stored on the card. The update happens regardless of the Load Image setting you made when you transferred the image to the SD card.

The On Power Up, and On Initialized Memory settings also load the controller application into an out of box controller.

This table shows what happens at power-up when you insert an SD card that contains an image into a 5580 controller.

Table 5 - SD Card Settings and Controller Power-up Behavior

Image Setting	Controller is in Out-of-Box Condition (v1.x firmware)	Firmware > 1.x and Internal Nonvolatile Memory is not Valid(2)	Firmware > 1.x and Internal Nonvolatile Memory is Valid(2)
User Initiated	Loads Firmware Only(1)	Does Nothing	Does Nothing
On Power Up	Loads both Firmware and Application	• Loads Firmware if there is a revision mismatch • Loads Application	• Loads Firmware if there is a revision mismatch • Loads Application
On Uninitialized Memory	Loads both Firmware and Application(1)	• Loads Firmware if there is a revision mismatch • Loads Application	Does Nothing

(1) Indicates change in behavior from ControlLogix 5570 and older controllers.

(2) "Valid" includes the No Project condition.

Communication Options

Several communication networks are available for use. This table describes typical network applications that are used, and lists the networks available to support such applications.

Application Type	5570 Controllers - Supported Networks	5580 Controllers - Supported Networks
Communication options	• EtherNet/IP • ControlNet® • DeviceNet® • Data Highway Plus™ (DH+™) • Remote I/O • SynchLink™ • USB Client	
Integrated Motion	• EtherNet/IP • SERCOS interface • Analog options: – Encoder input – LDT input – SSI input	EtherNet/IP • SERCOS interface(1) • Analog options:(1) – Encoder input – LDT input – SSI input
Time Synchronization	EtherNet/IP - Available with Integrated Motion and non-motion applications	
Control of distributed I/O	• ControlNet • DeviceNet • EtherNet/IP • Foundation Fieldbus • HART • Universal remote I/O	
Produce/consume data between controllers	• ControlNet • EtherNet/IP	
Messaging to and from other devices, including access to the controller via Logix Designer application	• ControlNet • DeviceNet (only to devices) • Data Highway Plus (DH+) • DH-485 • EtherNet/IP	

(1) With Studio 5000 Logix Designer Application Version 31.00.00 or later.

Communication Throughput

Unlike 5570 controllers, which shares the main core between application code and communications, 5580 controllers run communications asynchronously from the user application.

This implementation provides better communications throughput in both the bandwidth and speed of data the 5580 controllers can deliver to and from, for example, HMIs, Historians, and MES systems. It also improves the overall application performance as the controller no longer has to task switch and pause application execution to handle HMI or other class 3 traffic.

For 5570 and 5580 controllers, the controller runs communication asynchronously to the application, make sure communication that is delivered to the controller is complete before the application executes on the newly delivered data. This applies to both data that comes into the controller and data that goes out.

For example, if the HMI is writing a large block of recipe data to the controller, application code can start executing on that recipe data before the data writing process finishes. This action results in half of the current recipe and half of the last recipe in the application space.

Traditionally, programmers have used the following techniques to control the effects of asynchronous communications:

- UID/UIE pairs
- Periodic tasks
- Moving data with CPS instructions

The techniques all rely on controlling when the main core can switch tasks. This helps to prevent the communications task from changing data while the control task used it. Because the controller processes communications on an independent core of the CPU, then UID/UIE pairs and Periodic Tasks are not as effective in all cases.

The items that are highlighted in this table are where controller behavior differs.

Table 6 - ControlLogix 5570 and ControlLogix 5580 Controller Behavior Differences

Tag Read/Write Source	UID/UIE		CPS		Periodic Task	
	5580 Controllers	5570 Controllers	5580 Controllers	5570 Controllers	5580 Controllers	5570 Controllers
HMI	Allows	Blocks	Blocks	Blocks	Allows	Blocks
MSG	Allows	Blocks	Blocks	Blocks	Allows	Blocks
I/O Update	Allows	Allows	Blocks	Blocks	Allows	Allows
Produce/Consume	Allows	Allows	Blocks	Blocks	Allows	Allows
Other User Tasks	Blocks	Blocks	Blocks	Blocks	Allows	Allows
Motion Planner	Allows	Allows	Blocks	Blocks	Allows	Allows

Blocks - Stops source data values from change by communications during application execution.
Allows - Communications can change source data values during application execution.

Because the controllers have 32-bit data integrity, this only applies to data structures larger than 32 bits. If word-level integrity is your primary concern, the 32-bit data integrity does not impact your data use.

Good programming practice dictates the use of two unique words at the beginning and the end of data. The controller validates the words to assure the entire structure has data integrity. We recommend that the handshake data is changed and the application code validates it every transaction before the controller application code or higher-level system reading controller data acts on it.

Download the Program to the Controller

The first time that you download a program, it can take longer than subsequent downloads. These situations can affect download/compile times:

- The capability of the personal computer or laptop.
- You download the project immediately after a project import or upload, but before Logix Designer has compiled the project once.
- You edit a User Defined Tag (UDT), Add-On Instruction (AOI), or an object that is used in many places.
- Increased load when Logix Designer compiles and generates code.

Build Button

The new Build button in Logix Designer creates binary files that are compiled from user subroutines, and caches them in the project .ACD file.

If these files are present in the project during a download, then Logix Designer does not have to recompile them, and saves time during the download process.

Every download requires that only the changed subroutines must be recompiled. You can perform a build offline, save the project .ACD file, and later distribute it to many controllers without recompilation.

This manual build step is optional. If you do not use the build button, Logix Designer builds all necessary files when you initiate a download.

An imported project requires a complete rebuild, and extends the download process the first time you attempt a download.

Downloading Workflow Change on page 43 provides an explanation of the download changes.

Downloading Workflow Change

Offline builds can save time when doing subsequent downloads.

5580 Controllers	5570 Controllers
Only changed source code is recompiled on a download.	All source code is recompiled on every project download.

Mitigation

Adjust your workflow to save workstations from having to rebuild the project. You can do offline builds, save the project file, and distribute it to other workstations to minimize your download times.

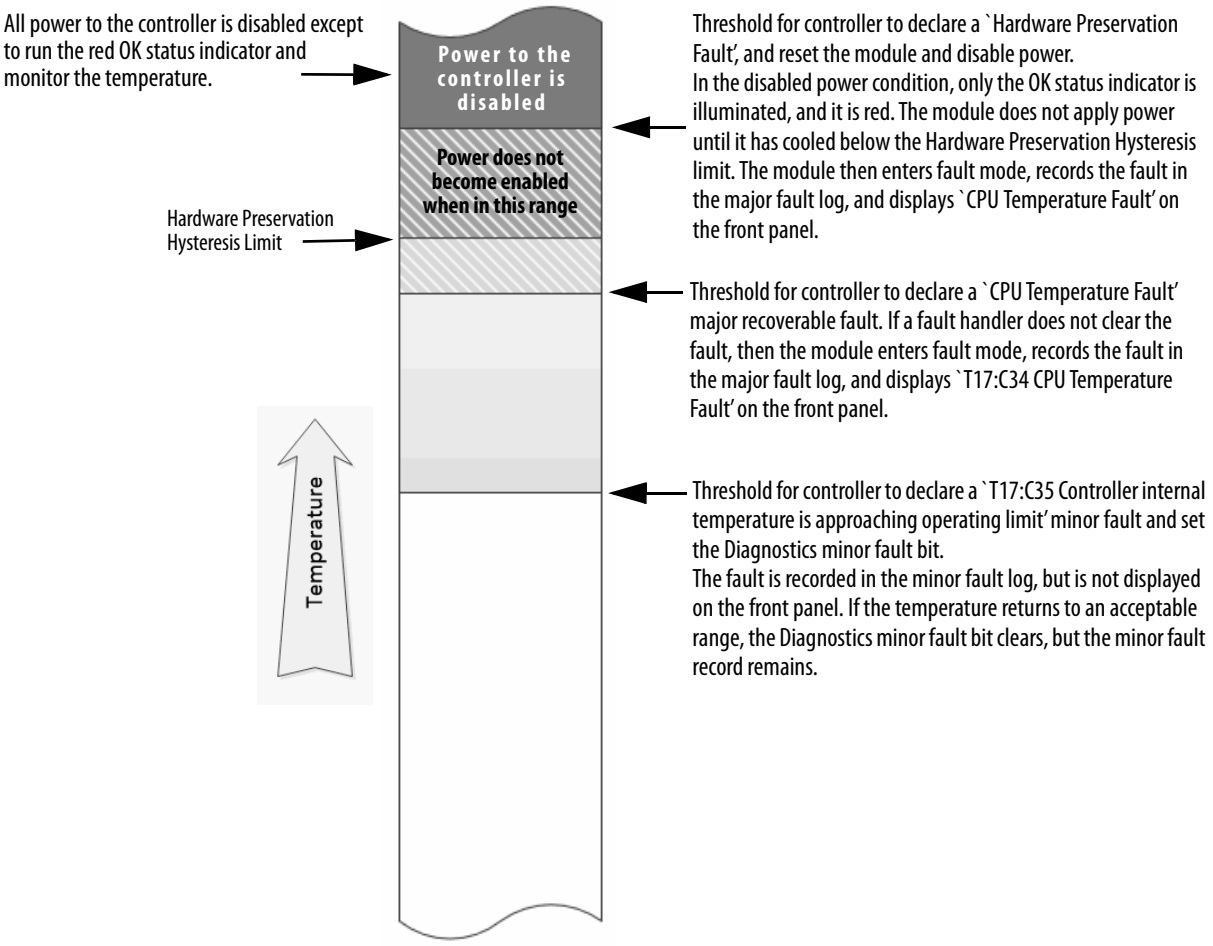
Upload Fidelity Change

When you upload, projects that contain program parameters and aliases now are faithfully reproduced. The uploaded Ladder Diagram source code is an exact replica of what was downloaded. This was not the case in 5570 controller Ladder Diagram subroutines, which referenced aliases or program parameters.

Thermal Monitoring and Thermal Fault Behavior

The controllers can monitor internal module temperatures and respond as the temperature increases.

Figure 8 - Controller Thermal Fault Behavior



Replacement Considerations with CompactLogix and Compact GuardLogix Systems

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This chapter describes features and functions that are associated these controllers:

- CompactLogix™ 5380 controllers when used with the Studio 5000 Logix Designer® application, version 28 or later.
- Compact GuardLogix® 5380 SIL 2 controllers when used with the Studio 5000 Logix Designer application, version 31 or later.
- Compact GuardLogix® 5380 SIL 3 controllers when used with the Studio 5000 Logix Designer application, version 32 or later.

For information on replacing CompactLogix 1769-L3 or CompactLogix 1768-L4 controllers, see Replacement Considerations for 1768-L4 and 1769-L3 Controllers on page 163.

This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes These Controllers
5380 controllers	CompactLogix™ 5380, Compact GuardLogix 5380 SIL 2, and Compact GuardLogix 5380 SIL 3 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers

The features and functions described in this chapter are not an exhaustive list of the features and functions available with the controller. Instead, they provide a picture of what is new or changed in the controller at this release, including the following:

- Dual embedded 10/100/1000 Mbps Ethernet ports
- Dual-IP mode
- Higher performance and capacity including:
  - Total Motion processing: Support for up to 32 axes (limit differs by controller catalog number)
  - Total I/O packets processing: 128,000 pps
  - 320 unconnected message buffers
  - 256 simultaneous cached message instructions in the running state
  - Support for up to 180 Ethernet nodes (limit differs by controller catalog number)
- Support for Compact 5000™ I/O modules as local and remote I/O modules
- Change Ethernet port speed without a module reset

Minimum Requirements

The controllers have these minimum requirements.

CompactLogix Controllers Minimum Requirements

Requirement, Minimum	CompactLogix 5370 L3 Controller	CompactLogix 5380 Controller
Programming Software	Studio 5000 Automation Engineering & Design Environment®, Version 20.00.00 or later	Studio 5000 Logix Designer Application, Version 28.00.00 or later(1)

(1) Most CompactLogix 5380 controllers are first available in version 29.00.00. Also, you must use version 29 or later to use Dual-IP mode with CompactLogix 5380 controllers.

Compact GuardLogix Controllers Minimum Requirements

Requirement, Minimum	Compact GuardLogix 5370 Controller	Compact GuardLogix 5380 Controller
Programming Software	Studio 5000 Automation Engineering & Design Environment, Version 28.00.00 or later	**Compact GuardLogix 5380 SIL 2 Controller**: Studio 5000 Logix Designer Application, Version 31.00.00 or later **Compact GuardLogix 5380 SIL 3 Controller**: Studio 5000 Logix Designer Application, Version 32.00.00 or later

Product Comparison

The 5380 controllers operate similar to the 5370 controllers, with these differences.

CompactLogix Controllers Product Comparison

Table 7 - Technical Specifications

Attribute	CompactLogix 5370 L3 Controller	CompactLogix 5380 Controller
Memory	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM: 1 MB 1769-L33ER, 1769-L33ERM: 2 MB 1769-L36ERM: 3 MB 1769-L37ERM: 4 MB 1769-L38ERM: 5 MB	5069-L306ER, 5069-L306ERM: 0.6 MB 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM: 1 MB 5069-L320ER, 5069-L320ERM, 5069-L320ERP: 2 MB 5069-L330ER, 5069-L330ERM: 3 MB 5069-L340ER, 5069-L340ERM, 5069-L340ERP: 4 MB 5069-L350ERM: 5 MB 5069-L380ERM: 8 MB 5069-L3100ERM: 10 MB
Local I/O modules supported	1769 Compact I/O™ only Number of local I/O modules that are supported varies by controller catalog number	Compact 5000 I/O Standard modules only Number of local I/O modules that are supported varies by controller catalog number
Embedded Ethernet	10/100 Mbps	10/100/1000 Mbps
Ethernet nodes	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM: 16 1769-L33ER, 1769-L33ERM: 32 1769-L36ERM: 48 1769-L37ERM: 64 1769-L38ERM: 80	5069-L306ER, 5069-L306ERM: 16 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM: 24 5069-L320ER, 5069-L320ERM, 5069-L320ERP: 40 5069-L330ER, 5069-L330ERM: 60 5069-L340ER, 5069-L340ERM, 5069-L340ERP: 90 5069-L350ERM: 120 5069-L380ERM: 150 5069-L3100ERM: 180
Ethernet performance	I/O Capacity (Class 0/1): 10,000 packets per second max Message Rate Capacity HMI/MSG (Class 3): 400 packets per second max	I/O Capacity (Class 0/1) [3]: 128,000 packets per second Message Rate Capacity HMI/MSG (Class 3)[3]: 2000 messages per second[4]
Dual-IP mode	Not supported	Supported with the Logix Designer application, version 29 or later
Unconnected message buffers	No fixed limits, as long as the controller can allocate the buffer at will.	320 - Any combination of outbound and inbound messages
Concurrent cached message instructions in the running state	32, drawn from the 250 total connections supported by the controller.	256 dedicated buffers
HMI and Messaging (Class 3)	Drawn from the 250 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	EtherNet/IP™ network	
Motion axes[1]	Position Loop: • 1769-L30ERM - As many as 4 axes • 1769-L33ERM- As many as 8 axes • 1769-L36ERM, 1769-L37ERM, 1769-L38ERM - As many as 16 axes Other Loop Types: • Up to 100 Integrated Motion Drives: • Up to 80 max nodes, depending on controller catalog number	Position Loop: • 5069-L306ERM: As many as 2 axes • 5069-L310ERM: As many as 4 axes • 5069-L320ERM, 5069-L320ERP: As many as 8 axes • 5069-L330ERM: As many as 16 axes • 5069-L340ERM, 5069-L340ERP: As many as 20 axes • 5069-L350ERM: As many as 24 axes • 5069-L380ERM: As many as 28 axes • 5069-L3100ERM: As many as 32 axes Other Loop Types: • Up to 256 Integrated Motion Drives: • Up to 180 max nodes, depending on controller catalog number and firmware revision

Table 7 - Technical Specifications (continued)

Attribute	CompactLogix 5370 L3 Controller	CompactLogix 5380 Controller
Axes/ms over EtherNet/IP™ port	As many as 2 (2 ms coarse update period and 50% controller load) **IMPORTANT**: Not all CompactLogix 5370 controllers support Integrated Motion over an EtherNet/IP network.	As many as 32 when you use the built-in EtherNet/IP port at 1 Gbps **IMPORTANT**: Not all CompactLogix 5380 controllers support Integrated Motion over an EtherNet/IP network.
Voltage and current ratings	Controller power: 500 mA @ 5.1V DC and 225 mA @ 24V DC	MOD Power: 450 mA @ 18…32V DC MOD Power Inrush: 850 mA for 125 ms SA Power: 10 mA @ 0…32V DC 25 mA @ 0…240V AC, 47…63 Hz ATEX/IECEX, 125V AC Max MOD Power (Passthrough)(5): 9.55 A @ 18…32V DC SA Power (Passthrough)(6): 9.95 A @ 0…32V DC 9.975 A @ 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC Max
Energy storage module	Non-removable	Non-removable
Weight, approx	0.31 kg (0.68 lb)	0.394 kg (.868 lb)
Wire category(2)	3 - on USB port 2 - on Ethernet port	3 - on USB port 1 - on power ports 2 - on Ethernet port
Wire size	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702	Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2
Removable terminal block	Not Applicable	Kit 5069-RTB64-SCREW or kit 5069-RTB64-SPRING You must order the kit separately. RTBs do not ship with the controller. 5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only
Reset Button	Clears the user application and memory but retains the firmware revision and all network settings	A stage 1 reset clears the user application program and memory, but retains the controller IP address. A stage 2 reset returns the controller to out-of box settings (including firmware), and clears all network settings.

(1) For information on motion axes and Integrated Motion on an EtherNet/IP network, see the Integrated Motion on the EtherNet/IP Network: Configuration and Startup User Manual, publication MOTION-UM003.

(2) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(3) I/O numbers are maximums; they assume no HMI/MSG. HMI/MSG numbers are maximums, they assume no I/O. Maximums assume the processor is target, not originator. Packet rates vary depending on packet size. For more details, see Troubleshoot EtherNet/IP Application Technique, publication ENET-AT003, and the EDS file for a specific catalog number.

(4) Data size = 32-bits / 1-DINT

(5) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(6) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

Compact GuardLogix Controllers Product Comparison

Table 8 - Technical Specifications

Attribute	Compact GuardLogix 5370 Controller	Compact GuardLogix 5380 Controller
Memory	1769-L30ERMS: 1 MB standard, 0.5 MB safety 1769-L33ERMS: 2 MB standard, 1 MB safety 1769-L36ERMS: 3 MB standard, 1.5 MB safety 1769-L37ERMS: 4 MB + 1.5 MB safety 1769-L38ERMS: 5 MB + 1.5 MB safety	5069-L306ERS2, 5069-L306ERMS2, 5069-L3100ERMS3: 0.6 MB + 0.3 MB Safety 5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3: 1 MB + 0.5 MB Safety 5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERMS3: 2 MB + 1 MB Safety 5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERMS3: 3 MB + 1.5 MB Safety 5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3: 4 MB + 2 MB Safety 5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERMS3: 5 MB + 2.5 MB Safety 5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3: 8 MB + 4 MB Safety 5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3: 10 MB + 5 MB Safety
Local I/O modules supported	• 1769 Compact I/O only • Number of local I/O modules that are supported varies by controller catalog number	• Compact 5000 I/O Standard and Safety modules only • Number of local I/O modules that are supported varies by controller catalog number
Safety I/O support	• 1734 POINT Guard I/O™, 1732 ArmorBlock® Guard I/O™, 1791 CompactBlock™ Guard I/O™ • Can only communicate to safety I/O through the embedded Ethernet ports.	• Compact 5000 I/O Safety modules, 1734 POINT Guard I/O, 1732 ArmorBlock Guard I/O, 1791 CompactBlock Guard I/O, FLEX 5000™ I/O Safety modules, 1756 ControlLogix® Digital Safety I/O • Can communicate to local Compact 5000 I/O safety modules through the backplane, and also communicate to distributed safety I/O through the embedded Ethernet ports. • Can communicate to DeviceNet® safety I/O nodes with the 1788-EN2DNR Ethernet to DeviceNet linking device.
Embedded Ethernet	10/100 Mbps	10/100/1000 Mbps
Ethernet nodes	1769-L30ERMS: 16 1769-L33ERMS: 32 1769-L36ERMS: 48 1769-L37ERMS: 64 1769-L38ERMS: 80	5069-L306ERS2, 5069-L306ERMS2, 5069-L306ERMS3: 16 5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3: 24 5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERMS3: 40 5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERMS3: 60 5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3: 90 5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERMS3: 120 5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3: 150 5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3: 180
Ethernet performance	Ethernet I/O (Class 0/1): 10,000 packets per second max Ethernet Messaging (Class 3): 400 packets per second max	Ethernet I/O (Class 0/1): 128,000 packets per second Ethernet Messaging (Class 3): 2000 messages per second[3]
Dual-IP mode	Not supported	• Compact GuardLogix 5380 SIL 2 controllers are supported with the Logix Designer application, version 31 or later • Compact GuardLogix 5380 SIL 3 controllers are supported with the Logix Designer application, version 32 or later
Unconnected message buffers	No fixed limits, as long as the controller can allocate the buffer at will.	320 - Any combination of outbound and inbound messages
Concurrent cached message instructions in the running state	32, drawn from the 250 total connections supported by the controller.	256 dedicated buffers
HMI and Messaging (Class 3)	Drawn from the 250 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	EtherNet/IP network	
Motion axes[1]	Position Loop: • 1769-L30ERMS - As many as 4 axes • 1769-L33ERMS - As many as 8 axes • 1769-L36ERMS, 1769-L37ERMS,1769-L38ERMS - As many as 16 axes Other Loop Types: • Up to 100 Integrated Motion Drives: • Up to 80 max nodes, depending on controller catalog number	Position Loop: 5069-L306ERMS2, 5069-L306ERMS3: As many as 2 axes 5069-L310ERMS2, 5069-L310ERMS3: As many as 4 axes 5069-L320ERMS2, 5069-L320ERMS3: As many as 8 axes 5069-L330ERMS2, 5069-L330ERMS3: As many as 16 axes 5069-L340ERMS2, 5069-L340ERMS3: As many as 20 axes 5069-L350ERMS2, 5069-L350ERMS3: As many as 24 axes 5069-L380ERMS2, 5069-L380ERMS3: As many as 28 axes 5069-L3100ERMS2, 5069-L3100ERMS3: As many as 32 axes Other Loop Types: • Up to 256 Integrated Motion Drives: • Up to 180 max nodes, depends on controller catalog number and firmware revision

Table 8 - Technical Specifications (continued)

Attribute	Compact GuardLogix 5370 Controller	Compact GuardLogix 5380 Controller
Axes/ms over EtherNet/IP port	As many as 2 (2 ms coarse update period and 50% controller load)	As many as 32 when you use the built-in EtherNet/IP port at 1 Gbps **IMPORTANT**: Not all Compact GuardLogix 5380 controllers support Integrated Motion over an EtherNet/IP network.
Voltage and current ratings	Controller power: 850 mA @ 5.1V DC and 700 mA @ 24V DC	**Compact GuardLogix 5380 SIL 2 controllers**: • MOD Power: 475 mA @ 18…32V DC • MOD Power Inrush: 1200 mA for 125 ms • SA Power: 10 mA @ 0…32V DC • MOD Power (Passthrough)(4): 4.525 A @ 18…32V DC • SA Power (Passthrough)(5): 9.99 A @ 0…32V DC **Compact GuardLogix 5380 SIL 3 controllers**: • MOD Power: 950 mA @ 18…32V DC • MOD Power Inrush: 2.375 A • SA Power: 10 mA @ 0…32V DC • MOD Power (Passthrough)(4): 4.05 A @ 18…32V DC • SA Power (Passthrough)(5):9.99 A @ 0…32V DC
Energy storage module	Non-removable	Non-removable
Weight, approx	0.54 kg (1.18 lb)	**Compact GuardLogix 5380 SIL 2 controllers**: 0.768 kg (1.693 lb) **Compact GuardLogix 5380 SIL 3 controllers**: 1.2 kg (2.645 lb)
Wire category(2)	3 - on USB port 2 - on Ethernet port	3 - on USB port 1 - on power ports 2 - on Ethernet port
Wire size	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702	Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2
Removable terminal block	Not applicable	Kit 5069-RTB64-SCREW or kit 5069-RTB64-SPRING You must order the kit separately. RTBs do not ship with the controller. 5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only
Reset Button	Clears the user application and memory but retains the firmware revision and all network settings	A stage 1 reset clears the user application program and memory, but retains the controller IP address. A stage 2 reset returns the controller to out-of box settings (including firmware), and clears all network settings.

(1) For information on motion axes and Integrated Motion on an EtherNet/IP network, see the Integrated Motion on the EtherNet/IP Network: Configuration and Startup User Manual, publication MOTION-UM003.

(2) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(3) Data size = 32-bits / 1-DINT

(4) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(5) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

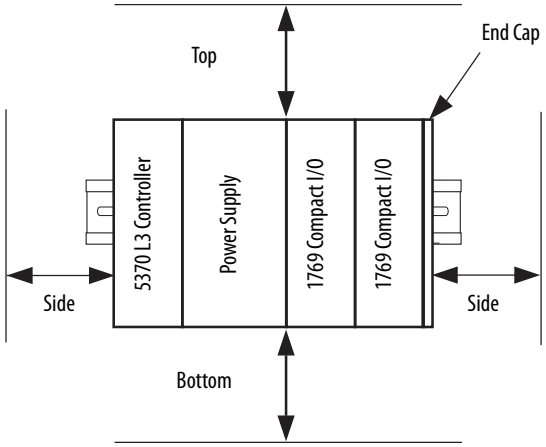
Controller Spacing

Controller spacing differs between the 5370 controllers and the 5380 controllers. The graphics in this section are not to scale.

CompactLogix 5370 L3 and Compact GuardLogix 5370 L3 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment.

Leave 50.80 mm (2.00 in.) of space on all sides, as shown. This spacing provides ventilation and electrical isolation.

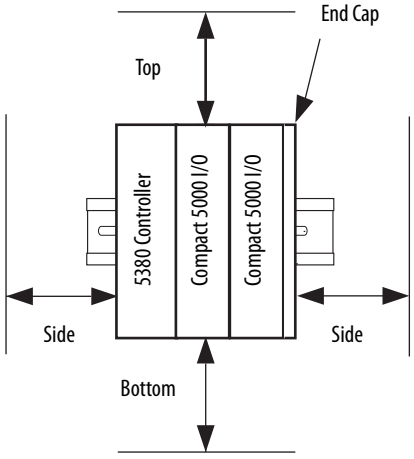


CompactLogix 5380 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment.

The minimum distance on all sides of the CompactLogix 5380 system varies based on the operating temperature, as follows:

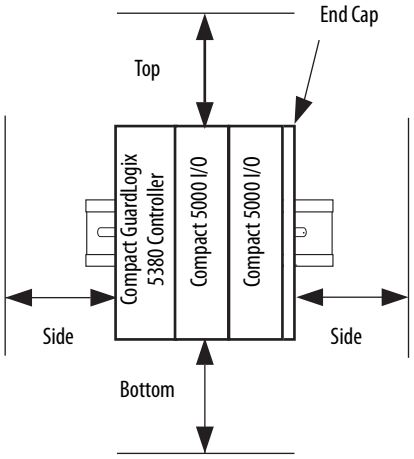
- 50.80 mm (2.00 in.) at 55 °C (131 °F)
- 101.60 mm (4.00 in.) at 60 °C (140 °F)



Compact GuardLogix 5380 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment. The minimum distance on all sides of the Compact GuardLogix 5380 system varies based on the operating temperature, as follows:

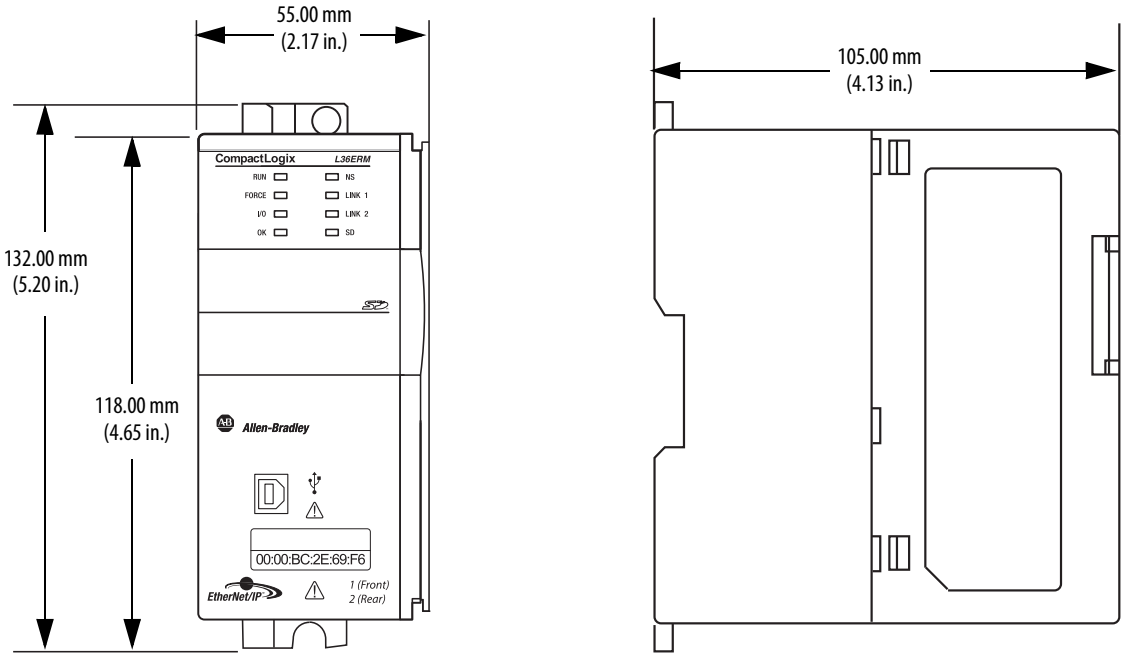
Compact GuardLogix SIL2 Controllers	Series A catalog numbers: • 50.80 mm (2.00 in.) at 50 °C (131 °F) • 101.60 mm (4.00 in.) at 55 °C (122 °F) • 152.40 mm (6.00 in.) at 60 °C (140 °F) Series B catalog numbers: • 50.8 mm (2.00 in.) at 55 °C (131 °F) • 101.6 mm (4.00 in.) at 60 °C (140 °F)
Compact GuardLogix SIL 3 Controllers	• 50.8 mm (2.00 in.) at 55 °C (131 °F) • 101.6 mm (4.00 in.) at 60 °C (140 °F)



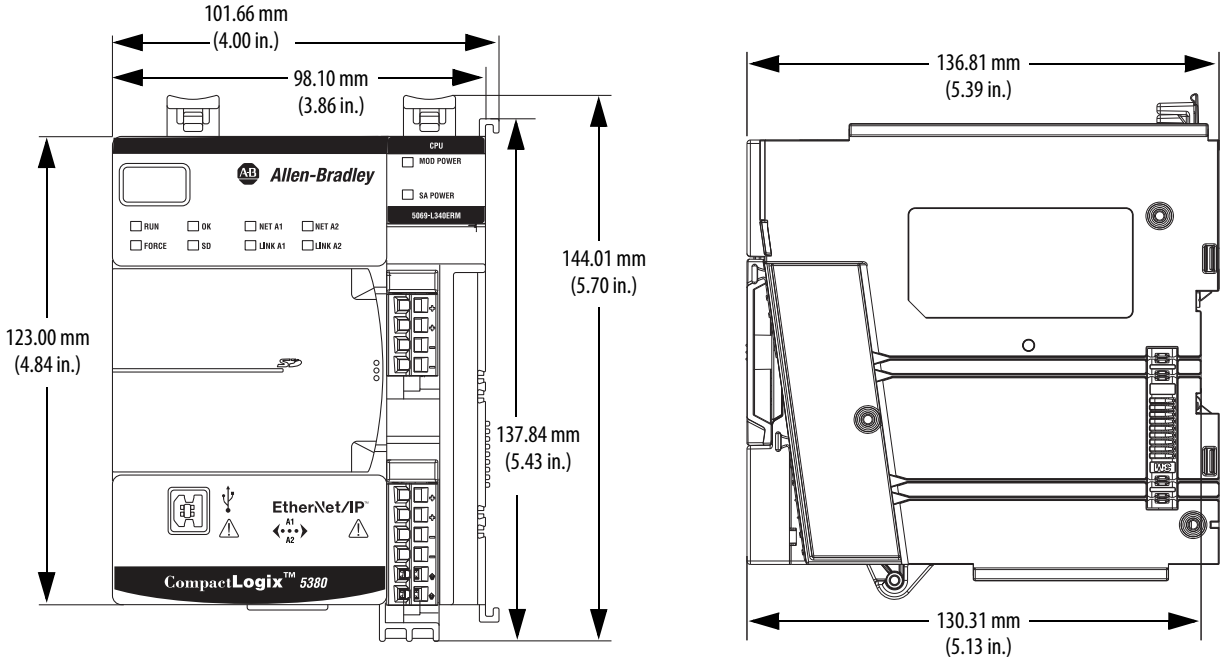
Controller Dimensions

This section shows dimensional differences.

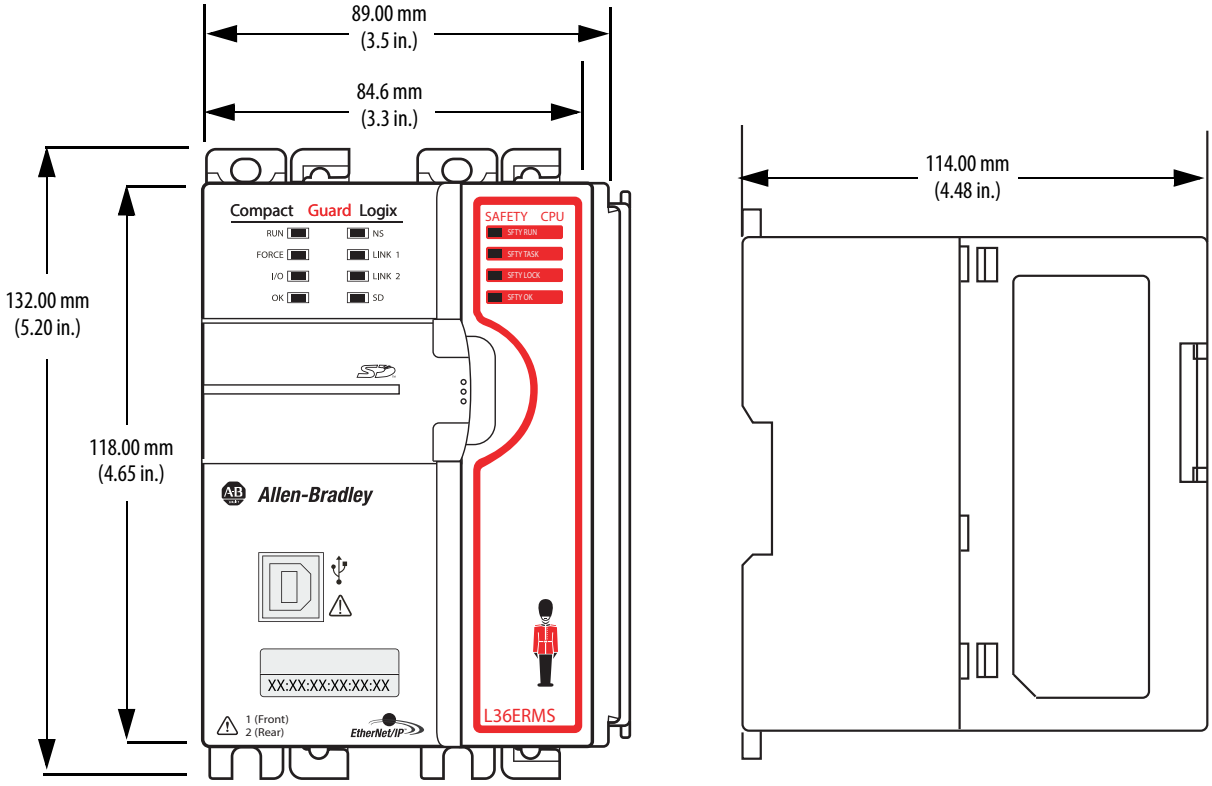
CompactLogix 5370 L3 Dimensions



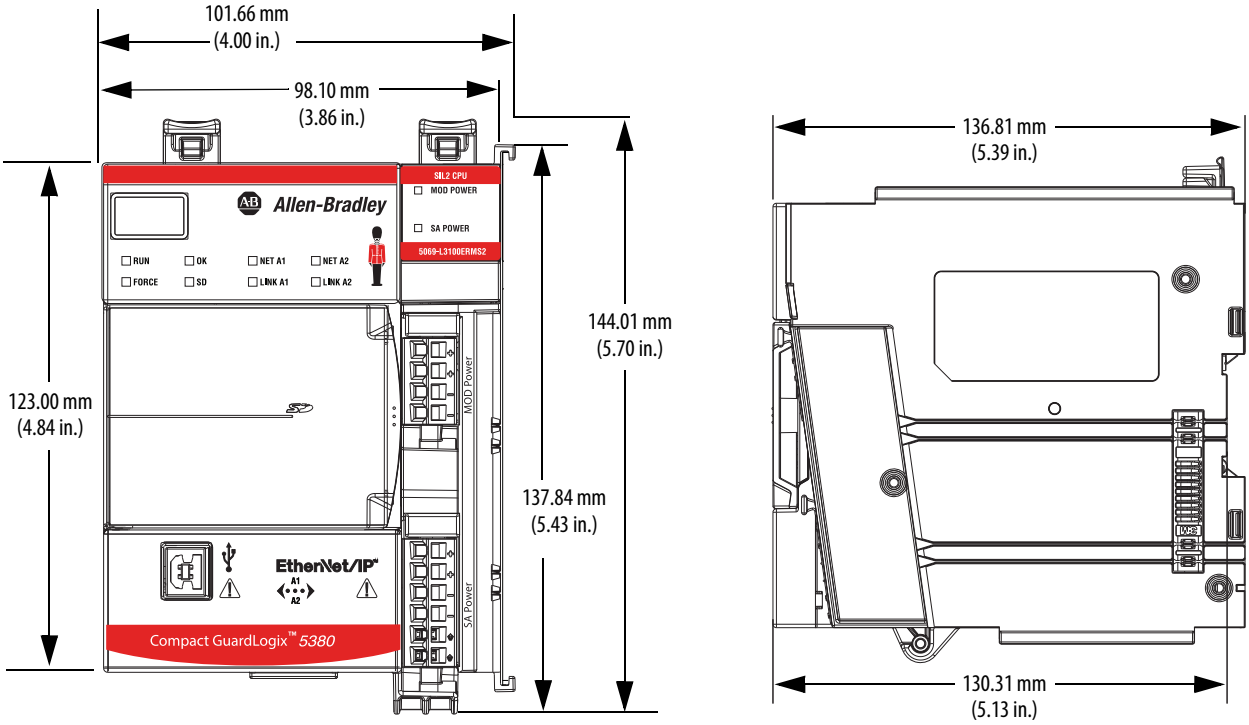
CompactLogix 5380 Dimensions



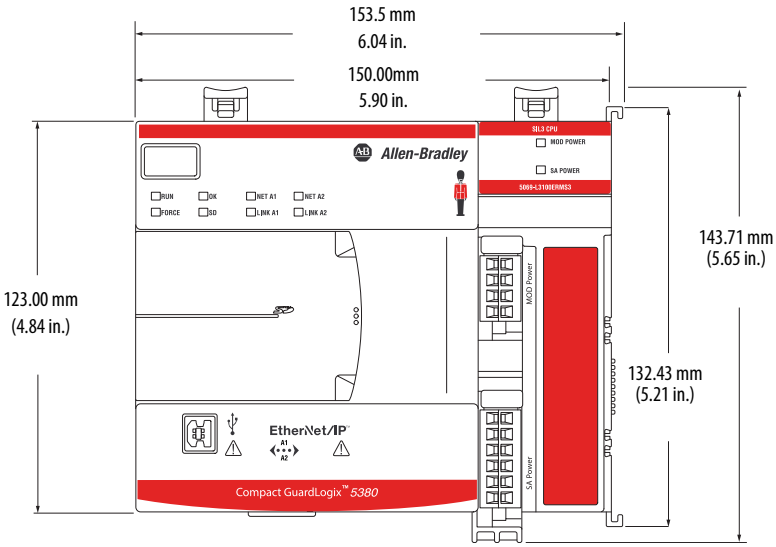
Compact GuardLogix 5370 Dimensions

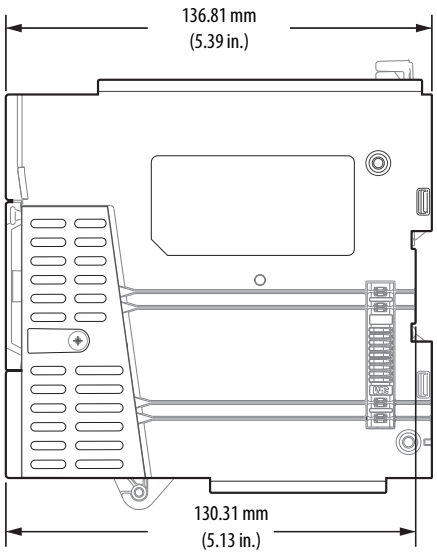


Compact GuardLogix 5380 SIL 2 Controller Dimensions



Compact GuardLogix 5380 SIL 3 Controller Dimensions



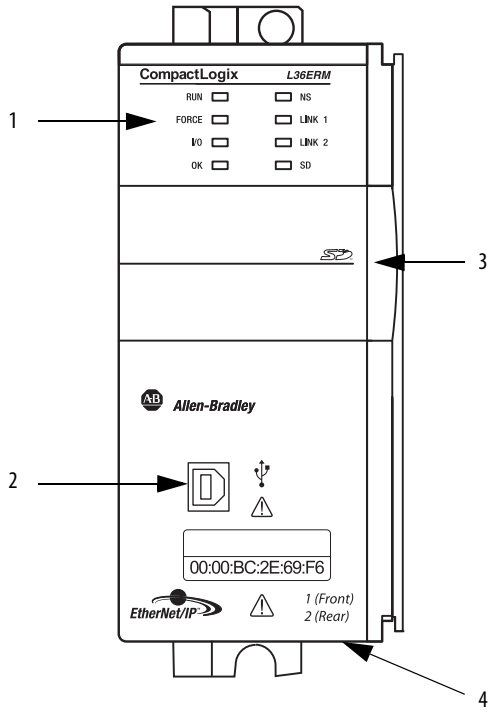


Connectors and Status Indicators

The following tables shows the differences between the connectors and status indicators.

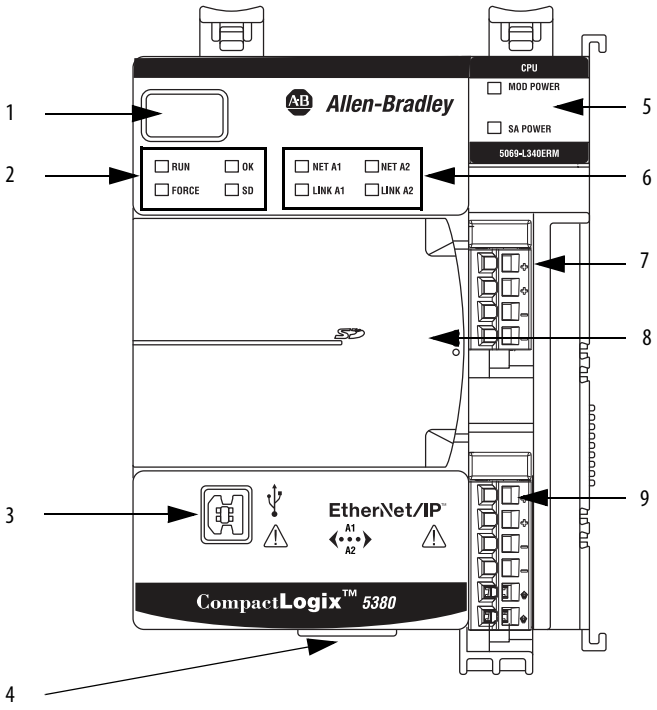
For more information on the controller status indicators and reset button, see Chapter 9, Diagnostics and Status Indicators with CompactLogix Systems on page 159.

CompactLogix 5370 L3



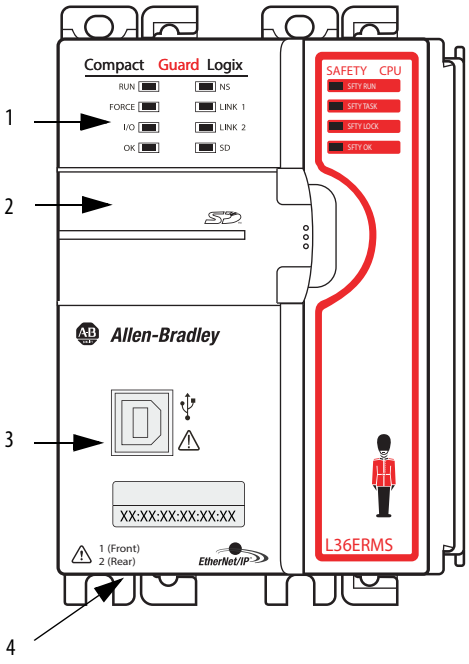
Item	Description
1	Status Indicators
2	USB port
3	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
4	Ethernet ports 1 and 2

CompactLogix 5380



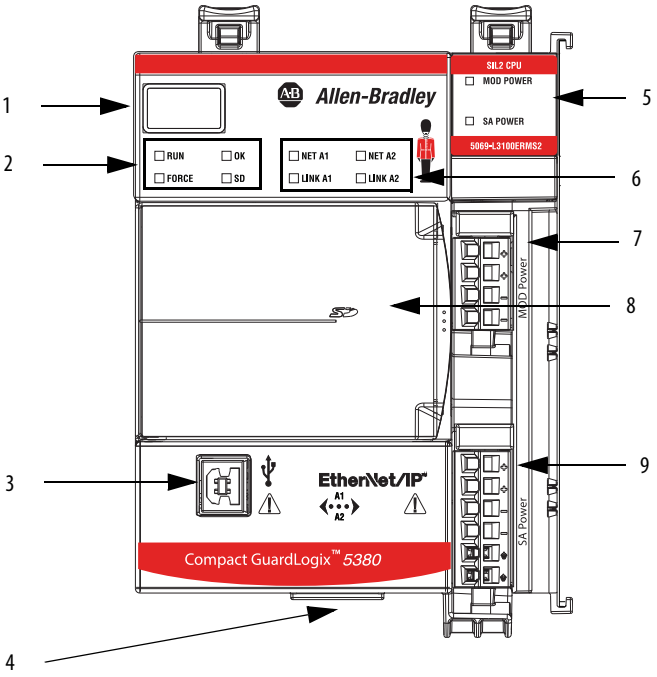
Item	Description
1	4-character display
2	Controller Status Indicators
3	USB port
4	Ethernet ports 1 and 2
5	Power Status Indicators
6	EtherNet/IP Status Indicators
7	MOD power connection
8	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
9	SA power connection

Compact GuardLogix 5370



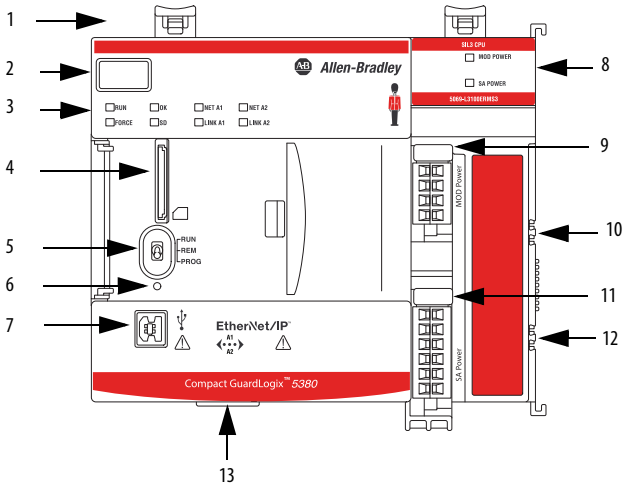
Item	Description
1	Status Indicators
2	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
3	USB port
4	Ethernet ports 1 and 2

Compact GuardLogix 5380 SIL 2



Item	Description
1	4-character display
2	Controller Status Indicators
3	USB port
4	Ethernet ports 1 and 2
5	Power Status Indicators
6	EtherNet/IP Status Indicators
7	MOD power connection
8	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
9	SA power connection

Compact GuardLogix 5380 SIL 3



1	DIN Rail Latches
2	Four-character Display
3	Status Indicators
4	SD Card Slot
5	Mode Switch
6	Reset Button
7	USB Port
8	Module Power and Sensor Actuator Power Status Indicators
9	MOD Power RTB
10	MOD Power Bus Connector
11	SA Power RTB
12	SA Power Bus Connector
13	Ethernet ports (bottom of controller)

Power the Controller

There are differences in how to power the 5380 controllers versus the 5370 controllers. Table 9 highlights some of the power differences.

For information on how to power your system, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

Table 9 - Power Differences

	CompactLogix 5370 L3 System, Compact GuardLogix 5370 L3 System	**CompactLogix 5380 System**	**Compact GuardLogix 5380 System**
Power source	Compact I/O power supply	External power supply	
Power source location	Power supply that is installed in the system The power supply location is based on the requirements of the modules in the system.	Separate from the system and connected to RTBs on controller The modules installed in the system do not impact the power supply location. Power is transferred to the system via removable terminal blocks (RTBs) on the controller.	
Power types provided	System-side power only	• System-side power via MOD Power RTB • Field-side power via SA Power RTB **IMPORTANT**: RTBs do not ship with the controller. The RTBs are available in kits that you must order separately. Kit 5069-RTB64-SCREW contains screw-type RTBs that are used for MOD power and SA power. Kit 5069-RTB64-SPRING contains spring-type RTBs that are used for MOD power and SA power.	
Current type provided	AC or DC as dictated by system design	• System-side power - DC only • Field-side power - AC or DC as dictated by system design	• System-side power - DC only • Field-side power - DC only at the controller, AC only through the use of a local 5069-FPD, Field Potential Distributor module.
Special requirement	• Must meet Power Supply Distance Rating requirements • Must track power consumption in the local bank and on both sides of the power supply	• Must track the system-side and field-side power consumption to properly size the external power supplies that provide each power type. • Must use 5069-FPD, Field Potential Distributor if SA Power consumption is exceeded before reaching max of 31 local I/O modules. • Must use Field Potential Distribution module to change SA Power potential between AC and DC.	

Project Size

The Logix Designer application uses the .ACD file format type with controller projects. The project file size does not reflect the size of your project that downloads to the controller. The .ACD file contains multiple components. Not all components are downloaded to the controller.

Configure the Controller

You must consider the best way to use controller resources when CompactLogix controllers communicate over an EtherNet/IP network. There are limitations regarding how much EtherNet/IP communication the controller supports.

Consider the following:

- Connections
- Ethernet Nodes

Connections Overview

A Logix 5000™ controller provides connection resources whenever communications are established between two devices.

Connections are used when the system contains the following conditions or activities:

- I/O modules, communication modules, and adapters are present in the I/O configuration of the user project
- Produced or Consumed tags are configured in the user project
- Connected Messages are executed in the user application
- External devices, programming terminals, or HMIs communicate with the controller

Nodes on an EtherNet/IP Network

When used in a Logix Designer application project, 5380 and 5370 controllers offer a simplified method for counting controller resources.

When you configure a 5380 control system, you simply count the number of Ethernet nodes that you include in the I/O configuration section of your Logix Designer application project.

On the Controller Properties dialog box, the Logix Designer application project displays the updated number of nodes that are used as you add Ethernet nodes to the project.

To see an example of how the project displays the node count, see Figure 12 on page 67.

For the EtherNet/IP node limits for 5380 and 5370 controllers, see:

- CompactLogix Controllers Product Comparison on page 47
- Compact GuardLogix Controllers Product Comparison on page 49

Devices Included in the Node Count

Any devices that you add directly to the I/O configuration section are counted toward the node limits of the controller. The following are example devices that must be counted:

- Remote communication adapters
- Devices with an embedded EtherNet/IP port, such as I/O modules, drives, and linking devices
- Remote controllers when a produce/consume connection is established between the two controllers
- HMI devices that are included in the I/O configuration tree
- Third-party devices that are directly connected to the EtherNet/IP network

Devices Excluded from the Node Count

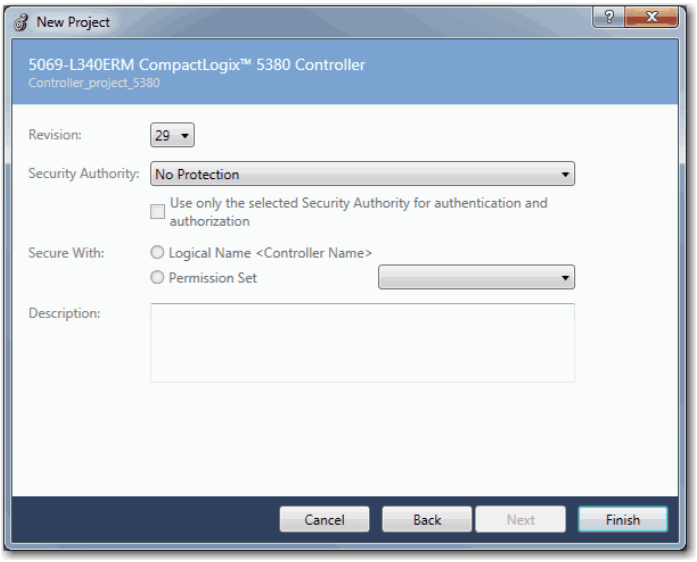
When you calculate the EtherNet/IP node limitation of a controller, do not count devices that exist on the EtherNet/IP network but are not added to the I/O configuration section.

The following devices are **not added** to the I/O configuration section and are **not counted** among the number of nodes:

- Computer
- HMI that is not added to the I/O configuration section
- MSG instruction
- Standard Ethernet devices for which the controller uses a socket interface to communicate

New Project Dialog Box

When you create a project with a 5380 controller, the New Project dialog box appears. The dialog box provides standard controller settings, including security settings. The information that is entered in this dialog box displays on the Controller Properties General tab and Security Tab.



Controller Properties

This table lists Controller Properties dialog box tabs and indicates how a tab is different on a CompactLogix 5380 controller compared to a CompactLogix 5370 L3 controller.

Controller Properties Tab	Comments
General	Same functionality as the 5370 controllers.
Major Faults	Same functionality as the 5370 controllers.
Minor Faults	Same functionality as the 5370 controllers.
Date/Time	Same functionality as the 5370 controllers.
Advanced	New parameter to enable Minor Overflow fault reporting. The System Overhead Time Slice parameter was removed. For more information, see page 64.
SFC Execution	Same functionality as the 5370 controllers.
Project	Option to download custom properties when you download project documentation and extended properties. For more information, see page 65.
Nonvolatile Memory	Same functionality as the 5370 controllers.
Memory (Logix Designer application, version 28) Capacity (Logix Designer application, version 29 and later)	The tabs indicate the same information but are named differently between the Logix Designer application versions. Indicates data usage. Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. See Memory Tab on page 66 or Capacity Tab on page 67.
Internet Protocol	Same functionality as the 5370 controllers.
Port Configuration	Same functionality as the 5370 controllers.
Network	Same functionality as the 5370 controllers.
Security	Now has additional security parameters. For more information, see page 68.
Alarm Log	Not available for 5380 controllers in version 28. Available in version 29 or later with the same functionality as the 5370 controllers.

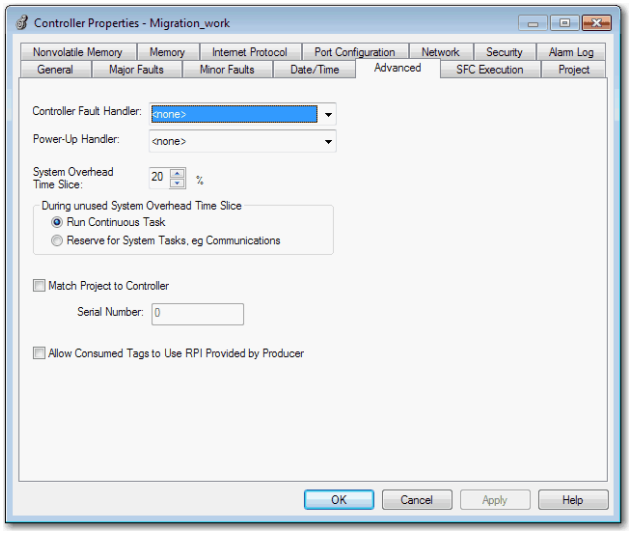
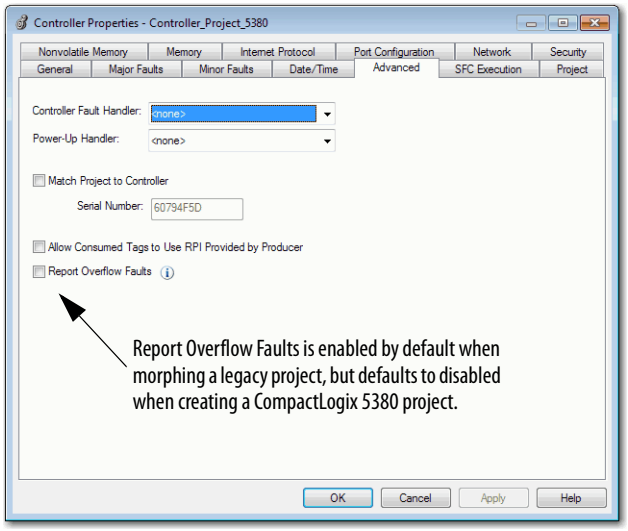
Advanced Tab

The Advanced tab provides a way to assign the Controller Fault Handler and Power-up Handler. You can also match a project to a specific controller by serial number. The tab is used when the project is offline.

- Report Overflow Faults is a new parameter that lets you control Minor Overflow fault reporting. When you create a project, the default setting is disabled. When you import or open a legacy project, the default setting is enabled. For more information, see Minor Fault on Overflow on page 128.

- System Overhead Time Slice is no longer required for 5380 controllers, and the parameter is removed.

Figure 9 - Controller Properties Dialog Box - Advanced Tab

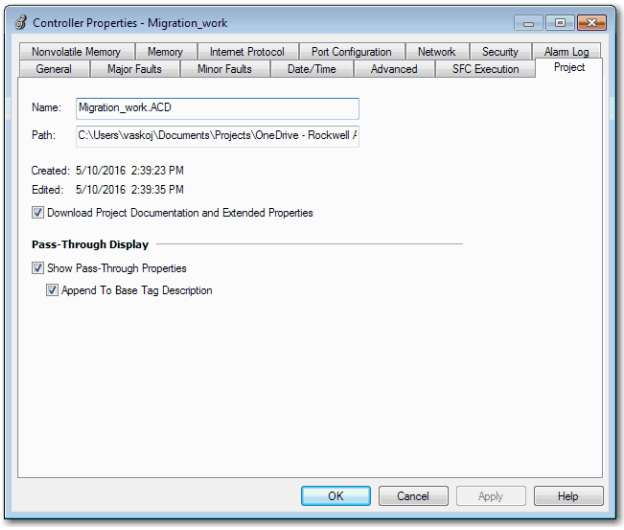
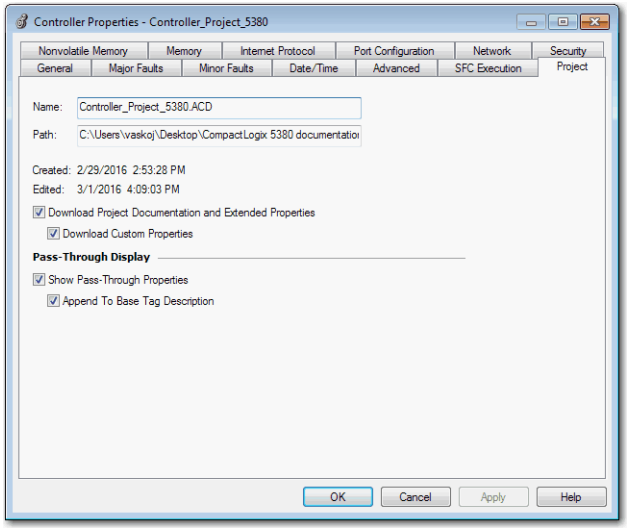
5370 Controllers	5380 Controllers
	

Project Tab

The Project tab provides general project information and lets you configure project download and pass-through display parameters.

The tab is used when the project is offline.

Figure 10 - Controller Properties Dialog Box - Project Tab

5370 Controllers	5380 Controllers
	

Memory Tab

In the Logix Designer application, version 28 or earlier, the Memory tab indicates data usage.

- **5370 controllers** - Data usage is indicated with two values. The tab shows I/O memory and Data and Logic memory separately.

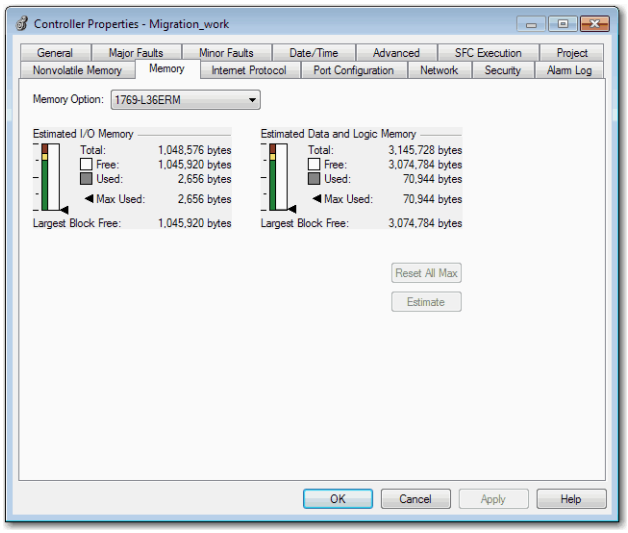
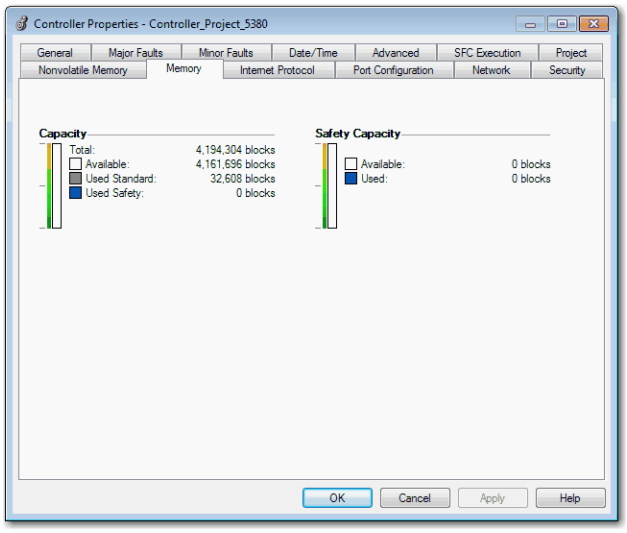
  As you change the project, you can click Estimate to see the estimated memory usage and remaining available memory.

- **5380 controllers** - Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage.

  As you change the project, the data values are automatically updated to indicate the estimated memory usage and remaining available memory.

IMPORTANT Programmatic access to memory is not supported for 5380 controllers, see Controller Memory Usage on page 114.

Figure 11 - Controller Properties Dialog Box - Memory Tab

CompactLogix 5370 L3 Version 28 Example	CompactLogix 5380 Version 28 Example
	

Capacity Tab

In the Logix Designer application, version 29 or later, the Capacity tab indicates data and Ethernet node usage. This tab was named Memory in previous versions of the Logix Designer application.

- **5370 controllers** - Data usage is indicated with two values. The tab shows I/O memory and Data and Logic memory separately. The tab also shows the number of Ethernet nodes that are used.

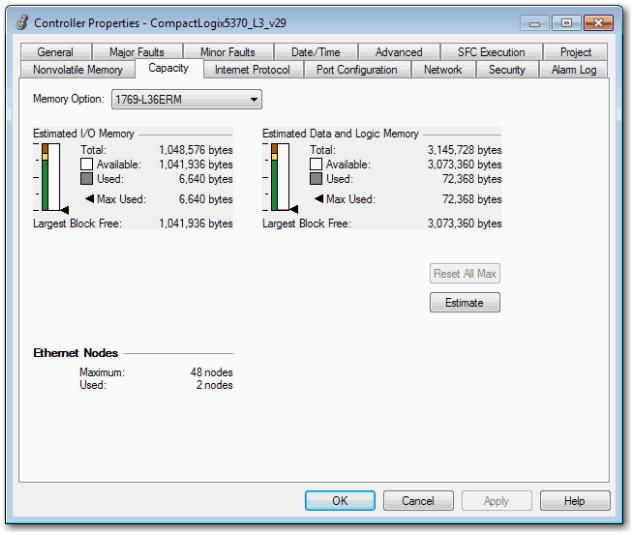
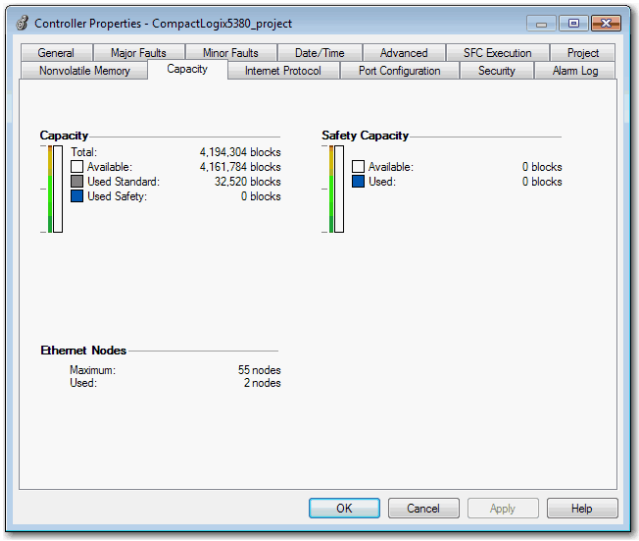
  As you change the project, you can click Estimate to see the estimated memory usage and remaining available memory. The number of Ethernet nodes is updated automatically, however.

- **5380 controllers** - Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. The tab also shows the number of Ethernet nodes that are used.

  As you change the project, the data values are automatically updated to indicate the estimated memory usage and remaining available memory. The number of Ethernet nodes is also updated automatically.

  As you change the project, the data values are automatically updated.

Figure 12 - Controller Properties Dialog Box - Capacity Tab

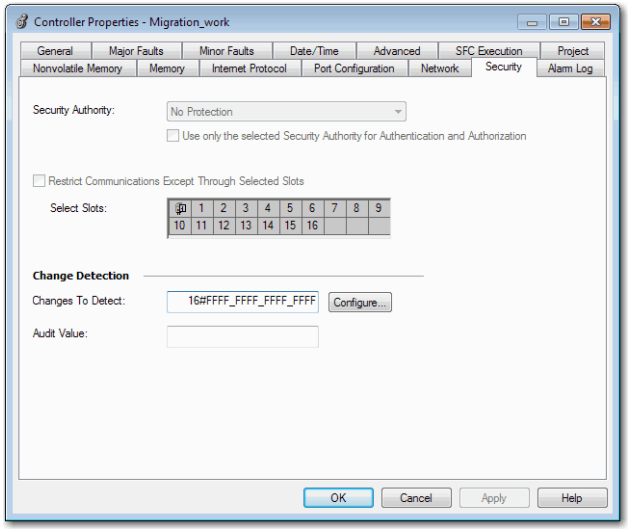
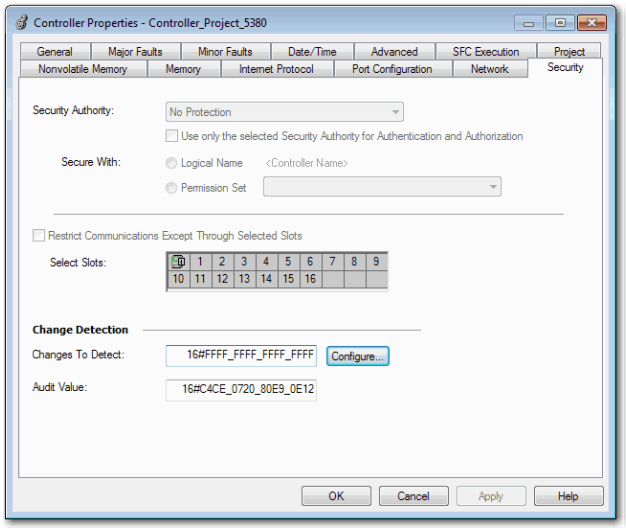
5370 Controllers	5380 Controllers
	

Security Tab

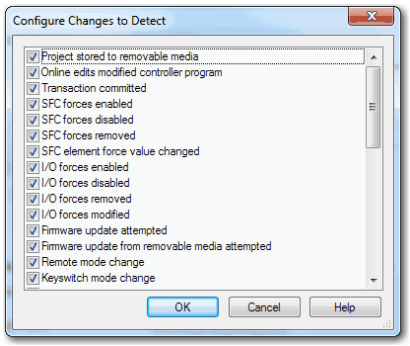
The Security Tab lets you see the controller security settings, for example, the Security Authority choice. Security settings are configured when you create the project.

With the Logix Designer application, version 28 or later, the controllers support additional parameters in the Security Authority section.

Figure 13 - Controller Properties Dialog Box - Security Tab

5370 Controllers	5380 Controllers
	

Click the Configure button to access the Configure Changes to Detect dialog box. Use the dialog box to choose the events you wish to monitor or ignore in the controller.



For more information on Security settings, see the FactoryTalk® Security System Configuration Guide, publication FTSEC-QS001.

Controller Reset Button

You can reset the controller with the reset button behind the front door on the controller. You press the button in and hold it during a controller power-up sequence to reset the controller.

WARNING: When you press the reset button while power is on, an Electric 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.

Table 10 describes the differences between the reset stages.

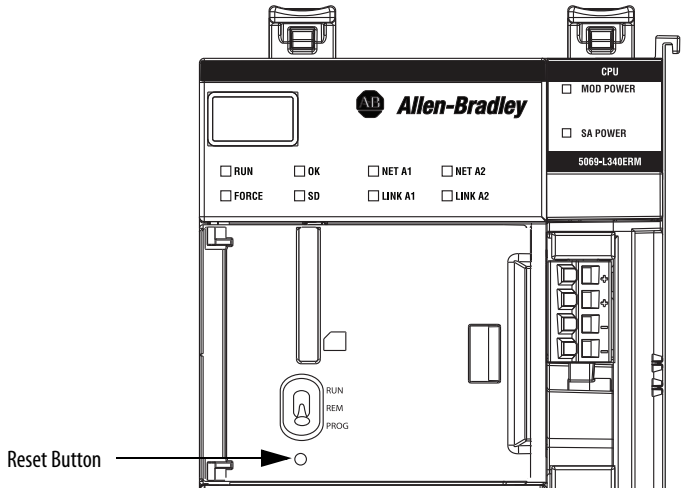
Table 10 - Reset Button Descriptions

Reset Stage	Definition	5370 Controllers	5380 Controllers
Stage 1	A Stage 1 reset clears the application program and memory, but retains the IP address and all object attributes designated as non-volatile. A Stage 1 reset occurs only if the controller contains a user application.	Supported	Supported
Stage 2	A Stage 2 reset returns the controller to out-of box settings, including firmware, and clears all network settings. A Stage 2 reset occurs only if the controller does not contain a user application, and the current controller firmware is not a 1.x revision.	Not supported	Supported

IMPORTANT Remember the following:

- Because port enable/disable status is associated with the application program, ports become enabled after a Stage 1 reset.
- A reset occurs only when you hold the button while the module powers up. If you press the reset button during runtime, there is no effect.

Figure 14 - 5380 Controllers - Reset Button



For information on how to use the reset button, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

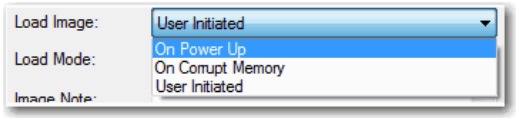
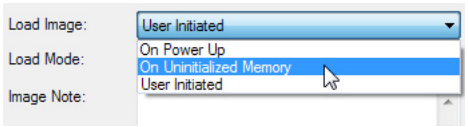
SD Card Behavior

The controller has changed some behavior when loading a project from the SD card into a controller. The changes facilitate an easier commissioning of new, out-of box controllers. All Logix 5000 controllers ship from the factory with firmware revision 1.x.

With 5380 controllers, the Load Image setting On Uninitialized Memory is available. This setting replaces the On Corrupt Memory setting that is available with 5370 controllers.

The general behavior is the same for both settings. The only difference is the controller behavior when it is in the out-of-box condition, as described in Table 11.

You can install an SD card that uses On Uninitialized Memory in an out-of the box controller, that is, one that uses firmware revision 1.x. In this case, at power-up the image loads both the controller firmware and controller application.

5370 Controllers	5380 Controllers
	

When you use an SD card with an image in an out-of-box controller (firmware revision 1.x), at power-up that controller updates its firmware to the revision stored on the card. The update occurs regardless of the Load Image setting for the image on the SD card.

The On Power Up, and On Initialized Memory settings also load the controller application into an out-of box controller.

This table shows what happens at power-up when you insert an SD card that contains an image into a CompactLogix 5380 and Compact GuardLogix 5380 controller.

Table 11 - SD Card Settings and Controller Power-up Behavior

Image Setting	Controller is in Out-of-Box Condition (Firmware Revision 1.*x*)	Firmware > 1.x and Internal Nonvolatile Memory is Not Valid[2]	Firmware > 1.x and Internal Nonvolatile Memory is Valid[2]
User Initiated	Loads Firmware Only[1]	Does Nothing	Does Nothing
On Power Up	Loads both Firmware and Application	• Loads Firmware if there is a revision mismatch • Loads Application	• Loads Firmware if there is a revision mismatch • Loads Application
On Uninitialized Memory	Loads both Firmware and Application[1]	• Loads Firmware if there is a revision mismatch • Loads Application	Does Nothing

(1) Indicates change in behavior from CompactLogix 5370 L3 and older controllers.

(2) "Valid" includes the No Project condition.

Communication Options

CompactLogix 5380 and Compact GuardLogix 5380 controllers can operate on EtherNet/IP networks.

CompactLogix 5370 L3 and Compact GuardLogix 5370 L3 controllers can operate on EtherNet/IP and DeviceNet networks.

IMPORTANT Be aware of the following:

- The 5380 controllers do not support for half-duplex communications on Ethernet at any speed.

Application Type	5370 Controllers Support	5380 Controllers Support
Network communication option	• EtherNet/IP • DeviceNet via a 1769-SDN scanner • 1769-ASCII module for an ASCII serial interface to RS-232, RS-422 and RS-485 devices • 1769-SM2 module for a Modbus RTU serial interface • MVI69-MNET for Modbus TCP/IP interface	EtherNet/IP
EtherNet/IP mode options	Can be used in linear, DLR, and star topologies. Does not support for Dual-IP mode.	• Linear/DLR mode • Dual-IP mode - Available with the Logix Designer application, version 29 or later Both modes can be used in linear, DLR, and star topologies.
Integrated Motion	EtherNet/IP	
Time Synchronization	EtherNet/IP - Available with Integrated Motion and non-motion applications	
Control of distributed I/O	• EtherNet/IP • DeviceNet	EtherNet/IP
Produce/consume data between controllers	EtherNet/IP	
Messaging to and from other devices, including access to the controller via Logix Designer application	• EtherNet/IP • DeviceNet (only to devices)	EtherNet/IP

Communication Throughput

Unlike 5370 controllers, which shares its main core between application code and communications, the 5380 controllers run communications asynchronously from the user application.

This implementation provides better communications throughput in both the bandwidth and speed of data the 5380 controller can deliver to and from, for example, HMIs, Historians, and MES systems. It also improves the overall application performance as the controller no longer has to task switch and pause application execution to handle HMI or other class 3 traffic.

Because the controller runs communications asynchronously to the application, make sure communications that are delivered to the controller are complete before the application executes on the newly delivered data. This practice applies to both data that comes into the controller and data that goes out.

For example, if the HMI is writing a large block of recipe data to the controller, application code can start executing on that recipe data before the data writing process finishes. This action results in half of the current recipe and half of the last recipe in the application space.

Traditionally, programmers have used the following techniques to control the effects of asynchronous communications:

- UID/UIE pairs
- Periodic tasks
- Moving data with CPS instructions

The techniques all rely on controlling when the main core can switch tasks, thus helping to prevent the communications task from changing data while the control task used it. Because the 5380 controller processes communications on an independent core of the CPU, then UID/UIE pairs and Periodic Tasks are not as effective in all cases.

The items that are highlighted in this table are where 5370 and older controllers and the 5380 controllers behavior differ.

Table 12 - Behavior Differences

Tag Read/ Write Source	Tag Access					
	UID/UIE		CPS		Periodic Task	
	5380 Controllers	5370 Controllers	5380 Controllers	5370 Controllers	5380 Controllers	5370 Controllers
HMI	Allows	Blocks	Blocks	Blocks	Allows	Blocks
MSG	Allows	Blocks	Blocks	Blocks	Allows	Blocks
I/O Update	Allows	Allows	Blocks	Blocks	Allows	Allows
Produce/ Consume	Allows	Allows	Blocks	Blocks	Allows	Allows
Other User Tasks	Blocks	Blocks	Blocks	Blocks	Allows	Allows
Motion Planner	Allows	Allows	Blocks	Blocks	Allows	Allows

Blocks - Prevents source data values from change by communications during application execution.
Allows - Communications can change source data values during application execution.

Because the 5370 and 5380 controllers have 32-bit data integrity, this only applies to data structures larger than 32 bits. If word-level integrity is your primary concern, the 32-bit data integrity does not impact your data use.

Good programming practice dictates the use of two unique words at the beginning and the end of data. The controller validates the words to assure the entire structure has data integrity. We recommend that the handshake data is changed and the application code validates it every transaction before the controller application code or higher-level system reading controller data acts on it.

EtherNet/IP Modes

With the Logix Designer application, version 29 or later, 5380 controllers support the following EtherNet/IP modes:

- Dual-IP Mode
- Linear/DLR Mode

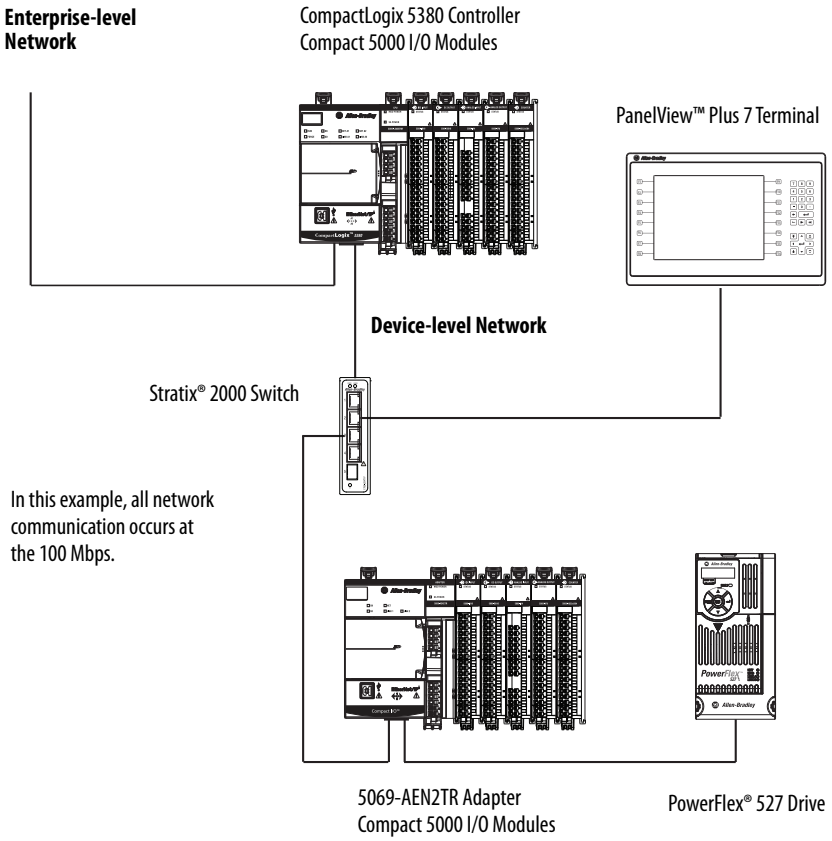
For more information on how to use EtherNet/IP modes, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

Dual-IP Mode

With the Logix Designer application, version 29 or later, you can use Dual-IP mode.

Dual-IP mode lets you configure the controller embedded Ethernet ports to connect to separate networks, that is, an enterprise-level Ethernet network and a device-level network.

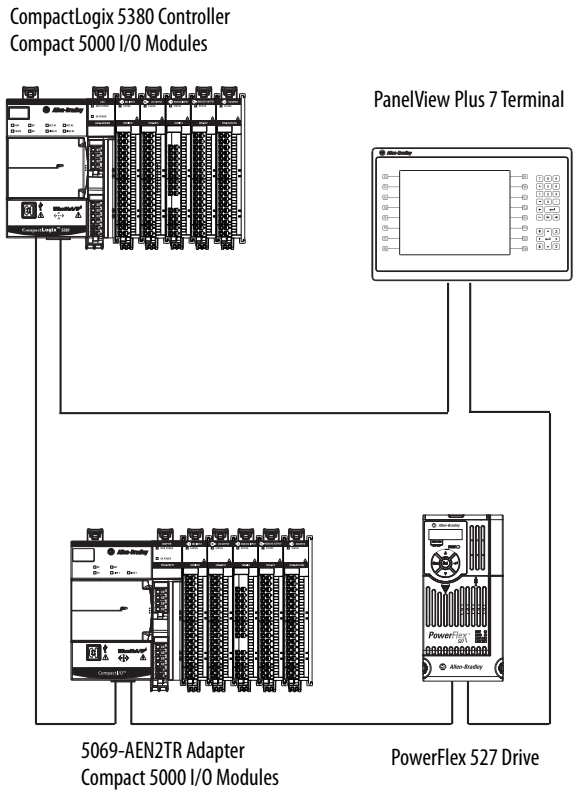
The following graphic shows a CompactLogix 5380 controller that uses Dual-IP mode in a star topology.



Linear/DLR Mode

When the controllers operate in Linear/DLR mode, they can only connect to one network and have only one network configuration. The controllers can connect to any EtherNet/IP topology.

In this example, all network communication occurs at the 100 Mbps.



Use I/O Modules in CompactLogix Systems

You can use local and remote I/O modules with the controllers.

The following is information about how you can use I/O modules in different applications.

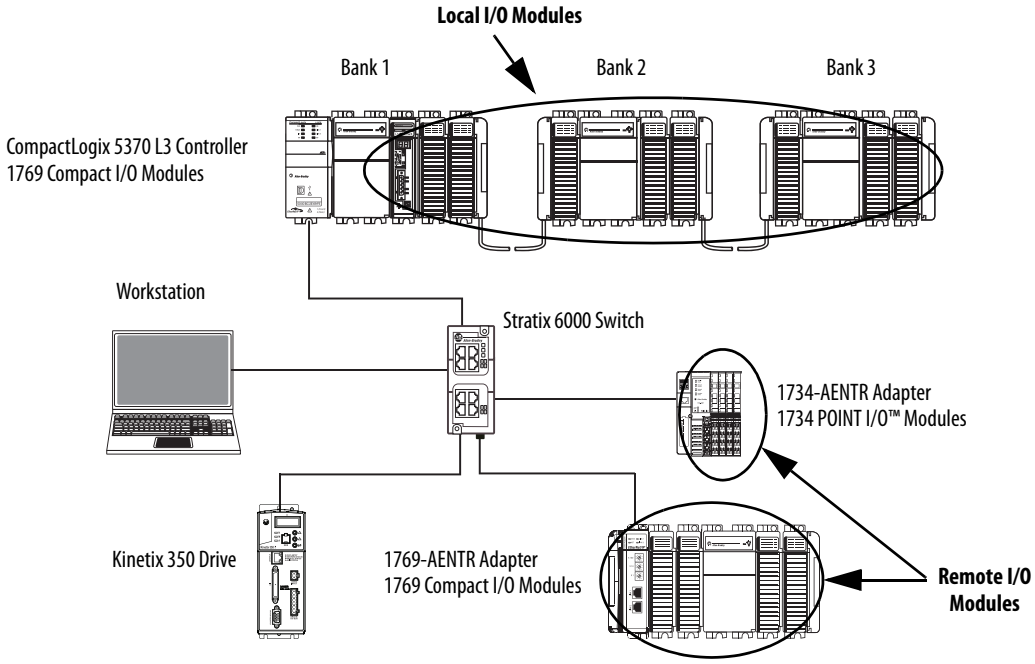
	5370 Application	5380 Application
Local I/O modules	1769 Compact I/O modules across up to three banks	Compact 5000 I/O modules in one bank
Number of local I/O modules supported, max	• 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMS: 8 • 1769-L33ER, 1769-L33ERM, 1769-L33ERMS: 16 • 1769-L36ERM, 1769-L36ERMS: 30	• 5069-L306ER, 5069-L306ERS2, 5069-L306ERM, 5069-L306ERMS2, 5069-L306ERMS3, 5069-L310ER, 5069-L310ERS2, 5069-L310ER-NSE, 5069-L310ERM, 5069-L310ERMS2, 5069-L310ERMS3: 8 • 5069-L320ER, 5069-L320ERS2, 5069-L320ERM, 5069-L320ERMS2, 5069-L320ERMS3, 5069-L320ERP: 16 • 5069-L330ER(1), 5069-L330ERS2, 5069-L330ERM, 5069-L330ERMS2, 5069-L330ERMS3, 5069-L340ER, 5069-L340ERS2, 5069-L340ERM, 5069-L340ERMS2, 5069-L340ERMS3, 5069-L340ERP, 5069-L350ERS2, 5069-L350ERM, 5069-L350ERMS2, 5069-L350ERMS3, 5069-L380ERM, 5069-L380ERMS2, 5069-L380ERMS3, 5069-L3100ERS2, 5069-L3100ERM, 5069-L3100ERMS2, 5069-L3100ERMS3: 31
Installation location of local I/O modules	Across as many as three banks, the bank containing the controller and two expansion banks	Same bank as the controller
Installation orientation of local I/O modules	• I/O modules are only installed in the local bank - Horizontal only • I/O modules are installed in multiple banks - Horizontal or vertical	Horizontal only
Spacing on all sides of system, min For more information see, Controller Spacing on page 51	50 mm (2 in.) of space on all sides	Varies based on the operating temperature: **Compact GuardLogix 5380 SIL 2 Series A catalog numbers**: • 50.80 mm (2.00 in.) at 50 °C (131 °F) • 101.60 mm (4.00 in.) at 55 °C (122 °F) • 152.40 mm (6.00 in.) at 60 °C (140 °F) **Compact GuardLogix 5380 SIL 2 Series B catalog numbers**: • 50.8 mm (2.00 in.) at 55 °C (131 °F) • 101.6 mm (4.00 in.) at 60 °C (140 °F) **Compact GuardLogix 5380 SIL 3 catalog numbers**: • 50.8 mm (2.00 in.) at 55 °C (131 °F) • 101.6 mm (4.00 in.) at 60 °C (140 °F)
Remote I/O modules	Accessible over the following: • EtherNet/IP network • DeviceNet network via 1769-SDN adapter The controllers cannot access Compact 5000 I/O.	Accessible over an EtherNet/IP network For optimal CompactLogix 5380 control system performance, we recommend that you use Compact 5000 I/O modules as the remote I/O modules.
Special considerations	• Consider the number and type of 1769 Compact I/O modules in a system when you set the requested packet interval (RPI) rate • Track collective system power use by the local I/O modules • Consider the power supply distance rating when you plan the slot location for local I/O modules	Track collective SA power use by the local I/O modules in a system

(1) When you use this controller with the Logix Designer application, version 29.00.00, the application limits the number of local I/O modules in the project to 16. For more information, see Knowledgebase Article *CompactLogix controllers limited to 16 local 5069 modules in V29 of Studio 5000®*.

With the Logix Designer application, version 30.00.00 or later, the controller supports as many as 31 local I/O modules.

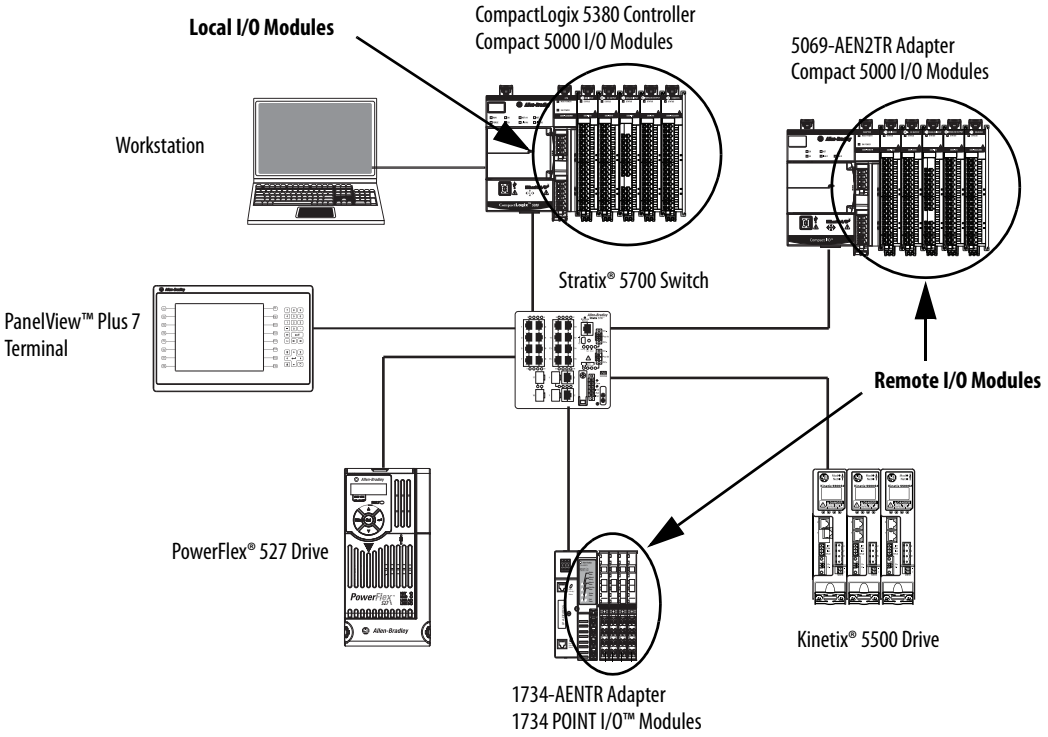
CompactLogix 5370 L3 System

The following shows I/O modules used in CompactLogix 5370 L3 system.



CompactLogix 5380 System

The following shows I/O modules in a CompactLogix 5380 system.



Local I/O Module Performance

Local I/O module performance is significantly improved in 5380 systems when compared to 5370 systems. The improved performance results from the following:

- A high-performance, multi-core processor architecture
- High-speed Compact 5000 I/O system backplane supports faster transfer rates

In 5370 systems, local I/O module updates are transferred to the controller via the 1769 CompactBus at the specified requested packet interval (RPI). The controller uses a dedicated I/O task to update internal I/O tag data. The task is internally set to a priority of level 6. You must carefully arrange user task priorities so that important local I/O updates are not interrupted by scanning of lower-level tasks in the controller.

With the high-performance 5380 controller, you are no longer required to arrange task priorities around the dedicated I/O task. The I/O tag data is updated as part of an internal task on its own processor core and does not affect the user tasks running on the controller processor core.

System performance is also improved because you can configure much faster RPI rates with Compact 5000 I/O modules. For example, you can configure the RPI to occur as fast as every 200 µs. You cannot use the same rate with the 1769 Compact I/O modules that are used in 5370 systems.

Finally, the backplane is optimized to move larger amounts of data in one packet than is possible on the 1769 CompactBus backplane.

Logix 5000 controllers still scan for I/O updates at the RPI asynchronously to the program scan. The 5380 system handles controller multi-tasking and I/O updates more efficiently and faster than 5370 systems, though. The enhanced performance results from improvements to the architecture, hardware, and system backplane.

When you use 5380 systems, there are fewer configuration considerations and a much better screw-to-screw I/O performance compared to 5370 systems that use local 1769 Compact I/O.

Event Task Triggers

You can use event task triggers in 5380 systems to optimize local I/O performance and screw-to-screw times. An event task, if configured correctly, interrupts all other tasks for the minimum amount of time that is required to respond to the event.

You can now configure event triggers on I/O data change of state with Compact 5000 I/O fast input modules. This option is not available with 5370 controllers because the 1769 Compact I/O modules do not support event triggers on I/O data change of state. If the controller executes the immediate output instruction (IOT) at the end of the event task, the output data is transmitted immediately. The controller does not have to wait for processing at the next RPI.

The table shows an updated comparison of event triggers with 5380 and 5370 controllers. Consult Logix 5000 Controllers Tasks, Programs, and Routines Programming Manual, publication 1756-PM005 for considerations that can affect the execution of an event task.

Controllers	Event task triggers supported					
	Module Input Data State Change	Consumed Tag	Axis Registration 1 or 2	Axis Watch	Motion Group Execution	EVENT instruction
5370 controllers		X	X	X	X	X
5380 controllers	X	X	X	X	X	X

For more information on how to use event triggers with Compact 5000 I/O fast input modules, see the 5000 Series Digital I/O Modules in Logix 5000 Control Systems User Manual, publication 5000-UM004.

Scheduled Outputs

New with 5380 controllers and Compact 5000 I/O fast modules is the option to schedule outputs and time stamp inputs to a grandmaster clock within a CIP Sync™ system. CIP Sync technology supports highly distributed applications that require the following:

- Timestamping
- Sequence of Events recording
- Distributed motion control
- Increased control coordination

This level of control is not available with 5370 controllers because you cannot configure 1769 Compact I/O modules with scheduled outputs or timestamped inputs.

For more information on how to use scheduled outputs with Compact 5000 I/O fast output modules, see the 5000 Series Digital I/O Modules in Logix 5000 Control Systems User Manual, publication 5000-UM004.

You can use the following to obtain an ideal midrange solution for applications that use Integrated Motion Over an EtherNet/IP network:

- 5380 controllers
- Compact 5000 I/O fast I/O modules
- Kinetix® 5500 servo drives

Download the Program to the Controller

The first time that you download a program, it can take longer than subsequent downloads. These situations can affect download/compile times:

- The capability of the personal computer or laptop.
- You download the project immediately after a project import or upload, but before Logix Designer has compiled the project once.
- You edit a User Defined Tag (UDT), Add-On Instruction (AOI), or an object that is used in many places.
- Increased load when Logix Designer compiles and generates code.

Build Button

The new Build button in Logix Designer creates binary files that are compiled from user subroutines, and caches them in the project .ACD file.

If these files are present in the project during a download, then Logix Designer does not have to recompile them, and saves time during the download process.

Every download requires that only the changed subroutines must be recompiled. You can perform a build offline, save the project .ACD file, and later distribute it to many controllers without recompilation.

This manual build step is optional. If you do not use the build button, Logix Designer builds all necessary files when you initiate a download.

An imported project requires a complete rebuild, and extends the download process the first time you attempt a download.

Downloading Workflow Change on page 82 provides an explanation of the download changes for 5380 controllers.

Downloading Workflow Change

Offline builds can save time when doing subsequent downloads.

5380 Controllers	5370 Controller
Only changed source code is recompiled on a download.	All projects had their source code recompiled on every download.

Mitigation

Adjust your workflow to save workstations from having to rebuild the project. You can do offline builds, save the project file, and distribute it to other workstations to minimize your download times.

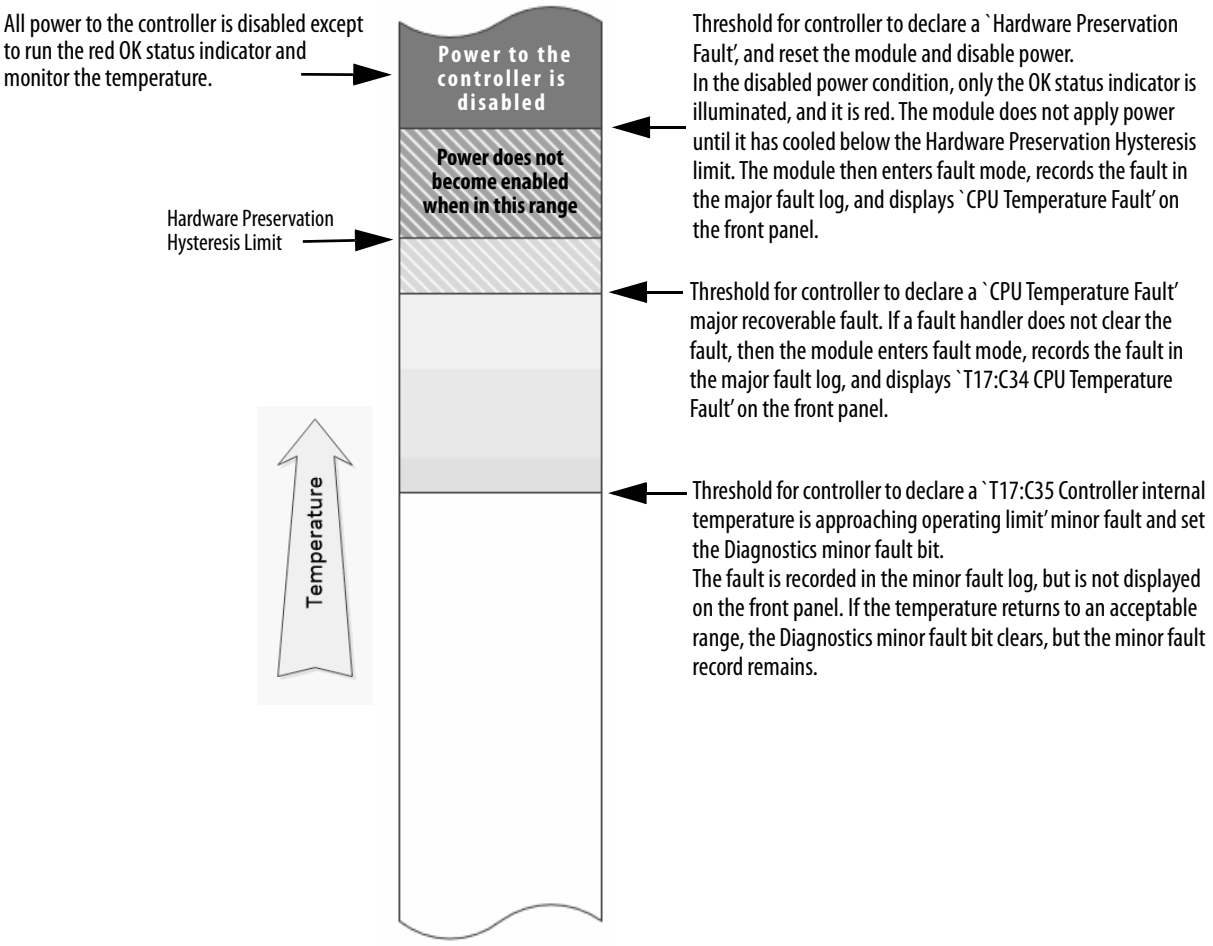
Upload Fidelity Change

When you upload, projects that contain program parameters and aliases now are faithfully reproduced. The uploaded RLL source code is an exact replica of what was downloaded. 5370 controller RLL subroutines that referenced aliases or program parameters are not reproduced as faithfully.

Thermal Monitoring and Thermal Fault Behavior

The controllers monitor internal module temperatures and respond as the temperature increases.

Figure 15 - Thermal Fault Behavior



Notes:

Replacement Considerations with Safety Applications

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This chapter describes features and functions that are associated with the GuardLogix® 5580 and Compact GuardLogix 5380 controllers, and the differences in safety functionality from previous safety controllers.

IMPORTANT In this chapter, "Compact GuardLogix 5380 controllers" refers to both Compact GuardLogix 5380 SIL 2 and Compact GuardLogix 5380 SIL 3 controllers.

Perform Risk Assessment

A proper safety strategy consists of risk assessment and risk reduction.

- Risk Assessment – understand the machine limits and functions and tasks that may be required to be performed at the machine throughout its life.
- Risk Reduction – performed if necessary and safety measures are selected based on the information derived from the risk assessment stage. The manner in which this is done is the basis of the Safety Strategy for the Machine.

For guidance on how to assess the impact of a product change as part of the risk assessment process, see IEC 61508 Part 1:2010, Section 7.16 (Overall modification and retrofit).

See the Machinery Safebook 5 - Safety Related Control Systems For Machinery Reference Manual, publication SAFEBK-RM002C-EN-P.

Firmware Upgrade Guidelines for Safety Controllers

IMPORTANT **Safety Consideration**

You cannot update a controller that is safety locked.

The IEC 61508 functional safety standard requires impact analysis before upgrading or modifying components in a certified, functional safety system. This section provides high-level guidance on how you can perform the impact analysis for safety controller hardware/firmware upgrades. Reference the standard to make sure you fulfill all of the requirements as they relate to your application.

When you upgrade controller firmware to a newer version, consider the following:

- All major and minor firmware releases for GuardLogix 5580 and Compact GuardLogix 5380 controller systems are certified for use in safety applications. As part of the certification process, Rockwell Automation tests the safety-related firmware functions (for example the CIP Safety™ communication subsystems, embedded safety instruction execution, and safety-related diagnostic functions). The firmware release notes identify changes to safety-related functions.
- Perform an impact analysis of the planned firmware upgrade.
  - Review of the firmware release notes for changes in safety-related functionality.
  - Review of hardware and firmware compatibility in the Product Compatibility and Download site to identify potential compatibility conflicts.
  - Any modification, enhancement, or adaptation of your validated software must be planned and analyzed for any impact to the functional safety system as described in the 'Edit Your Safety Application' section in the safety reference manual for your controller.
- You must remove and re-generate the safety signature as part of the firmware upgrade process. Use the online and offline edit process described in the safety reference manual for your controller.

For more controller-specific information, see the GuardLogix 5580 and Compact GuardLogix 5380 Safety Reference Manual, publication 1756-RM012.

IMPORTANT GuardLogix 5580 and Compact GuardLogix 5380 controllers have a different compiler than earlier controllers. You must revalidate that applications on earlier controllers compile correctly on GuardLogix 5580 and Compact GuardLogix 5380 controllers.

For product change management guidelines and definitions of how Rockwell Automation manages product versions, see System Security Design Guidelines Reference Manual, publication SECURE-RM001.

For Example:

1. From the Product Compatibility and Download Center:
   a. Review all firmware release notes, starting with the original firmware revision through the new firmware revision, to identify any changes that impact the safety-related implementation of the application.
   b. Review hardware and firmware compatibility to identify any restrictions between the original system components and the new system components.
2. Perform a hazard and risk assessment for any changes identified during the impact analysis and determine what additional testing is necessary.
3. Perform the online and offline edit process described in the safety reference manual for your controller. You can restrict the 'Test the Application' block to the testing identified by the hazard and risk assessment.

Applications with 1734-AENTR Series A Modules

If your system includes 1734-AENTR Series A modules and you update to a GuardLogix 5580 controller, reconnection events can result in a failure to connect. The modules display error code 16#203 (connection time out) or 16#117 (invalid connection POINT). Rockwell Automation recommends that you upgrade to 1734-AENTR Series B or later modules.

Safety Signature

The safety signature consists of an ID number, date, and time that uniquely identifies the safety portion of a project. This signature includes safety logic, data, and configuration.

- Compact GuardLogix 5370 and GuardLogix 5570 controllers in SIL1 or SIL2 configuration did not require safety signature.
- Compact GuardLogix 5370 and GuardLogix 5570 controllers in a SIL3 configuration, required a safety signature.
- For Compact GuardLogix 5380 and GuardLogix 5580 controllers in a SIL2 configuration (safety controller only), a safety signature is required for up to SIL2.
- For GuardLogix 5580 controllers in a SIL3 configuration (primary safety controller and separate safety partner), a safety signature is required.
- For Compact GuardLogix 5380 SIL 3 Controllers (safety controller with internal safety partner), a safety signature is required.

For Compact GuardLogix 5380 and GuardLogix 5580 controllers, the safety signature ID is now 256-bit.

Compact GuardLogix 5370 and GuardLogix 5570 Controllers Safety Signature ID	Compact GuardLogix 5380 and GuardLogix 5580 Controllers Safety Signature ID

GSV of Safety Attributes

The two attributes below generate errors when imported into a Compact GuardLogix 5380 or GuardLogix 5580 Controller project. These attributes no longer exist in the Compact GuardLogix 5380 and GuardLogix 5580 Controllers.

Compact GuardLogix 5370 and GuardLogix 5570 Controllers only

SafetySignatureID (DINT)	32-bit identification number
SafetySignature (String)	ID number plus date and time stamp

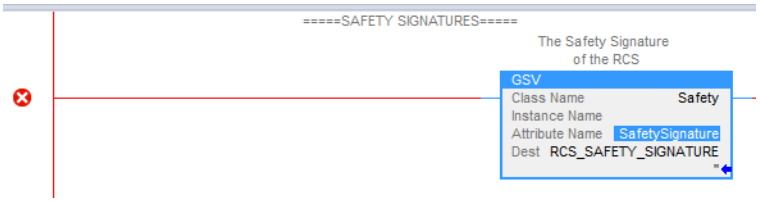
SafetySignatureID is changed to SafetySignatureIDLong or SafetySignatureIDHex in the Compact GuardLogix 5380 and GuardLogix 5580 Controllers.

Compact GuardLogix 5380 and GuardLogix 5580 Controllers only

SafetySignatureIDLong (SINT [33])	The first byte is the size of the safety signature ID in bytes, and the remaining 32 bytes contain the content of the 32-byte safety signature ID.
SafetySignatureIDHex (String)	64 character hexadecimal string representation of the safety signature ID.
SafetySignatureDateTime (String)	27 character date time of a safety signature in the format of mm/dd/yyyy, hh:mm:ss.iii<Am or PM>

This example shows the SafetySignature after the import, and what to change it to.

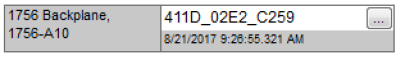
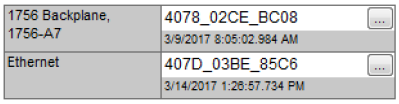
4. Compact GuardLogix 5370 and GuardLogix 5570 controllers have a safety attribute called SafetySignature. Since this attribute does not exist in Compact GuardLogix 5380 and GuardLogix 5580 controllers, this is how the rung appears after the import.

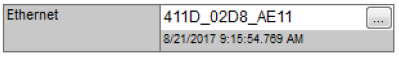
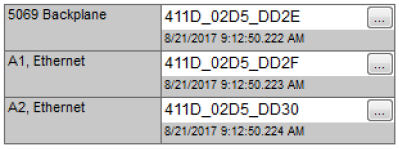


5. When you change the SafteySignature attribute to the SafetySignatureDateTime attribute, the rung compiles.

Safety Network Number

The safety network number (SNN) uniquely identifies CIP Safety™ subnets within a routable safety network. The combination of the SNN + Node Address uniquely identifies each CIP Safety port on each device in the routable safety network.

GuardLogix 5570	GuardLogix 5580
	
GuardLogix 5570 controllers have one SNN for the backplane communications.	The GuardLogix 5580 requires two SNNs, one for the embedded Ethernet port, and one for the backplane communications

Compact GuardLogix 5370	Compact GuardLogix 5380
	
Compact GuardLogix 5370 controllers have one SNN for the embedded Ethernet ports.	The Compact GuardLogix 5380 controllers have a SNN for each embedded Ethernet port, and one for the backplane communications

For an explanation of the Safety Network Number, see the GuardLogix 5580 and Compact GuardLogix 5380 Controller Systems Safety Reference Manual, publication 1756-RM012.

Produce/Consume Safety Tags

GuardLogix 5580 and Compact GuardLogix 5380 controllers can produce standard tags as unicast or multicast, but they can only produce safety tags as unicast. The controllers can consume safety tags as either unicast or multicast.

When you configure a produced safety tag, you are only allowed to configure unicast connection options. Studio 5000 Logix Designer® does not allow you to configure multicast connection options.

When you configure a consumed tag, you must consider the capabilities of the producer:

- If the producer in the I/O tree of this controller is a GuardLogix 5580 or Compact GuardLogix 5380 controller, and you are consuming a safety tag, you must configure the consumed tag to use unicast.
- If the producer in the I/O tree of this controller is a GuardLogix 5570 or 5560 controller, or a Compact GuardLogix 5370 controller, the safety consumed tag can be configured as either unicast or multicast.
- Produce/Consume from GuardLogix 5570 (V28) to GuardLogix 5570 (V28) in local chassis; and change the Producer to GuardLogix 5580 (SIL2 or SIL3)
- The GuardLogix 5580 can only produce safety tags using Unicast connections. An older safety controller (such as GuardLogix 5570) in the same chassis as the GuardLogix 5580 will not be able to consume safety tags, because backplane consumed tags cannot be configured as Unicast.
- For multi-controller Produce/Consume safety systems in the same chassis, you must upgrade all the safety controllers to Studio 5000 Logix Designer version 31 or later. This works because V31 allows the backplane safety consumed tags to be configured as Unicast.

  The fault code for these unicast/multicast issues is Code 0124 / Connection Request error / Invalid input network connection type.

Safety Application Conversion

When you import a Logix Designer project that was created in an earlier version of Logix Designer application, the project is converted to the later version.

IMPORTANT The standard side of Compact GuardLogix 5380 and GuardLogix 5580 Controllers operate the same as standard CompactLogix™ 5380 and ControlLogix® 5580 controllers.

The other chapters in this publication cover the standard side of the controllers. Before you convert your safety application, make sure you read and understand the rest of the chapters in this publication.

Compact GuardLogix 5380 Controllers

- During import from Compact GuardLogix 5370 to Compact GuardLogix 5370 version 31 application; the application remains a SIL3 project.
- When you change the controller from Compact GuardLogix 5370 to Compact GuardLogix 5380, 1769 modules will be deleted, since 1769 modules no longer communicate to Compact GuardLogix 5380 controllers.
- For a Compact GuardLogix 5380 SIL 2 controller, the project also changes from a SIL 3 project in 5370 to a SIL 2/PLd project (only SIL 3 is possible in Compact GuardLogix 5370).
- For a Compact GuardLogix 5380 SIL3 controller, the SIL 3 project in 5370 remains a SIL3 project in 5380.
- The safety signature is deleted during the application conversion.

GuardLogix 5580 Controllers

- During import from GuardLogix 5570 (V20 to V30) to GuardLogix 5570 V31, it remains a SIL3 project. The safety controller and safety partner remain in the same two slots.
- When you change the controller from GuardLogix 5570 to GuardLogix 5580, it remains a SIL3 project. To change the GuardLogix 5580 from a SIL3 to SIL2 project, just change the safety level in the safety tab. The application then deletes the safety partner.
- The safety signature is deleted during the application conversion.

Exporting and importing Safety Add-on Instructions

To help optimize the internal memory structures:

- Import the version 30 or earlier project from an ASCII.L5K or an XML .L5X file to create the version 31 or later project.
- Import rungs, routines, programs, equipment phases, UDTs, tags, and Add-On Instructions into a version 31 or later project.

For more information on how to import your project, see:

- Logix 5000™ Controllers Import/Export Reference Manual, publication 1756-RM084.
- Logix 5000 Controllers Import/Export Project Components Programming Manual, publication 1756-PM019.

Convert a Safety Application

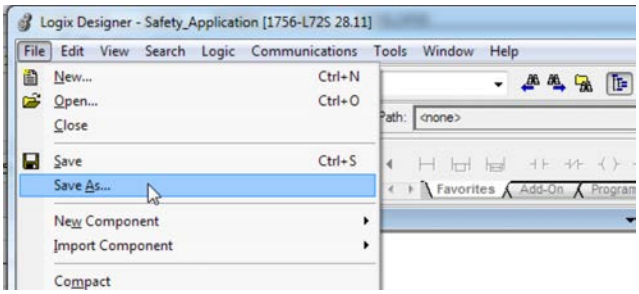
To convert from a Compact GuardLogix 5370 or GuardLogix 5570 controller to a Compact GuardLogix 5380 or GuardLogix 5580 controller, follow this procedure:

TIP The example in this procedure converts a 1756-L72S controller to a 1756-L84ES controller.

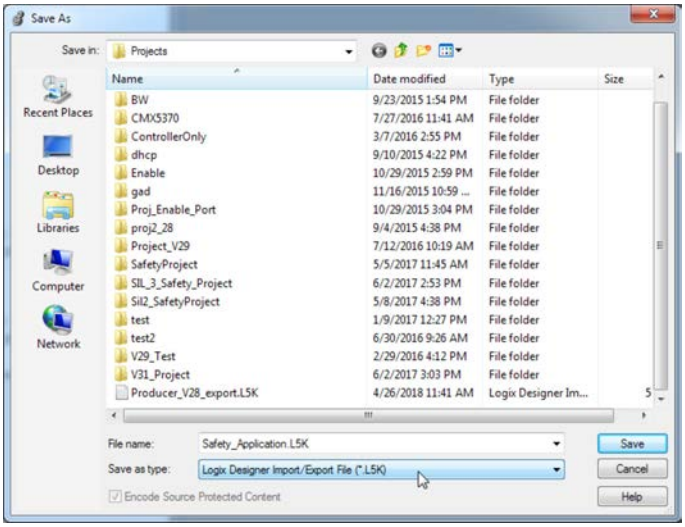
1. Export the project to an ASCII .L5K or XML .L5X file.

   In a pre-version 31 Release, export the project to an ASCII .L5K or XML .L5X file. You can only export a project if you have the project file open.

   c. From the File menu, choose Save As.



   d. In the File name field, enter a name for the export file. You do not need to add a file extension, but if you do, you must use the .L5K extension.



e. Choose Logix Designer Import/Export File (*.L5K, .L5X) from the Save As Type field. Note that you can skip this step if you entered the extension (.L5K or .L5X) in step b.

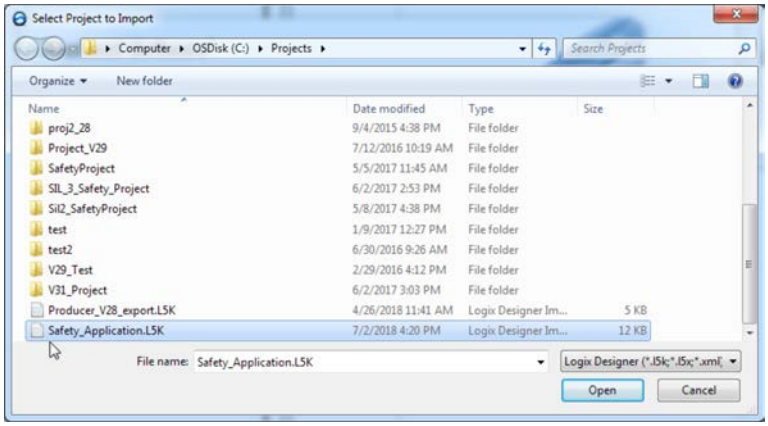
f. Click Save to export the project file.

IMPORTANT

- If you are offline, and there are one or more properties dialog boxes with pending edits, the edits are automatically applied.
- If you are online, you are prompted to apply the edits.
- If you are online, you are prompted to upload tag values from the controller before exporting. This allows you to decide whether you want the current tag values exported.
- If Force Masks are set in your project, they are exported. Upon import, any Force Masks are input to the project, and the Online Bar indicator is set to Forces Installed.
- The state of the Online Bar Forces Enabled indicator is not exported; upon import, it is set to Forces Disabled. We do not recommend editing force values in the export file.

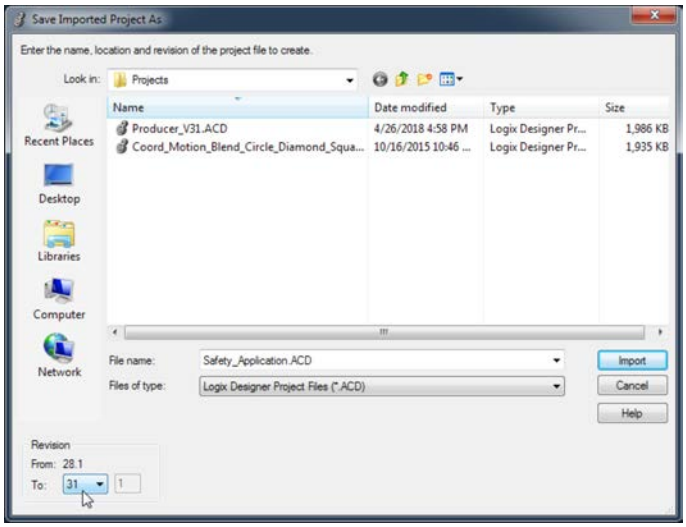
2. Import the project from an ASCII .L5K or an XML .L5X file into Studio 5000 Logix Designer version 31.00.00 or later.
   a. Launch the Studio 5000 Logix Designer application version 31.00.00 or later.
   b. Choose Create > From Import.

   c. Select the project file you want to open.



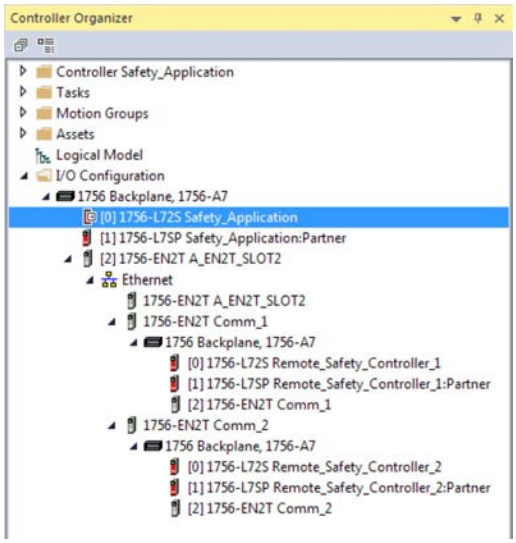
   d. Click Open.
   e. The Save Imported Project As dialog opens.

   The import process must create a project file - you must specify the name, location and revision of the project file to create.



f. Click Import to open the project file.

Once the project file is opened, the Controller Organizer appears, and shows everything in the controller as of the time when the project file was last saved.



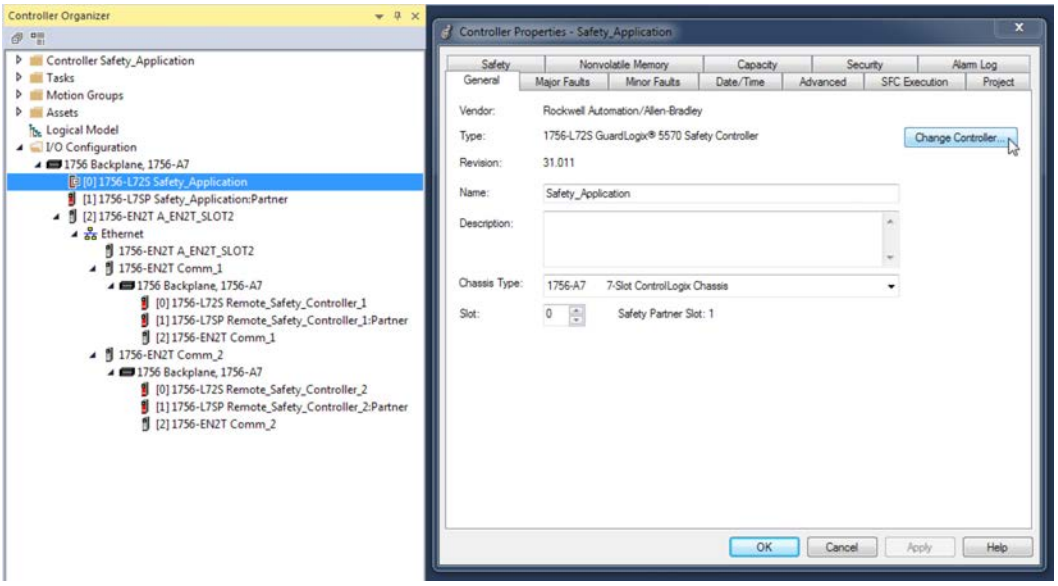
IMPORTANT If you import an .L5K or .L5X file that contains Serial Port, DF1, or ASCII elements into a project that uses a controller with no serial ports results in an import error. The import then continues to completion.

3. Change the GuardLogix 5570/Compact GuardLogix 5570 controller to a GuardLogix 5580/Compact GuardLogix 5380 controller.

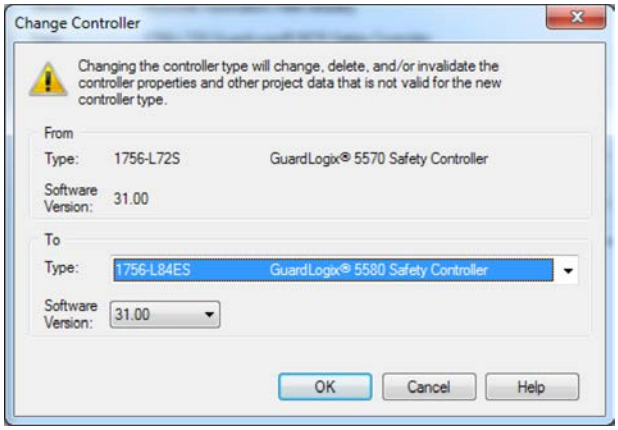
IMPORTANT

- If you change from a GuardLogix 5570 safety controller with a SIL 3/PLe application to a Compact GuardLogix 5380 controller, the application changes to SIL 2/PLd.
- If you change from a GuardLogix 5570 safety controller with a SIL 3/PLe application to a Compact GuardLogix 5380 SIL 3 controller, the application remains SIL 3/PLe.
- If you change from a GuardLogix 5570 safety controller with a SIL 3/PLe application to a GuardLogix 5580 controller, it defaults to a SIL 3/PLe configuration. The safety controller and safety partner remain in the same two slots in the I/O tree. If you want to change the GuardLogix 5580 from a SIL 3/PLe to SIL 2/PLd safety project, then change the safety level in the Safety tab on the Controller Properties dialog box.

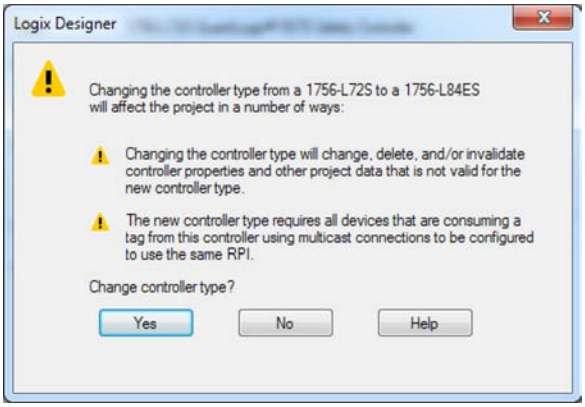
a. Open the Controller Properties, and click Change Controller.



b. Select your safety controller in the Change Controller dialog box, and click OK.

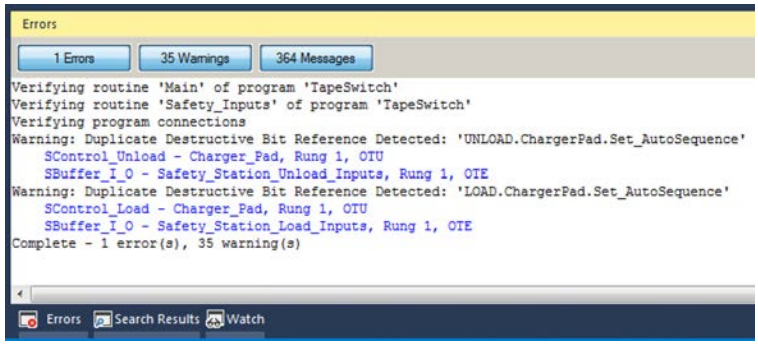


c. On the confirmation dialog, read the and be aware of the warning messages.

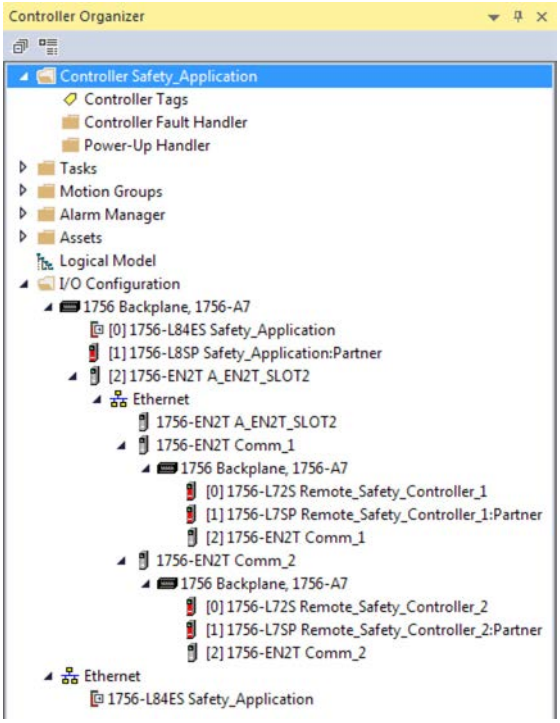


d. On the confirmation dialog, click Yes.

e. Verify Errors and Warnings.



f. The 1756-L84ES safety controller retains the SIL 3/PLe configuration.

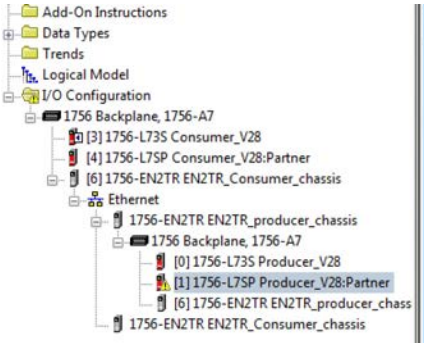


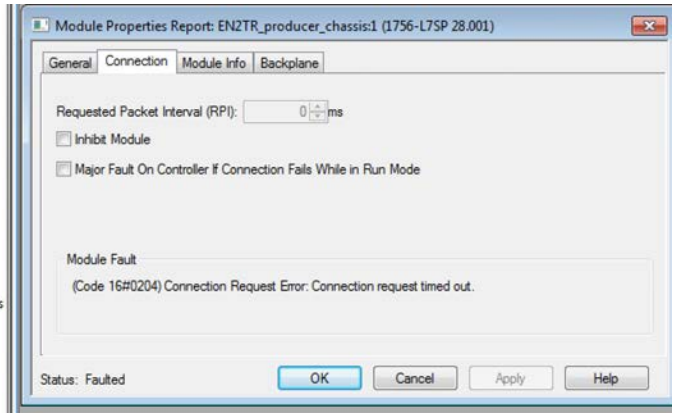
Replace Producer Controller

If the producer controller has changed to a GuardLogix 5580 SIL 2 application (1-slot solution without a safety partner), while the consumer controller is a GuardLogix 5570 or earlier, the consumer controller can fault due to the missing safety partner in the producer.

The data appears properly, but there is a yellow yield sign (signifying a fault) next to the partner because the partner does not exist. Since there are no single-slot safety controllers available in the Studio 5000 Logix Designer application version 28, you cannot resolve the issue by selecting another controller to represent the single-slot GuardLogix 5580 controller in the SIL 2 application.

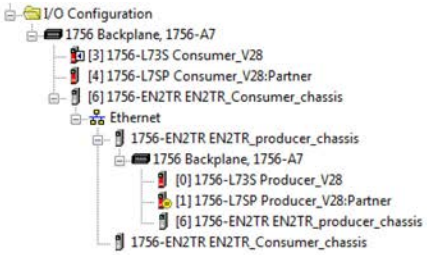
Here is the fault for the non-existent partner:

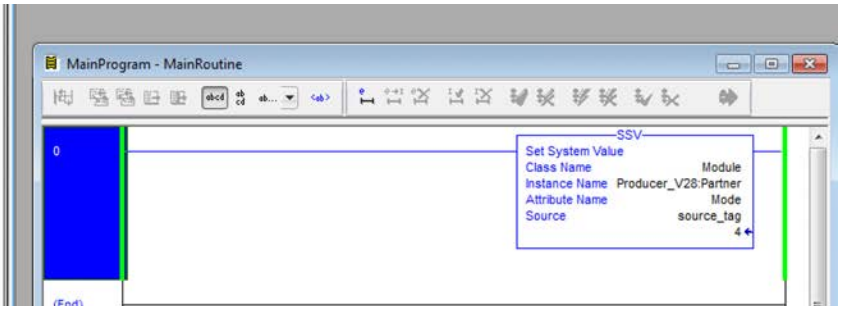




To help eliminate faults:

- In the version 31 producer project, do not place any hardware in the slot to the right of the GuardLogix 5580 SIL 2 controller.
- In the consumer version 28 project, send an SSV to the 1756-L7SP to programmatically inhibit the partner module. Place the SSV in the standard routine. The '4' represents bit 2 of the attribute. To un-inhibit the module, set bit 2 back to 0. The partner cannot be inhibited from the I/O tree. The SSV is needed to inhibit the partner only.





If only standard tags are being produced by the GuardLogix 5580 SIL2 controller, then the existing GuardLogix 5570 controller in the consumer project can be replaced by a ControlLogix 5570 controller. Since the GuardLogix 5570 version 28 controller is consuming standard tags, there is no need for the device in the I/O tree to be a [2-slot] safety controller. Replacing it with any single-slot controller can help eliminate the connection fault.

Notes:

Replacement Considerations with Redundant Systems

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Overview

This chapter describes features and functions that are associated with ControlLogix® 5580 controllers enabled for redundancy, and the differences in redundant functionality from previous redundant controllers. The other chapters in this publication cover the standard side of the controllers.

The ControlLogix 5580 redundant system uses a redundant chassis pair to maintain process operation when events occur that stop process operation on non-redundant systems, such as a fault on a controller.

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

Controllers are typically used in 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.

Product Comparison

This section compares ControlLogix 5580 redundancy to ControlLogix 5570 redundancy.

	Feature	ControlLogix 5570 Redundnacy	ControlLogix 5580 Redundancy
Rack Specifications	Up to seven communication modules per chassis	Fully supported	Fully supported
	Two controllers per chassis	Fully supported	Not supported
	Transparent switchover	Fully supported	Fully supported
	Compatible with 1756-RM2 ControlLogix redundancy modules	Fully supported	Fully supported
Process	PhaseManager™ software support	Fully supported	Fully supported
	SequenceManager™ software support	Not supported	Not supported
	SIL 2 process safety solution with 1715 redundant I/O modules	Fully supported	Not supported
	ControlLogix 5580 Process controller support with embedded process objects	Not supported	Fully supported
Networks	Ethernet support	Fully supported	Fully supported
	ControlNet® and DeviceNet® support	Fully supported	Not supported(1)
	Legacy networks and controllers communication: • Data Highway Plus™ • Remote I/O • PLC-2®, PLC-5® • SLC™	Fully supported	Not supported
	Support of Gigabit Ethernet	Not supported	Not supported
	Use of the embedded Ethernet port	Not supported	Not supported
I/O and Devices	FLEX 5000™ I/O modules	Not supported	Fully supported
	Compact 5000™ I/O	Not supported	Not supported
	Existing I/O platforms: • 1756 ControlLogix I/O • 1715 Redundant I/O • 1794 FLEX™ I/O • 1734 POINT I/O™	Fully supported	Fully supported
	Drives (non-motion)	Fully supported	Fully supported
Security	CIP Security™ support (IEC62443-4-2)	Not supported	Not supported
Alarms	Logix instruction-based alarms	Fully supported	Fully supported
	Logix-based tag alarms	Not supported	Fully supported

(1) DeviceNet modules are supported if accessed across an Ethernet bridge, but can experience a bump during a ControlLogix Redundancy switchover.

Data Transfer

ControlLogix 5580 controllers use 4K byte pages for data transfer, while ControlLogix 5570 controllers use 256 byte grains for data transfer.

This table shows how much data is transferred from the primary controller to the secondary controller, assuming each tag is a DINT.

Scenario	ControlLogix 5570 transfer size range (bytes)	ControlLogix 5580 transfer size range (bytes)
Change 1 tag	256	4,096
Change 2 adjacent tags	256	4,096
Change 2 non-adjacent tags	256…512	4,096…8,192
Change 10 adjacent tags	256…512	4,096…8,192
Change 10 non-adjacent tags	256…2,560	4,096…40,960
Change 16 non-adjacent tags	256…4,096	4,096…65,536
Change 1000 tags	4,096…256,000	4,096…4,096,000

IMPORTANT We recommend to keep data that changes at similar frequencies adjacent to minimize impacts on crossloading. For this, and additional information, see Chapter 6, Programming Best Practices in the ControlLogix 5580 Redundant Controller User Manual, publication 1756-UM015.

For more information on redundancy, see:

- High Availability System Reference Manual, publication HIGHAV-RM002
- ControlLogix 5570 Redundancy User Manual, publication 1756-UM535

Notes:

Standard Application Conversion

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Late Binding of I/O Data	113
I/O Data Manipulation	114
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AXIS_CIP_Drive Data Type	118

This chapter describes application conversions for the controllers. This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5580 controllers	ControlLogix® 5580 and GuardLogix® 5580 controllers
5380 controllers	CompactLogix™ 5380, Compact GuardLogix 5380 SIL 2, and Compact GuardLogix 5380 SIL 3 controllers
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers

Converting Logix Designer Projects

When you open a Studio 5000 Logix Designer® project to open a project that was created in an earlier version of Logix Designer application, the project is converted to the higher version. After the conversion, the Logix Designer application can fail to use internal memory structures in the most efficient manner.

To help optimize the internal memory structures, you can complete the following:

- Import the version 27 or earlier project from an ASCII.L5K or an XML .L5K file to create the version 28 or later project.
- Import rungs, routines, programs, equipment phases, UDTs, tags, and Add-On Instructions into a version 28 or later project.

For information on how to import your project, see:

- Logix 5000™ Controllers Import/Export Reference Manual, publication 1756-RM084.
- Logix 5000 Controllers Import/Export Project Components Programming Manual, publication 1756-PM019.

Produce and Consume Tags

The recommendations in this section provide techniques for establishing produced or consumed tag communication between the following:

- 5580 and 5570 controllers
- 5380 and 5370 controllers

RPI of Multicast Tags

In version 27 or earlier projects, a produced tag produces data at the RPI of the fastest requesting consumer. This let multiple consumers with different RPIs successfully connect to a producer.

In version 28 or later projects, the first consumer of a produce tag determines the RPI rate at which data is produced. All subsequent consumers must request the same RPI value as the first consumer. Otherwise, the subsequent consumers fail to connect.

When you migrate a Logix Designer project, version 27 or earlier, to a later version of the application, verify that the multicast consumers of a produce tag are configured properly in the original project. Table 13 provides more information.

Table 13 - Proper Configuration of Multicast Consumers of a Produced Tag

Consuming Controller	Producing Controller	Description
Any controller, version 17 or earlier	ControlLogix 5580 controller, version 28 or later	Verify that all multicast consumed tags of a produced tag are configured with the same RPI. If they are not, some of the consumers can fail to connect.
Any controller, version 18 or later		Verify that one of the following exists: • All multicast consumers of a produced tag are configured with the same RPI. • All consumers are configured to Allow Consumed Tags To Use RPI Provided By Producer.
Any controller, version 20 or later	CompactLogix 5380 controller, version 28 or later	Verify that one of the following exists: • All multicast consumers of a produced tag are configured with the same RPI. • All consumers are configured to Allow Consumed Tags To Use RPI Provided By Producer.

Data Structures

The Logix Designer application has requirements for data type use. The requirements differ based on the Logix Designer application version that you use.

Logix Designer Application Version	Requirement
Version 26 or earlier	Logix 5000 controllers require all data types to be placed on 4-byte address boundaries in RAM.
Version 27 or later	Logix 5000 controllers require 8-byte (64-bit) data types (LINTs) to be placed on 8-byte address boundaries in RAM.

The Logix Designer application manages the requirement automatically, and the change has no effect on individual LINT tags, regardless of application version.

The requirement change between Logix Designer application, version 26, and version 27 is fundamental to the application and applies to all Logix 5000 controllers. The fact that the requirement was changed does not alone require action on your part.

Conditions can exist within which the change between Logix Designer application, versions 26, and version 27 contributes to the need for action on your part.

If you migrate a Logix Designer project, version 26 or earlier, to a Logix Designer project, version 27 or later, LINTs inside a UDT can be misaligned. Additional pad bytes are added to the data structure to account for the misalignment. The pad bytes can cause an increase in the size of the UDT.

The possible effects of data structure changes, and subsequent actions that you can take as a result, are described in the rest of this section.

IMPORTANT You must act when in the following conditions:

- You migrate a project, version 26 or earlier, to project, version 27 or later, and you have LINT tags inside a UDT.
- Your application includes Logix 5000 controllers, version 26 or earlier, that communicate with Logix 5000 controllers, version 27 or later.

Possible Impact of Requirement Change

You can adapt your project to accommodate larger structure sizes, if necessary. You can see the following effects due to the larger size:

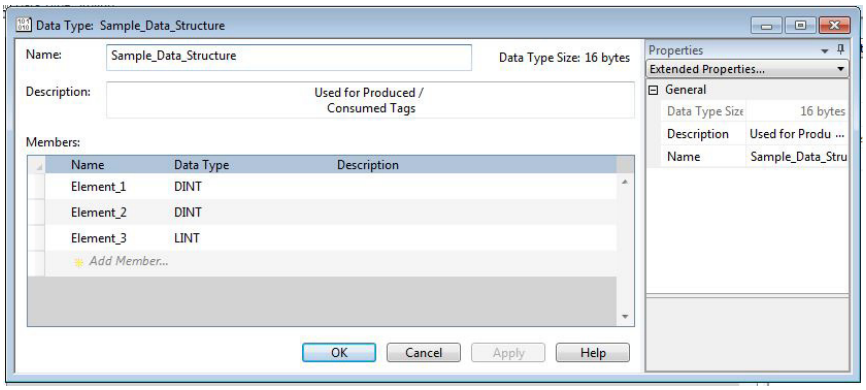
- Message instruction data lengths can require changes to complete successfully.
- Copy lengths of data structures can change.
- Produce/Consume connections to other Logix controller types can have data type mismatches and require changes to complete successfully.

To correct Produce/Consume errors that are caused by UDT alignment changes, modify the tag structures in both projects so that they match.

- Produce/Consume with Status requires an exact match of the UDT definition (including the name of the UDT definition).
- Produce/Consume without Status requires the Size of the UDT to match.

We recommend that you copy and paste the UDT definition from one project to the other to cover both of these cases. Use the Data Type editor to check the Data Type Size in both projects:

Figure 16 - Data Type Editor



If the data type size is different between the two projects, modify the UDT to produce the same internal data structure.

The following sample UDT illustrates how the 8-byte allocation rule and the 8-byte alignment rule cause a UDT to have another size.

Figure 17 - UDT Sample - Needs Additional Memory Allocation and Alignment

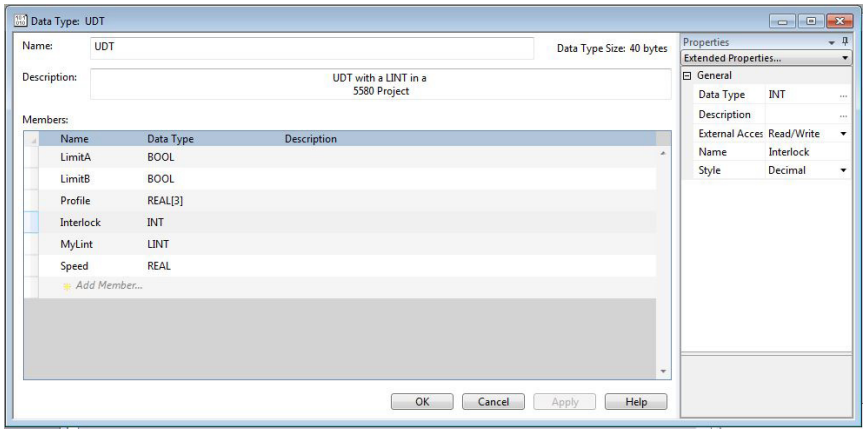


Table 14 illustrates how this data structure maps in a Logix Designer project, version 26 or earlier. MyLint is split across two 64-bit words, and the total size is only 32 bytes.

Table 14 - Data Structure for Logix Designer Projects, Version 26 or Earlier

Word	Elements	Byte Mapping Table				64 Bit Boundaries
0	LimitA and LimitB	Pad	Pad	Pad	Hidden SINT	0
1	Profile (Real [3])	Map	Map	Map	Map	
2		Map	Map	Map	Map	1
3		Map	Map	Map	Map	
4	Interlock (Int)	Pad	Pad	Map	Map	2
5	MyLint (LINT)	Map	Map	Map	Map	
6		Map	Map	Map	Map	3
7	Speed (REAL)	Map	Map	Map	Map	

Table 15 illustrates the hidden padding bytes that the Logix Designer application automatically adds to achieve the 8-byte alignment and allocation rules for a Logix Designer project, version 27 or later.

Consider the following:

- Padding is added in Word 5 so that MyLint starts at an 8-byte boundary.
- Padding is added in Word 9 so that the entire structure is a multiple of 8 bytes.

Table 15 - Hidden Padding Added for Logix Designer Projects, Version 27 or Later

Word	Elements	Byte Mapping Table				64 Bit Boundaries
0	LimitA and LimitB	Pad	Pad	Pad	Hidden SINT	0
1	Profile (Real [3])	Map	Map	Map	Map	
2		Map	Map	Map	Map	1
3		Map	Map	Map	Map	
4	Interlock (Int)	Pad	Pad	Map	Map	2
5	Padding for 8-byte alignment	Pad	Pad	Pad	Pad	
6	MyLint (LINT)	Map	Map	Map	Map	3
7		Map	Map	Map	Map	
8	Speed (REAL)	Map	Map	Map	Map	4
9	Padding for 8-byte allocation	Pad	Pad	Pad	Pad	

To create a UDT that is the same size in all types of projects, insert additional data elements so that hidden padding bytes are not necessary.

The following sample UDT illustrates how UnusedDint1 and UnusedDint2 were added to create a UDT with the same size in a Logix Designer project, version 26 or earlier compared to a Logix Designer project, version 27 or later.

Figure 18 - UDT Sample - Memory Allocation and Alignment OK

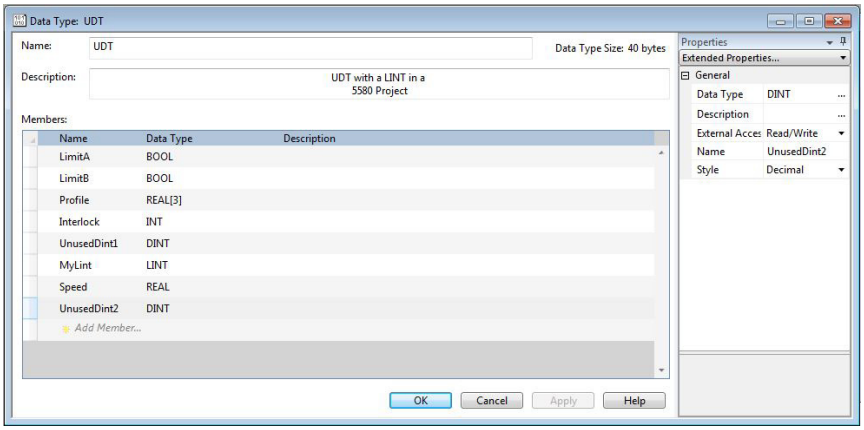


Table 16 illustrates how this data structure maps in all types of Logix 5000 controller projects:

Table 16 - Memory Map in All Project Types

Word	Elements	Byte Mapping Table				64 Bit Boundaries
0	Bools and 2	Pad	Pad	Pad	Hidden SINT	0
1	Profile (Real [3])	Map	Map	Map	Map	
2		Map	Map	Map	Map	1
3		Map	Map	Map	Map	
4	Interlock (Int)	Pad	Pad	Map	Map	2
5	UnusedDint1	Map	Map	Map	Map	
6	MyLint (LINT)	Map	Map	Map	Map	3
7		Map	Map	Map	Map	
8	Speed (REAL)	Map	Map	Map	Map	4
9	UnusedDint2	Map	Map	Map	Map	

The concept is the same for nested UDTs. If the lower-level UDT is an 8-byte type (that is, it contains at least one 8-byte data element), you must align it to start at an 8-byte boundary.

To correct any mismatched UDTs, complete the following tasks in either project:

1. Start at the deepest nesting level of any multi-level UDT.
2. Work from the beginning of each structure and look for LINT data types.
3. For each LINT data type or 8-byte UDT encountered, map out the sizes of the prior UDT elements, to determine the byte offset at the start of the element.

   For more information, see Instruction Error and Fault Changes on page 132.

   If the byte offset for the first 8-byte element is not divisible by 8 bytes (64 bits), insert a DINT tag element just above the 8-byte element. You can use any name. Instructions do not need to reference this element.
4. Repeat the process until all 8-byte elements are aligned on 8-byte (64-bit) boundaries.
5. If needed, add a DINT at the end of the UDT to satisfy the 8-byte allocation rule.
6. Continue up through nested UDTs until the top level is correct.

When the tasks are completed, the UDTs are the same size in the Logix Designer project, version 26 or earlier and the Logix Designer project, version 27 or later.

You can use the padded UDTs in the Logix Designer project, version 26 or earlier and the Logix Designer project, version 27 or later.

A useful technique when creating UDTs is to start with the largest data types first, and work down through 8-byte, 4-byte, 2-byte, 1-byte, and finally single-bit data types. The resultant mapping is 64-bit-aligned in all controller types, so no manual padding is required.

Produce/Consume with Status and Safety Produce/Consume tags require an adjustment to this technique. For these cases, the UDT must start with a 4-byte 'COMMAND_STATUS' element; therefore, one more 4-byte element (DINT or REAL) must be added before placing any 8-byte elements.

Late Binding of I/O Data

The Compact 5000™ I/O module family is the first set of Allen-Bradley® I/O modules use the following:

- A high-speed backplane that is optimized for performance that significantly exceeds previous I/O module families.
- A standard design for I/O tags based on module type that can be replicated in the development of other I/O modules.

  The standard design can simplify how you use modules from different I/O module families in a Studio 5000 Logix Designer application project.

Standard Native I/O Data Types and Tags

When you add I/O modules to a Logix Designer application project, the application automatically creates native I/O data types and tags. Historically, the native I/O data types and tags differed between I/O module families because the module designs differed.

With the introduction of the standard design by module type, the Logix Designer application creates standard native I/O data types and tags for modules of the same type irrespective of their families. Standard native I/O data types and tags make possible the concept of "late binding" of I/O data in Logix 5000 controllers.

You can write programs, routines, and Add-On instructions that operate on a set of standard I/O tags. The programs, routines, and Add-On instructions can then be applied, regardless of the I/O module family that is connected to the controller, early in the design phase and at any point in the implementation process, and use the same syntax.

The standard I/O data types and tags remove the task of changing or updating programming code modules based on the specific I/O module family that is used. As more I/O modules that use the standard design are developed, the use of multiple I/O module platforms in a Logix Designer gets progressively easier.

I/O Data Manipulation

When you address Compact 5000 I/O modules in a Logix Designer application project, many instructions that previously permitted a direct reference to an entire input or output word now report an invalid data type error.

You can encounter the invalid data type error when you migrate programs that are written for older Logix 5000 controllers and I/O platforms to programs written for 5580 and 5380 controllers with Compact 5000 I/O modules. The error is the result of the new structure that was implemented with the Compact 5000 I/O platform, as described in the previous section. The I/O data is grouped by "channel" by default, and no longer shown at the word level as an INT or DINT data type.

To get around this error a "Packed Data" type can be selected at the I/O configuration screen when adding the I/O module in the Logix Designer application. You can use a Copy File (COP) instruction or Synchronous Copy File (CPS) instruction to move the packed data into an interim tag. You can then use the tag in the user program for word-level manipulation.

We recommend that you only use CPS instructions when you need data integrity with copying produce/consume tag and I/O tag data. Overuse of the CPS instruction can have unintended consequences on task execution and program scan time.

When encountered with this error in converting your programs, follow closely the guidelines in Knowledgebase Article *Invalid data type error when using 5069 I/O modules* for a suitable migration path forward.

Controller Memory Usage

Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. As you change the project, the data values are automatically updated to indicate the estimated memory usage and remaining available memory.

The available memory used attributes are not supported with ControlLogix 5580, CompactLogix 5380, and CompactLogix 5480 controllers, as these controllers use memory differently and contain a new updated memory architecture.

You can no longer programmatically monitor a controllers' available memory via a MSG instruction, as the controller's memory no longer changes after a project is downloaded. To verify available controller memory, view the Controller Properties Memory Tab in the Logix Designer application.

For more information on controller memory, see:

- ControlLogix Memory Tab on page 32.
- CompactLogix Memory Tab on page 66.
- Logix 5000 Controllers Design Considerations Reference Manual, publication 1756-RM094.

Motion Applications

The use of integrated motion is slightly different between controllers. For example, not all CompactLogix 5380 and Compact GuardLogix 5380 controllers support Integrated Motion over an EtherNet/IP™ network.

ControlLogix 5580 and GuardLogix 5580 Controllers

The controllers support up to 256 axes of integrated motion. The number of axes that a controller supports is based on the Ethernet node limit for the specific controller. The axes can be any combination of the following axis types:

- CIP™
- Virtual
- Consumed

You can add all axes to one Motion Group, and you can assign any combination of axes to different axis update schedules.

TIP We recommend that you use the built-in EtherNet/IP™ port for high-performance motion applications.

Table 17 describes the motion networks that are available.

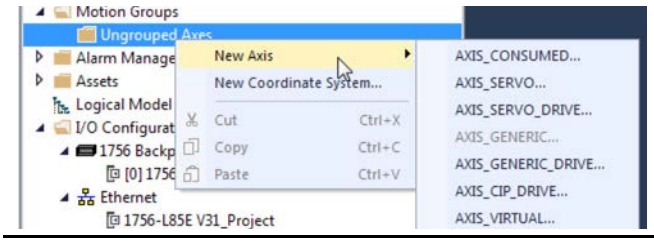
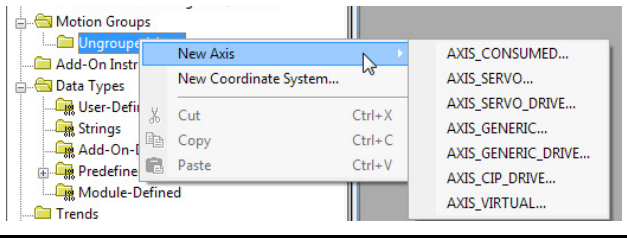
Table 17 - Available Motion Networks for ControlLogix Controllers

Motion Networks	5580 Controllers	5570 Controllers
EtherNet/IP	Yes	Yes
Analog Motion	Yes(1)	Yes
SERCOS	Yes(1)	Yes

(1) With Studio 5000 Logix Designer application, version 31 or later.

You can associate Integrated Motion axes with any appropriate drive. You can make the association regardless of whether the communication path to the drive is via the embedded Ethernet port, or over the 1756 backplane through an Ethernet bridge.

Table 18 - New Axis Menu

5580 Controllers Version 31	5570 Controllers
	

For more information on axis limits and scheduling, see the Integrated Motion on the EtherNet/IP Network User Manual, publication MOTION-UM003.

CompactLogix 5380 and Compact GuardLogix 5380 Controllers

Some CompactLogix 5380 and Compact GuardLogix 5380 controllers support integrated motion. For information on the controllers that support motion, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

The controllers support up to 32 axes of integrated motion. The 32 axes can be any combination of the following axis types:

- CIP - Up to32 Position Loop axes are supported
- Virtual Axes

The number of total axes that a controller supports is based on the Ethernet node limit for the specific controller. These axes types include velocity loop, torque loop, feedback only, frequency control, and others.

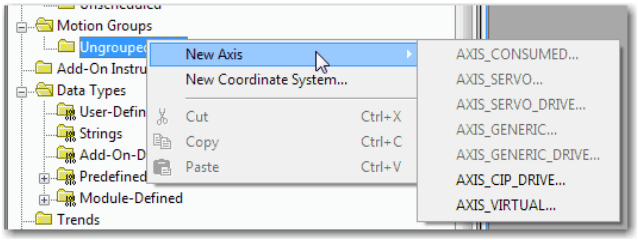
You can add all axes to one Motion Group, and you can assign any combination of axes to different axis update schedules.

The 5380 and 5370 controllers only support integrated motion on an EtherNet/IP network.

For information on motion axes and Integrated Motion on an EtherNet/IP network, see the Integrated Motion on the EtherNet/IP Network: Configuration and Startup User Manual, publication MOTION-UM003.

You can associate Integrated Motion axes to any appropriate drive. The Axis menu is the same for the 5380 and 5370 controllers:

Figure 19 - Axis Menu



Axis Position References in Move Instructions

When you use Feedback Only or Torque Loop Configured axes in the following Motion instructions, the available position data updates are different based on the Logix Designer projects within which they are used:

- Motion Axis Gear (MAG)
- Motion Arm Output Cam (MAOC)
- Motion Axis Position Cam (MAPC)
- Master Driven Speed Control (MDSC)

If you use a Logix Designer project, version 25 or earlier, the Motion Planner provides Actual Position and Command Position data updates.

If you use a Logix Designer project, version 26 or later, the Motion Planner provides only Actual Position data updates.

If you migrate a Logix Designer project, version 25 or earlier, to a Logix Designer project, version 26 or later, update your project where necessary to use the Actual Position data reference and not the Command Position data reference.

Pending Edits

Online edits now help you avoid unintentionally leaving routines in an inconsistent state. Accept Pending Edits is now blocked if any pending edits have verification errors

This implementation affects all instructions in the instruction set.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes

5580/5380 Controllers	5570/5370 Controllers
If you edit multiple rungs and choose Accept Pending Edits, Logix Designer does the following. • Accepts all rungs if there are no verification errors. • Accepts none of the rungs if errors occur.	You can accept and download individual Pending Edits to controller, while edits that error out are not downloaded to the controller.

IMPORTANT Manually determine the impact to your application and correct accordingly.

Mitigation

N/A

AXIS_CIP_Drive Data Type

Starting with the Studio 5000 Logix Designer application version 31, some Axis Safety Fault tags in the AXIS_CIP_DRIVE data type are renamed. See Table 19.

Table 19 - Axis Safety Fault Tags

Pre-version 31 Tag	Version 31 or Later Tag
SafeStop1Fault	SS1Fault
SafeStop2Fault	SS2Fault
SafeOperatingStopFault	SOSFault
SafeBrakeFault	SBCFault
SafeMotorOvertemperatureFault	SMTFault
SafeSpeedMonitorFault	SSMFault
SafeLimitedSpeedFault	SLSFault
SafeLimitedAccelFault	SLAFault
SafeLimitedDirectionFault	SDIFault

When you convert to a version 31 or later project, the updates are applied automatically.

If you import a pre-version 31 program or routine that uses these tag names, your project can experience errors.

Instruction Execution

Topic	Page
Math-related Instructions	120
Structural Changes to Execution	126
Instruction Error and Fault Changes	132
Operand Changes	144
Copy/File Instructions	145
GSV/SSV Instructions	149
MCT/MCTP Instructions	150

This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5580 controllers	ControlLogix® 5580 and GuardLogix® 5580 controllers
5380 controllers	CompactLogix™ 5380, Compact GuardLogix 5380 SIL 2, and Compact GuardLogix 5380 SIL 3 controllers
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers

This chapter describes the changes in instructions, and the comparisons between the 5580/5380 controllers and the 5570/5370 controllers.

Math-related Instructions

This section describes the changes in math-related instructions, and apply to the following:

- TRN Instruction Changes
- Improved Math Instruction Accuracy
- SQR/SQRT Adjustment
- X Mod 0
- AND, NOT, OR, and XOR Support for REAL
- Floating Point Literals
- XPY Instruction
- 0.0 div 0.0

IMPORTANT Manually determine the impact to your application and correct accordingly.

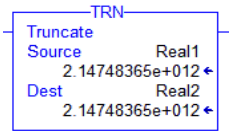
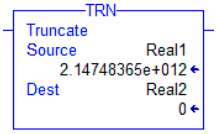
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

TRN Instruction Changes

Previously, if a large real number was truncated, overflow of the internal math that the instructions performs was possible. As a result, the instruction returned a zero. Some large reals that failed and returned a zero when truncated now return a value.

In RLL, S:V is set properly when the value that is truncated is too large to be stored in the destination. With this implementation, the truncation of real values to real destinations is more likely to complete without errors.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

Modify any existing code that relied on obtaining a zero result instead of range-checking the input value.

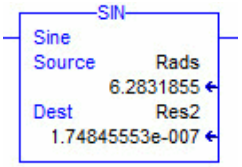
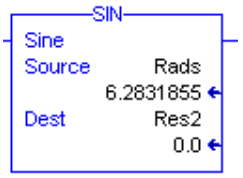
Improved Math Instruction Accuracy

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

The implementation changed from a proprietary implementation of a commonly found polynomial algorithm to invoking a function in a standard, commercial off-the-shelf, C math library. The algorithm change, along with hardware improvements, help to improve overall accuracy for the controllers.

This implementation affects these instructions: ACS/ACOS, ASN/ASIN, ATN/ATAN, COS, LN, LOG, SIN, SQR, TAN, XPY.

5580/5380 Controllers	5570/5370 Controllers
 Because 2*PI is an estimated value for Rads, the result does not equal 0.0.	

Mitigation

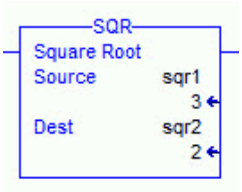
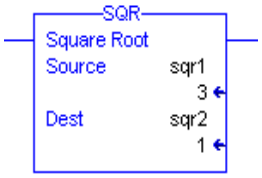
Reverify any existing code that expects an exact result whenever the input is close to values that produce zero, infinity, or asymptotic results.

SQR/SQRT Adjustment

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes

The SQR/SQRT instruction now uses round-to-even type conversion of the floating point result to integer destination. Previously, this operation truncated the floating point result.

The new implementation results in behavior from the SQR instruction that better matches the IEC standard math expectations.

5580/5380 Controllers	5570/5370 Controllers
 Source - DINT Dest - DINT	 Source - DINT Dest - DINT

Mitigation

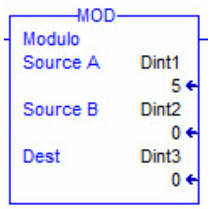
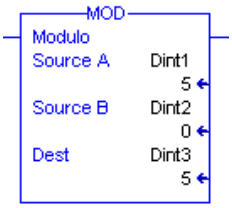
N/A

X Mod 0

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	No

This instruction was updated to conform to IEC 61131-3 ed. 2 table 28 for MOD function. In this case, anything Mod 0 results in 0.

This implementation affects the MOD instruction.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

N/A

AND, NOT, OR, and XOR Support for REAL

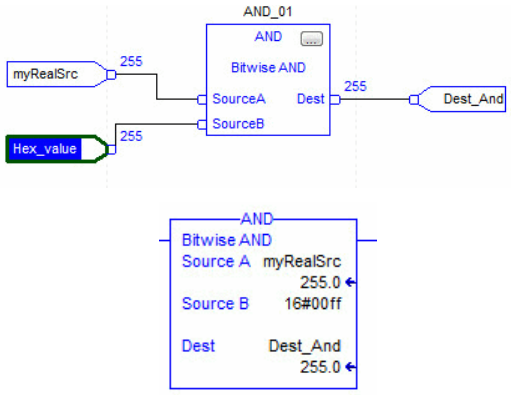
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

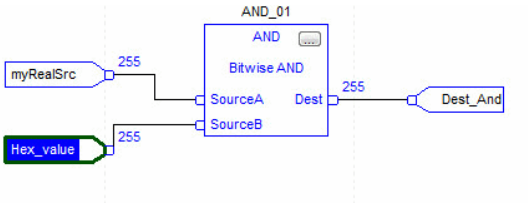
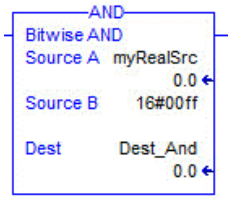
The verification rules for these instructions now let you use REAL operands in RLL routines that are based on existing behavior in non-RLL languages.

This implementation helps to make programming for these instructions consistent across all languages.

5580/5380 Controllers

Also supported in RLL.



5570/5370 Controllers
Bitwise arithmetic operations for reals only in FBD.  When used in RLL, you get this error: Invalid Data Type. Argument must match parameter data type.  Error: Rung 4, AND, Operand 0: Invalid data type. Argument must match parameter data type. Error: Rung 4, AND, Operand 2: Invalid data type. Argument must match parameter data type.

Mitigation

N/A

Floating Point Literals

The programming software now detects invalid parameter values. This helps to prevent you from accidentally specifying invalid values to certain instructions.

This implementation affects these instructions: MAG, MAJ, MAM, MAPC, MEQ.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes(1)
Sequential Function Chart (SFC)	Yes(2)

(1) MEQ instruction only.

(2) Only affects embedded Structured Text.

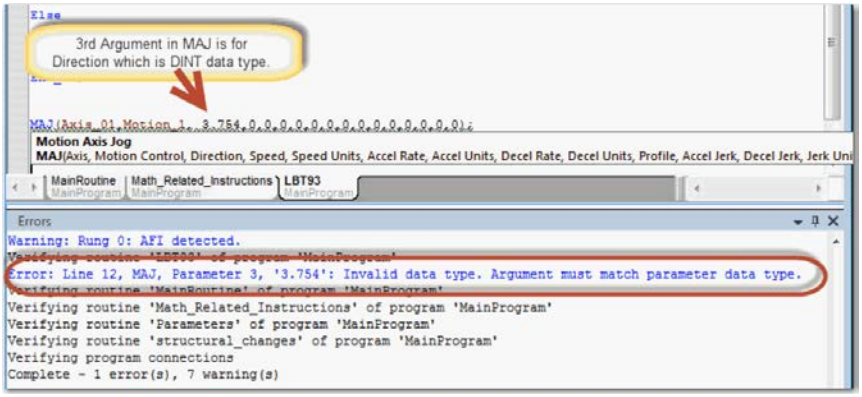
5580/5380 Controllers

If an instruction only verifies with tags of type DINT, it also only verifies with literal values that are Integers.

MEQ: Error during Controller Verification: Invalid Data Type.
Argument must match parameter data type.

```
Verifying routine 'MainRoutine' of program 'MainProgram'
Verifying routine 'Math_Related_Instructions' of program 'MainProgram'
Error: Rung 6, MEQ, Operand 1: Invalid data type. Argument must match parameter data type.
Verifying program connections.
```

MAJ in Structured Text
When you specify a floating literal for the Direction argument (a DINT), you get the following error.




```
Verifying routine 'MainRoutine' of program 'MainProgram'
Verifying routine 'Math_Related_Instructions' of program 'MainProgram'
Error: Rung 6, MEQ, Operand 1: Invalid data type. Argument must match parameter data type.
Verifying program connections.
```

5570/5370 Controllers

The following instruction is valid, even though it fails verification if a tag of type REAL was used for Mask.
MEQ
Source: DINT_Tag_1
Mask: 12.35
Compare: DINT_Tag_2

Mitigation

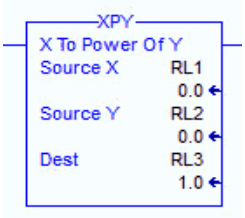
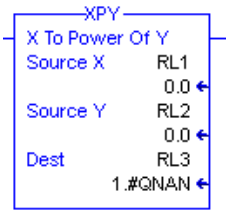
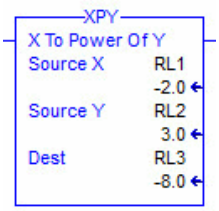
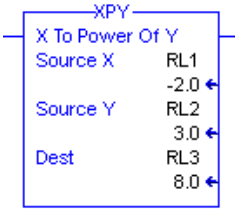
Resolve any verification errors that occur when you open and import projects in the Studio 5000 Logix Designer® application, version 28 or later.

XPY Instruction

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

This implementation matches the industry standard behavior for raising X to the power of Y.

5580/5380 Controllers	5570/5370 Controllers
	
	

Mitigation

N/A

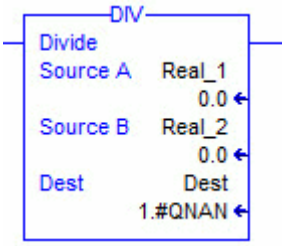
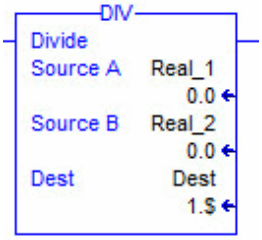
0.0 div 0.0

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

The special case of a floating point divide of zero by zero now results in a NAN value. Legacy controllers produced infinity.

This implementation affects the DIV instruction.

5580/5380 Controllers	5570/5370 Controllers
DIV(0.0, 0.0, dest) now produces NAN. 	DIV(0.0, 0.0, dest) used to produce infinity. 

Mitigation

Inspect your applications for the Divide operation and correct accordingly.

Structural Changes to Execution

This section describes the structural changes to execution, and apply to the following:

- JSR Nesting Level Limit
- Max Number of Inputs or Outputs for a Program JSR/RET
- Max Number of InOut Parameters for an Add-On Instruction
- Jump to Label Must Be Present
- MCR Placement
- Data Alignment and Memory Allocation Rules for User-defined Data Types (UDTs) That Contain LINTs

IMPORTANT Manually determine the impact to your application and correct accordingly.

JSR Nesting Level Limit

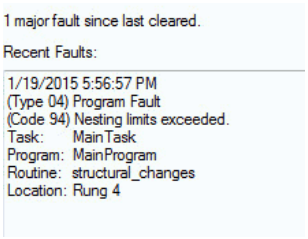
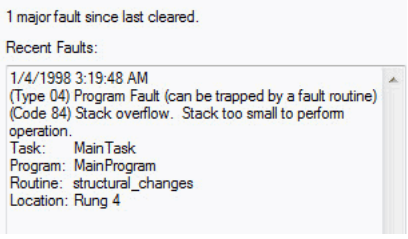
When you nest routines, the controller reserves enough memory to execute to a maximum of 25 nesting levels. Previously, controllers let you continue to nest until they ran out of stack space and faulted.

The major fault 'Nesting limits exceeded' signifies that you have exceeded the nesting limit.

This implementation affects the JSR instruction.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

Restructure your project to avoid excessive subroutine nesting. Resolve any verification errors that occur when you open and import projects in the Logix Designer application, version 28 or later.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

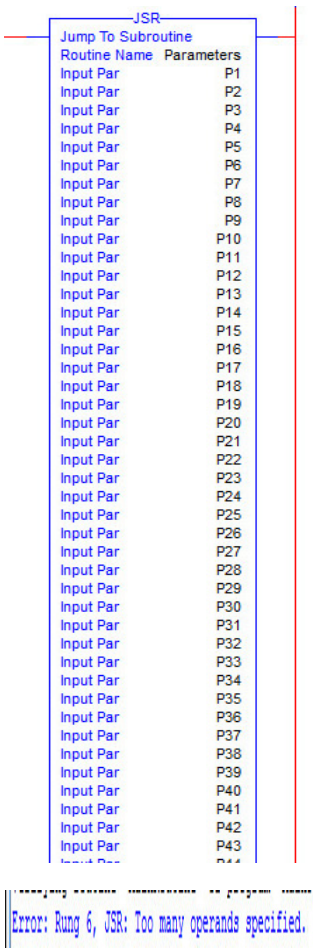
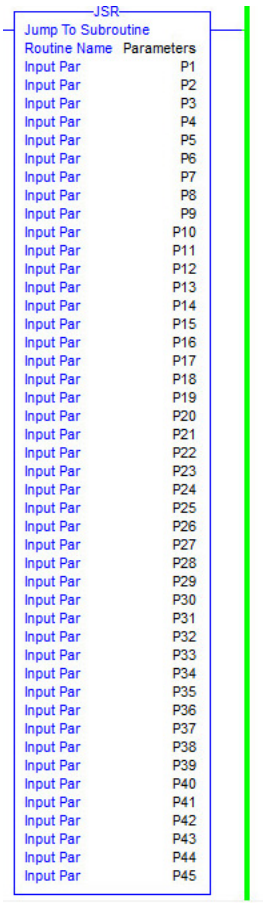
(1) Only affects embedded Structured Text.

Max Number of Inputs or Outputs for a Program JSR/RET

JSR calls are now limited to 40 input parameters and 40 output parameters. With this limit, the controller is less likely to run out of memory at runtime. If you exceed this limit, you get a verification error.

Previously, there was no limit on the number of parameters you could define as an input or output parameter. The absence of a limit can cause the controller to run out of stack space at runtime and fault.

This implementation affects these instructions: JSR, RET, SBR.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

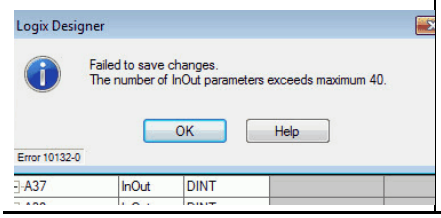
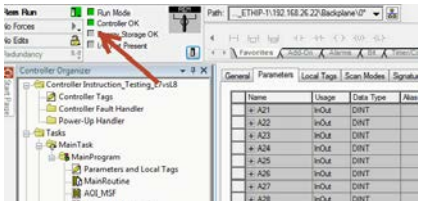
Resolve any verification errors that occur when you open and import projects in the Logix Designer application, version 28 or later.

Max Number of InOut Parameters for an Add-On Instruction

When an Add-On Instruction is called, the number of InOut parameters that you can pass into or out of the Add-On Instruction is as follows:

- Logix Designer application, version 28 or earlier - 40
- Logix Designer application, version 29 or later - 64

If you exceed the limits indicated, verification error occurs. There is no imposed limit on inputs or output parameters. You cannot access the limits inside an Add-On Instruction.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

Resolve any verification errors that occur when you open and import projects in the Logix Designer application, version 28 or later.

Add-On Instruction Nesting Level Limit

When you nest Add-On Instructions, the number of levels to which you are limited is as follows:

- Logix Designer application, version 28 or earlier - 25
- Logix Designer application, version 29 or later - 16

The controller has reserved enough memory to execute to the nesting level specified above. You cannot access the limits inside an Add-On Instruction. The major fault 'Nesting limits exceeded' signifies that you have exceeded the nesting limit.

5580/5380 Controllers	5570/5370 Controllers
When you nest Add-On Instructions, the number of levels to which you are limited is as follows: • Logix Designer application, version 28 or earlier - 25 • Logix Designer application, version 29 or later - 16	Previously, controllers let you continue to nest until they ran out of stack space and faulted.

Mitigation

Resolve any verification errors that occur when you open and import projects in the Logix Designer application, version 28 or later.

Jump to Label Must Be Present

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

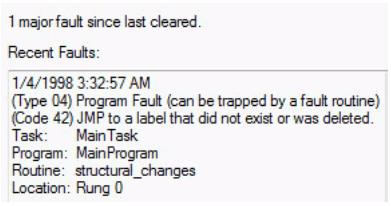
Previously, a jump to label request could reference a label that did not exist and cause a fault. The 5580 and 5380 controllers require the label to exist before the following:

- You download the project to the controller if you are working offline.
- You accept edits if you are working online.

Project verification now detects missing LBLs to help lower the risk of unexpected runtime faults.

```
Verifying routine 'MainRoutine' of program 'MainProgram'
Error: Rung 1, JMP: JMP instruction has no target label (Label_1).
```

This implementation affects these instructions: JMP, LBL.

5580/5380 Controllers	5570/5370 Controllers
The controllers now require the label to exist before: • Downloading if working offline. • Accepting edits if working online. 	Missing LBLs are not detected until the corresponding JMPs are executed. Depending on input logic, the project can appear to run OK until conditions trigger a JMP to a missing target. 

Mitigation

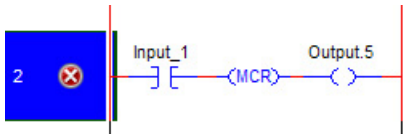
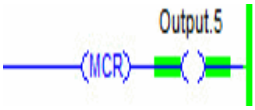
Resolve any verification errors that occur when you open and import projects in the Logix Designer application, version 28 or later.

MCR Placement

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

The MCR instruction must be the last instruction on any rung. Otherwise, the project generates an error upon verification.

```
Error: Rung 2, MCR: MCR instruction must be last instruction on rung.
```

5580/5380 Controllers	5570/5370 Controllers
Project generates error on verification. 	No error is shown. However, it is difficult for programmers to know how the MCR can affect any instructions following it on the rung. 

Mitigation

N/A

Data Alignment and Memory Allocation Rules for User-defined Data Types (UDTs) That Contain LINTs

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes

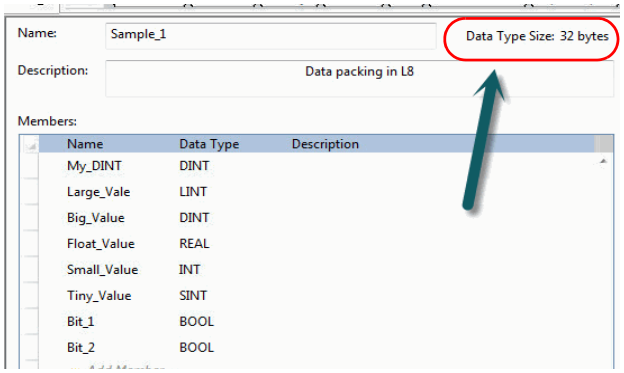
LINT data types are aligned on 64-bit boundaries in Logix 5000™ controllers, that use a Logix Designer project, version 27 or later. UDTs that contain LINTs allocate memory in multiples of 8 bytes.

In 5570 and 5370 controllers that use a Logix Designer project, version 26 or earlier, alignment and allocation used 4-byte boundaries. Proper alignment of data improves data integrity and performance.

This implementation affects UDTs that contain LINT data types, including LINTs that are in nested UDTs.

5580/5380 Controllers

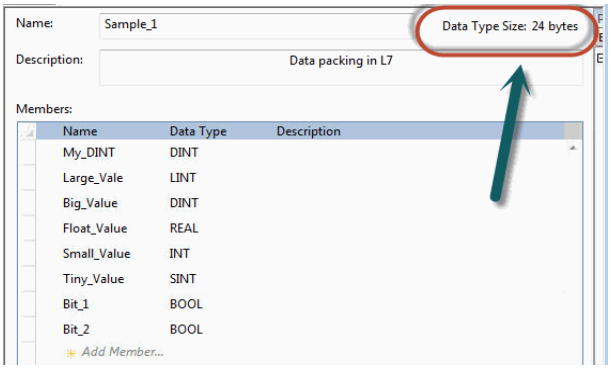
Data Type Size - 32 bytes



Word	Elements	5580/5380 controllers - 64-Bit Boundary				
		Data Type	Mapping Table (8 bits each column			
0	My_DINT	DINT	MAP	MAP	MAP	MAP
1	Padding Bytes		PAD	PAD	PAD	PAD
2	Large_Value	LINT	MAP	MAP	MAP	MAP
3			MAP	MAP	MAP	MAP
4	Big_Value	DINT	MAP	MAP	MAP	MAP
5	Float_Value	REAL	MAP	MAP	MAP	MAP
6	Small_Value Tiny_Value, Bit 1 Bit_2	INT, SINT, BOOL, BOOL	MAP	MAP	MAP	MAP
7	Padding Bytes		PAD	PAD	PAD	PAD

5570/5370 Controllers

Data Type Size - 24 bytes



Word	Elements	5570/5370 controllers - 32 Bit Boundary				
		Data Type	Mapping Table (8 bits each column			
0	My_DINT	DINT	MAP	MAP	MAP	MAP
1	Large_Value	LINT	MAP	MAP	MAP	MAP
2			MAP	MAP	MAP	MAP
3	Big_Value	DINT	MAP	MAP	MAP	MAP
4	Float_Value	REAL	MAP	MAP	MAP	MAP
5	Small_Value Tiny_Value, Bit 1 Bit_2	INT, SINT, BOOL, BOOL	MAP	MAP	MAP	MAP

Mitigation

See Produce and Consume Tags on page 106, if you Produce/Consume tags in UDTs between the following:

- 5580 and 5570 controllers that use Logix Designer projects, version 26 or earlier
- 5380 and 5370 controllers that use Logix Designer projects, version 26 or earlier

For more information about mapping, see Data Structures on page 107.

If you use COP or CPS instructions to move data between UDT-based tags and simple arrays, review your logic. Make sure that the COP/CPS instructions are the correct length, and the logic matches the position of the data within the array.

For example, when you use a CPS instruction to copy a SINT[32] array that is obtained from an external device into a UDT that contains LINTs

Instruction Error and Fault Changes

This section describes the instruction error and fault changes that apply to the following:

- Subscript Expressions
- TRN Operator and Math Status Flags
- Math Status Flags are Valid Only in One Rung
- AVE and STD Instruction Accuracy
- BTD, FAL, FSC, and CMP No Longer Generate Math Status
- Math Status Flags Not Permitted in Structured Text
- Minor Fault on Overflow
- Manually Set Math Overflow
- TOD Instruction Flags and Math Status Flags
- Add-On Instructions Do Not Propagate Math Status Flags
- Subroutines Do Not Affect Math Status Flags
- Carry Flag
- Store NAN in an Integer
- Compare NAN Values

IMPORTANT Manually determine the impact to your application and correct accordingly.

Subscript Expressions

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes(1)
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

(1) Structured Text does not update math flags but REALs in the expression and the major fault is not permitted if the calculated index that is out of range affects ST.

Subscript expressions are treated separately from instructions. If an overflow occurs during their evaluation, the overflow can be recorded as a minor overflow fault but always generates a major fault. The major fault indicates that an out-of-range condition exists.

Subscript expressions behave much more predictably:

- REAL operands/operators are no longer permitted.
- Calculation of subscript expressions no longer silently produces invalid results.
- Overflow conditions are detected and produce a Major Recoverable Fault.

5580/5380 Controllers	5570/5370 Controllers
In these controllers, math errors in subscript calculations do not impact math status flags in any way. Overflow minor faults for subscript expressions are reported if enabled. A major fault is generated if an overflow occurs to indicate that the index was not computed normally.	In these controllers, a subscript calculation changes the value of a math status flag. The change makes it impossible to identify if the instructions or evaluation of a subscript expression used with the instruction during operand address processing caused the actual error.

Mitigation

Review all subscript expressions in your application to make sure they cannot produce an overflow result, for example, a divide-by-zero. Update any major fault recovery logic in your application to handle this new fault appropriately.

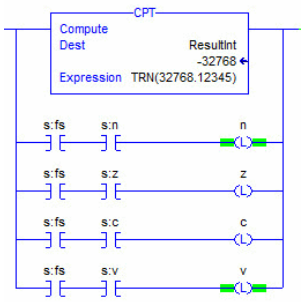
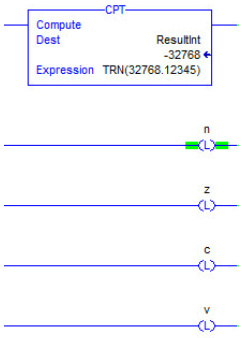
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

TRN Operator and Math Status Flags

TRN operators always produce a 32-bit integer value. When attempting to store that value into a destination too small to hold it, an overflow condition occurs.

While a 5570 or 5370 controller causes a minor overflow fault, it does not set the overflow flag.

CPT instructions that use a TRN operator now produce correct math status.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

N/A

Math Status Flags are Valid Only in One Rung

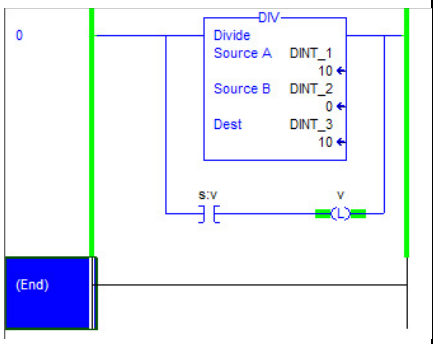
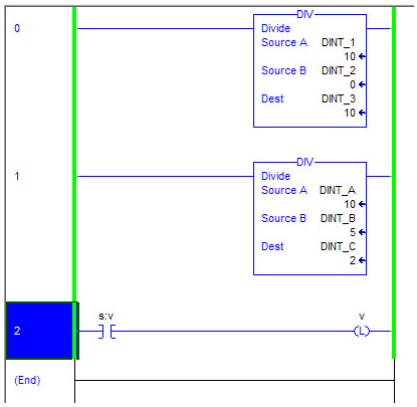
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

On 5570 and 5370 controllers, the math status flag reflects any math event that occurs anywhere in the routine that performs the evaluation. The ability to identify the instruction that caused the error is a challenge. Also, other instructions that execute correctly after the offending instruction can clear any math status flag errors.

On 5580 and 5380 controllers, the math status flag must reside after an instruction that can set the math status flag. The math status flag reflects the math status that occurred only on the previous instruction that can set the flag within this rung.

This removes the ambiguity as to which instruction caused the math status flag result. The controller does not waste CPU time generating math status flag values if they are not examined.

This implementation affects all math status producer/consumer instructions.

5580/5380 Controllers	5570/5370 Controllers
	

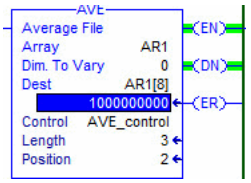
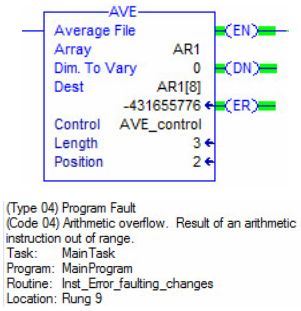
Mitigation

Rearrange logic that evaluates math status flags so that the logic is on the same rung as the flag-generating instruction, and there are no intervening instructions that could affect the flags.

AVE and STD Instruction Accuracy

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

The internal data type used for internal calculations of AVE and STD instruction now has greater precision. This improves the accuracy of the results that the AVE and STD instructions generate.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

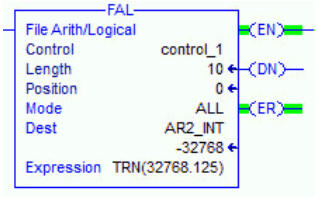
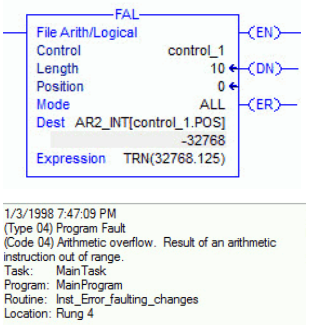
N/A

BTD, FAL, FSC, and CMP No Longer Generate Math Status

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

The BTD, FAL, FSC, and CMP instructions no longer impact math status flags (S:Z, S:N, S:V) because they do not write a value to a discrete destination. If the minor overflow reporting feature is enabled, BTD, FSC, and CMP instructions report this kind of fault. The FAL no longer generates a minor fault on overflow because the ER bit is set and the operation is aborted.

This removes the expectation that math status has a value for BTD, FAL, FSC, and CMP instructions.

5580/5380 Controllers	5570/5370 Controllers
	There are several situations in which math status flags are generated but you cannot determine exactly where they were generated. One case is with the FAL instruction. If the expression is repeated 10 times, you cannot tell which instance caused the flag. 

Mitigation

N/A

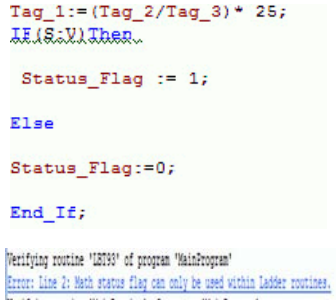
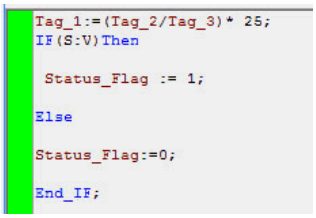
Language	Affected
Ladder Logic (RLL)	No
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes[1]

(1) Only affects embedded Structured Text.

Math Status Flags Not Permitted in Structured Text

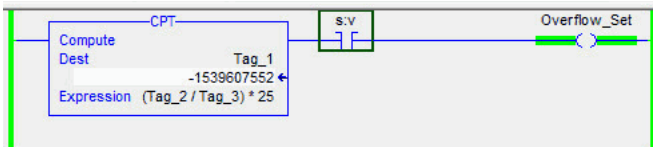
Math status flags are no longer permitted in ST. Use of math status flags in ST fails verification.

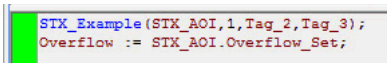
This implementation affects all math status producer/consumer instructions.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

Move legacy ST code into an Add-On Instruction that contains equivalent RLL code to emulate math status behavior. Also use Add-On Instruction output parameters to return math status flag-specific values for client to test.





Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

Minor Fault on Overflow

You can now generate overflow minor faults. Report Overflow Faults is a new parameter that lets you enable Minor Overflow fault reporting.

Report Overflow Faults appears on the Controller Properties Advanced Tab:

- If you convert a legacy project to a 5580 or 5380 project, this parameter defaults to enabled to keep legacy behavior.
- If you create a 5580 or 5380 controller project, this parameter defaults to disabled to improve performance.
- In either case, you can override the default by changing the checkbox in the Controller Properties Advanced tab.

Not monitoring overflow events in the minor fault log can reduce controller overhead.

This implementation affects all instructions that can overflow.

5580/5380 Controllers	5570/5370 Controllers
By default, these controller do NOT trigger a minor fault. • If you expect a minor fault condition that you must monitor, use the S:V math status flag following candidate instructions. • If you want to monitor all overflow minor faults, then enable the Report Overflow Faults property on the controller Advanced tab.	In these controllers, the controller always triggers a minor fault condition when a math overflow occurred.

Mitigation

If you want to monitor overflow conditions for specific instructions capable of generating a minor overflow fault, insert XIC(S:V) immediately following each instruction.

If you want to monitor all possible minor overflow conditions, set Report Overflow Faults on the Controller Properties Advanced Tab and check the minor fault log for their occurrence.

ATTENTION: Enabling Report Overflow Faults can slow down your program scan times.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

Manually Set Math Overflow

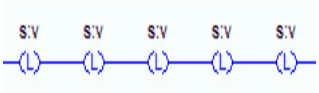
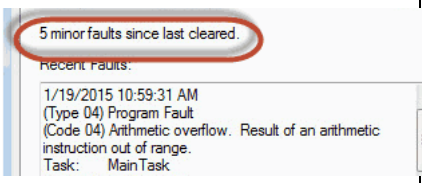
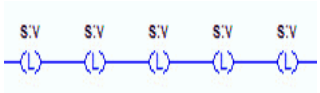
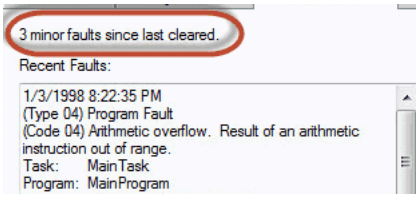
You can use overflow flags to help debug your code. Create math overflow conditions where appropriate in your code.

If you used an OTE or OTL instruction to set the overflow flag (S:V), the instruction did not always generate a minor fault with 5570 and 5370 controllers.

When you use an OTE or OTL instruction to set the overflow flag (S:V), the instruction causes an overflow minor fault with 5580 and 5380 controllers:

The fault occurs regardless of the state of the flag before the instruction was executed.

This implementation affects the OTE and OTL instructions.

5580/5380 Controllers	5570/5370 Controllers
 	 

Mitigation

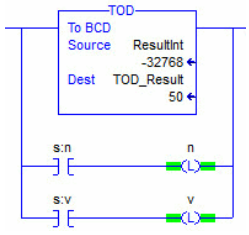
N/A

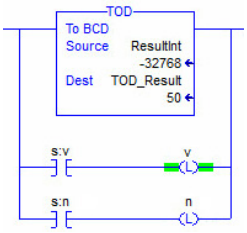
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

TOD Instruction Flags and Math Status Flags

This implementation sets math status flags in a consistent manner across instructions, and offers more complete math status flags for the TOD instruction.

5580/5380 Controllers	5570/5370 Controllers
In these controllers, a TOD instruction can modify the math status flags S:V, S:N, and S:Z.	In these controllers, the TOD instruction only populates the math overflow condition S:V.





Mitigation

N/A

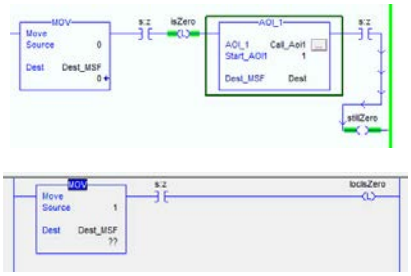
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes(1)

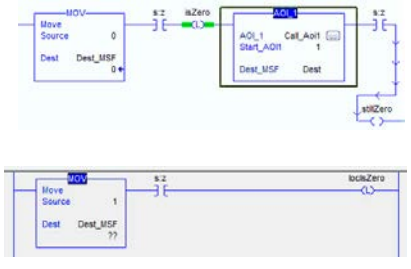
(1) Only affects embedded Structured Text.

Add-On Instructions Do Not Propagate Math Status Flags

When the content of an Add-On Instruction generates a math status flag, the status is not propagated to the routine or other Add-On Instructions that call the offending Add-On Instruction. Add-On Instructions are not considered producers of Math Status Flags. Math status flags can be evaluated in the Add-On Instruction, but not by the caller.

5580/5380 Controllers	5570/5370 Controllers





Mitigation

If you want the Add-On Instruction to return math status flags, then use Boolean output parameters.

Subroutines Do Not Affect Math Status Flags

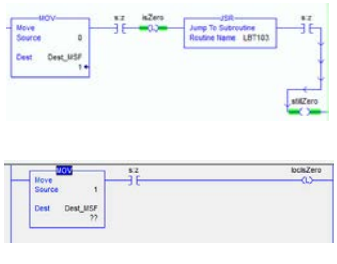
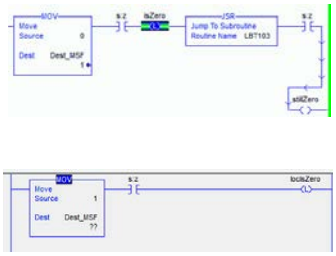
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

Subroutines are not considered MSF producers, so they do not preserve math status flags across calls. The JSR, SBR, RET, FOR, BRK instructions are not math status flags producers. FOR and BRK instructions do not affect math status flags because they do not pass any parameters.

The JSR instruction saves (and reinitializes) the flags on entry and restores them after the subroutine returns. Also, the SBR, RET, FOR, and BRK instructions do not change the flags.

This implementation affects the JSR and FOR instructions. FOR is only available in RLL.

5580/5380 Controllers	5570/5370 Controllers
	

Mitigation

N/A

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes(1)

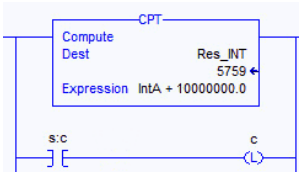
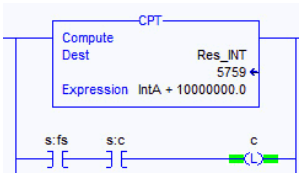
(1) Only affects embedded Structured Text.

Carry Flag

Only the ADD and SUB instructions that specify integer operands can affect the carry bit. This lets you perform chain calculations to support larger (unsupported) data types (Add low, Add_with_carry high).

The carry flag is limited to only those operations that are relevant. This simplifies its use and that of math status flags in general.

This implementation affects all instructions that can set math status flags.

5580/5380 Controllers	5570/5370 Controllers
Use of the ADD and SUB operators has no effect on the carry bit. Only ADD and SUB instructions with integer operands can affect the Carry flag. 	Many math instructions can set the Carry bit. 

Mitigation

Look for references to s:c in the user project and verify that the logic functions as intended.

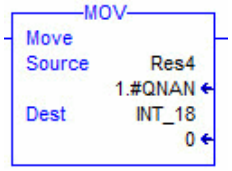
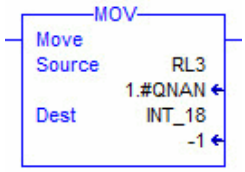
Store NAN in an Integer

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects the embedded Structured Text.

When writing/propagating NAN values 5580 and 5380 controllers offer standardized results.

This implementation affects all instructions that can produce a Floating Point value and store in an integer location.

5580/5380 Controllers	5570/5370 Controllers
Writing +/- NAN to an integer always results in the value 0 be stored. 	Writing NAN to an integer results in either -1 or 0 depending on the sign bit for NAN. 

Mitigation

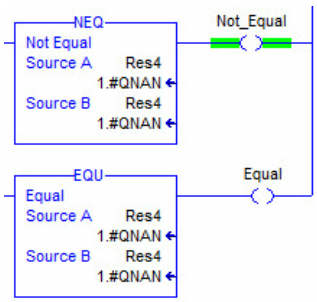
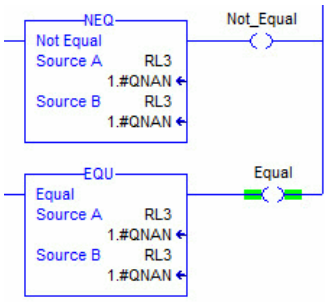
Revise your application if it was checking for the special value of '-1' to indicate a '-NAN' result.

Compare NAN Values

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	No

NAN does not compare true with ANY value (even another NAN). Any EQU, GEQ, GRT, LEQ, or LES comparison with at least one NAN input is always false, and any NEQ input with at least one NAN input is always true. Now offers standardized results when you use NAN in comparisons.

This implementation affects these instructions: CMP, EQU, GEQ, GRT, LEQ, LES, NEQ.

5580/5380 Controllers	5570/5370 Controllers
All compares with NAN are false except for NEQ. 	NAN values compare as equals and their signs are accounted for. 

Mitigation

Revise any logic that relies on the old, non-standard result from an NAN comparison. Also, it is now easier to test for a NAN result. This value is the only value that provides a true result for a 'NEQ TagA TagA' comparison.

Operand Changes

This section describes the changes to operands.

IMPORTANT Manually determine the impact to your application and correct accordingly.

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects the embedded Structured Text.

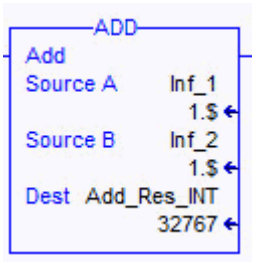
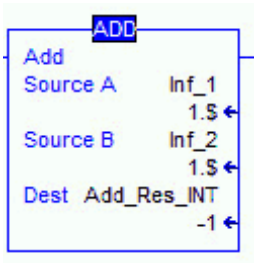
Converting +/- Infinity

Converting +/-Infinity to an integer results in MAX signed integer value with MS flags set based on the value. For 32-bit integer machines, this means 2147483647 for +Inf and -2147483648 for -Inf. Overflow (V) is always set.

When writing/propagating +/- infinity values, 5580 and 5380 controllers offer more standardized results.

MAX/MIN values are less common than 0 or -1 meaning there is less conflict with common program results.

This implementation affects all instructions that store floating point values into integer locations. Applicable to all languages.

5580/5380 Controllers	5570/5370 Controllers
Writing infinity to an integer is the MAX signed value that is permitted. 	Writing +infinity to an integer is -1 value whereas -infinity is stored as 0 in an integer. 

Mitigation

N/A

Copy/File Instructions

This section describes the changes to copy/file instructions that apply to the following:

- COP and CPS Into Structures
- JSR and RET Parameters Passing Into Structures
- JSR passing Atomic Data type into an Array or Structure
- Instructions That Operate On Arrays

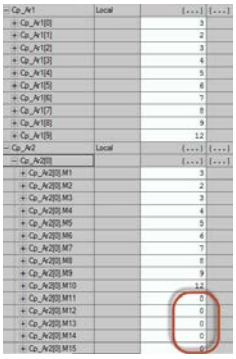
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

IMPORTANT Manually determine the impact to your application and correct accordingly.

COP and CPS Into Structures

Copying a 10-element array into a 100-element array now moves 10 elements (limited by the source). As always, copying a 100-element array into a 10-element array only moves the first 10 elements of the source (limited by the destination).

5580/5380 Controllers	5570/5370 Controllers
	
The GuardLogix 5580 and Compact GuardLogix 5380 controllers remove the possibility of a major fault due to a memory mis-compare between the primary controller and the safety partner.	These random values can cause a major fault in the GuardLogix 5570 and Compact GuardLogix 5370 controllers due to a memory mis-compare between the primary controller and the safety partner.

Mitigation

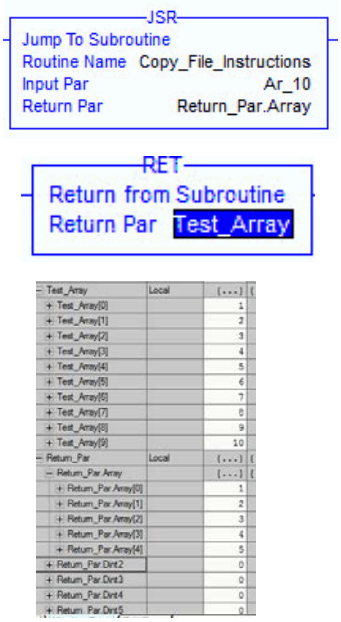
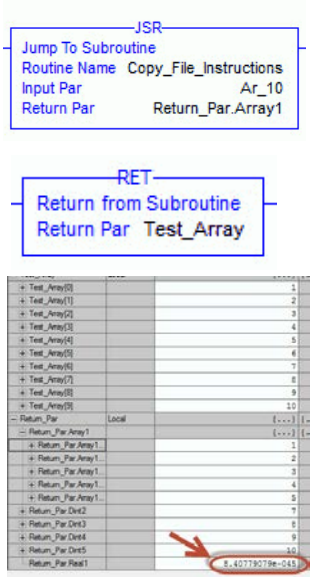
N/A

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

(1) Only affects embedded Structured Text.

JSR and RET Parameters Passing Into Structures

Parameters that pass from JSR (into subroutine) and RET (back to JSR) only use the size of the smaller structure (either source or destination) for the copy. Copies that are made into smaller destinations no longer overrun target arrays or structures.

5580/5380 Controllers	5570/5370 Controllers
JSR Return Par = Return_Par_Array[5] RET Return Par = Test_Array[10]	JSR Return Par = Return_Par_Array[5] RET Return Par = Test_Array[10]
	

Mitigation

N/A

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes(1)

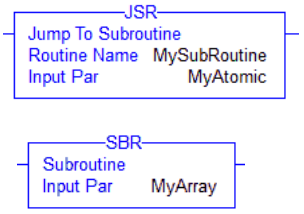
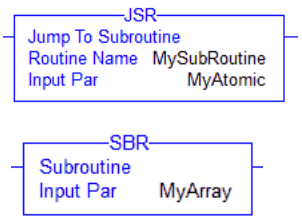
(1) Only affects embedded Structured Text.

JSR passing Atomic Data type into an Array or Structure

If a JSR passed an atomic data element as an input to a subroutine, and that subroutine stores it in an array or structure, then only parts of the target array were populated with 5570 and 5370 controllers:

4 bytes are always copied regardless of the atomic data type with these controllers. The exception is if the destination is less than 4 bytes. Then the entire destination is copied over for 5580 and 5380 controllers.

This implementation affects the JSR and SBR instructions.

5580/5380 Controllers	5570/5370 Controllers
 4 bytes are always copied unless the destination structure is smaller than 4 bytes. MyAtomic (SINT) = -1 MyArray Before the copy MyArray[0] = 100 MyArray[1] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100 If MyArray = SINT structure After the copy MyArray[0] = -1 MyArray[1] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100	 Only the first number of the array is stored. • If the destination array is bool array, bool_array[0] is updated, this is only 1 bit. • If the destination array is sint array, sint_array[0] is updated, this is 1 byte. • If the destination array is int array, int_array[0] is updated, this is 2 bytes. • If the destination array is dint array, dint_array[0] is updated, this is 4 bytes. • If the destination array is real array, real_array[0] is updated, this is 4 bytes. MyAtomic (SINT) = -1 MyArray Before the copy MyArray[0] = 100 MyArray[1] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100 If MyArray = SINT structure After the copy MyArray[0] = -1 MyArray[1] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100

5580/5380 Controllers	5570/5370 Controllers
If MyAtomic (DINT) = -1 If MyArray = SINT structure After the copy MyArray[0] = -1 MyArray[1] = -1 MyArray[2] = -1 MyArray[3] = -1 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100 If MyAtomic (DINT) = -1 If MyArray = Bool structure After the copy MyArray[0] = 1 MyArray[1] = 1 MyArray[2] = 1 MyArray[3] = 1 MyArray[4] = 1 MyArray[5] = 1 MyArray[6] = 1 MyArray[7] = 1 MyArray[8] = 1 MyArray[9] = 1 MyArray[10] = 1 MyArray[11] = 1 MyArray[12] = 1 MyArray[13] = 1 …… MyArray[31] = 1	If MyAtomic (DINT) = -1 If MyArray = SINT structure After the copy MyArray[0] = -1 MyArray[1] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 100 MyArray[5] = 100 MyArray[6] = 100 If MyAtomic (DINT) = -1 If MyArray = Bool structure After the copy MyArray[0] = 1 MyArray[1] = 0 MyArray[2] = 0 MyArray[3] = 0 MyArray[4] = 0 MyArray[5] = 0 MyArray[6] = 0 MyArray[7] = 0 MyArray[8] = 0 MyArray[9] = 0 MyArray[10] = 0 MyArray[11] = 0 MyArray[12] = 0 MyArray[13] = 0 …… MyArray[31] = 0

Mitigation

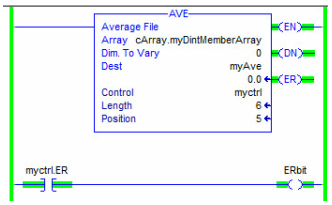
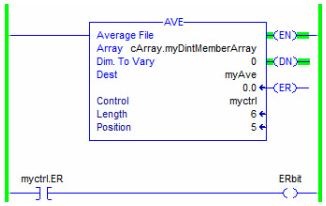
N/A

Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

Instructions That Operate On Arrays

Instruction actions are limited to member array boundaries. If any of these instructions attempt to access past the end of a member array, they set the ER bit and abort the operation.

AVE, BSL, BSR, DDT, FBC, FFL, FFU, LFL, LFU, SQL, SRT, and STD now respect boundaries when reading.

5580/5380 Controllers	5570/5370 Controllers
These instructions are now limited to member array boundaries. 	In previous controllers, these instructions could overwrite member boundaries if the array was within a UDT. 

Mitigation

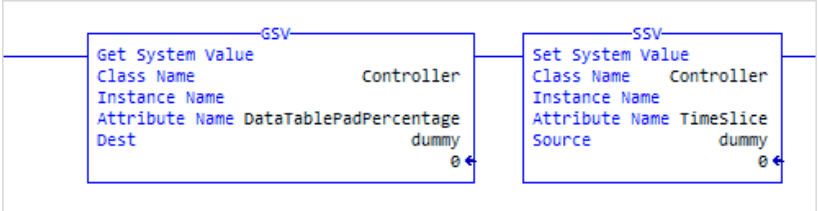
N/A

GSV/SSV Instructions

GSV and SSV instructions that access unused attributes in 5580 and 5380 controller projects display this verification warning.

IMPORTANT Rung <n>, GSV, Operand 2: Attribute is not used for this controller type. Instruction has no effect.

Figure 20 - GSV/SSV of Controller Attributes



The warning occurs for the following controller attributes:

- DataTablePadPercentage. (GSV only)
- TimeSlice (GSV/SSV)
- ShareUnusedTimeSlice (GSV / SSV)

MCT/MCTP Instructions

The Motion Coordinated Transform (MCT) and Motion Calculate Transform Position (MCTP) instructions are different with respect to source and target transform dimensions.

With version 29 or earlier, the controllers allowed the following MCT/MCTP associations:

- Cartesian-Cartesian (TD=[1,2],[1,3],[2,3])
- Cartesian-Articulated independent and dependent (TD=[2,3])

Version 30 or later does not support cases where the Coordinate System Dimension is not Equal to the Transform Dimension, and checks to make sure the dimensions match.

If the dimensions do not match, the Motion Instruction Status will show Error Code 61, with extended Error Code 17: "Make sure the Transform Dimension attribute on the Source and Target are equal."

Diagnostics and Status Indicators with ControlLogix Systems

This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5580 controllers	ControlLogix® 5580 and GuardLogix® 5580 controllers
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers

You can diagnose and troubleshoot the 5580 Controllers with:

- Controller Status Display and Indicators on page 151
- Controller Web Pages on page 153

Controller Status Display and Indicators

The 5580 controllers have a 4-character display, four status indicators, and two Ethernet indicators.

4-Character Display

The 4-character display on the 5580 controllers shows the same messages as the 5570 controllers, along with these updates.

This table lists the general status messages that can scroll across the display. For information about more detailed controller conditions, see the ControlLogix 5580 Controllers User Manual, publication 1756-UM543.

Message on 4-character Display	5580 Controller Behavior
Link Down	Message appears when an Ethernet port does not have a connection. Message scrolls continuously during operation.
Link Disabled	Message appears when you have disabled the Ethernet port. Message scrolls continuously during operation.
DHCP- XX:XX:XX:XX:XX:XX	Message appears when the controller is set for DHCP, but not configured on a network. The message shows the MAC address of the controller. Message scrolls continuously during operation if no IP address is set.
Ethernet Port Rate/Duplex State	The current port rate and duplex state when the port has a connection (for example, 1Gb/FULL). Message scrolls continuously during operation. If not connected directly to another 1 Gb device, then the message shows 100/FULL.
IP Address	The IP address of the controller. Appears on powerup, then scrolls continuously during operation. If the IP address is not yet set, then the MAC address appears.
Duplicate IP - XX:XX:XX:XX:XX:XX	Message appears when the controller detects a device with the same IP address on the network. The message shows the MAC address of the device with the duplicate IP address. Message scrolls continuously during operation.
Backup Energy HW Failure - Save Project	A failure with the embedded storage module has occurred. If a power is lost to the controller, the controller cannot save the program. If you see this message, save your program to SD card before you remove power and then replace the module.
Backup Energy Low - Save Project	The embedded storage module does not have sufficient energy to enable the controller to save the program if power is lost to the controller. If you see this message, save your program to SD card before you remove power and then replace the module.

Status Indicators

The Run, Force, SD, and OK status indicators function the same as the 5570 controllers.

Ethernet Indicators

The Ethernet indicators show the state of the Ethernet port and communications activity.

IMPORTANT The 5570 controllers do not have Ethernet indicators because they do not have a built-in Ethernet port.

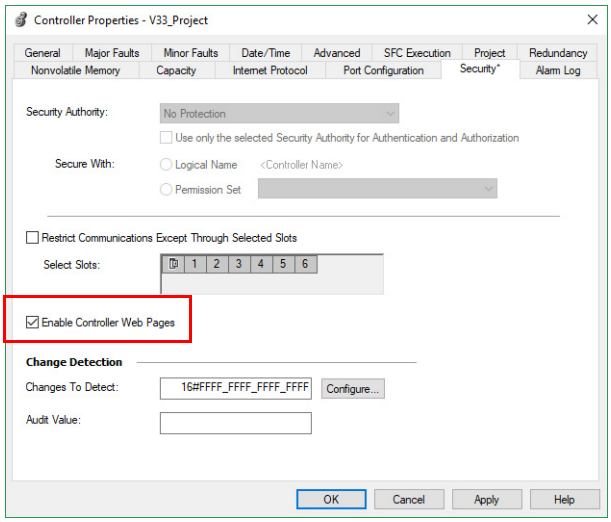
Indicator	State	Description
NET	Off	The controller is not configured, or does not have an IP address.
	Flashing green	The controller has an IP address, but no active connections are established.
	Steady green	The controller has an IP address and at least one established active connection.
	Steady red	Duplicate IP Address or invalid configuration.
LINK	Off	No activity. One of these conditions exists: • No link exists on the port. Verify that the RJ45 cables are properly seated in the adapter and connected devices. • The port is administratively disabled.
	Flashing green	Activity exists on the port.

Controller Web Pages

The 5580 controllers provides diagnostic web pages that track controller performance, network performance, and backplane performance. The 5570 controllers do not provide controller web pages because they do not have a built-in Ethernet port.

IMPORTANT With the Studio 5000 Logix Designer application version 33.00.00 and later, controller web pages are disabled by default.

- To enable the controller web pages, select the checkbox on the Logix Designer Controller Properties Security tab.



- For CIP Security applications, you can also use FactoryTalk Policy Manager to enable the webpages (this overrides the Controller Properties checkbox).

To access the diagnostic web pages, follow these steps.

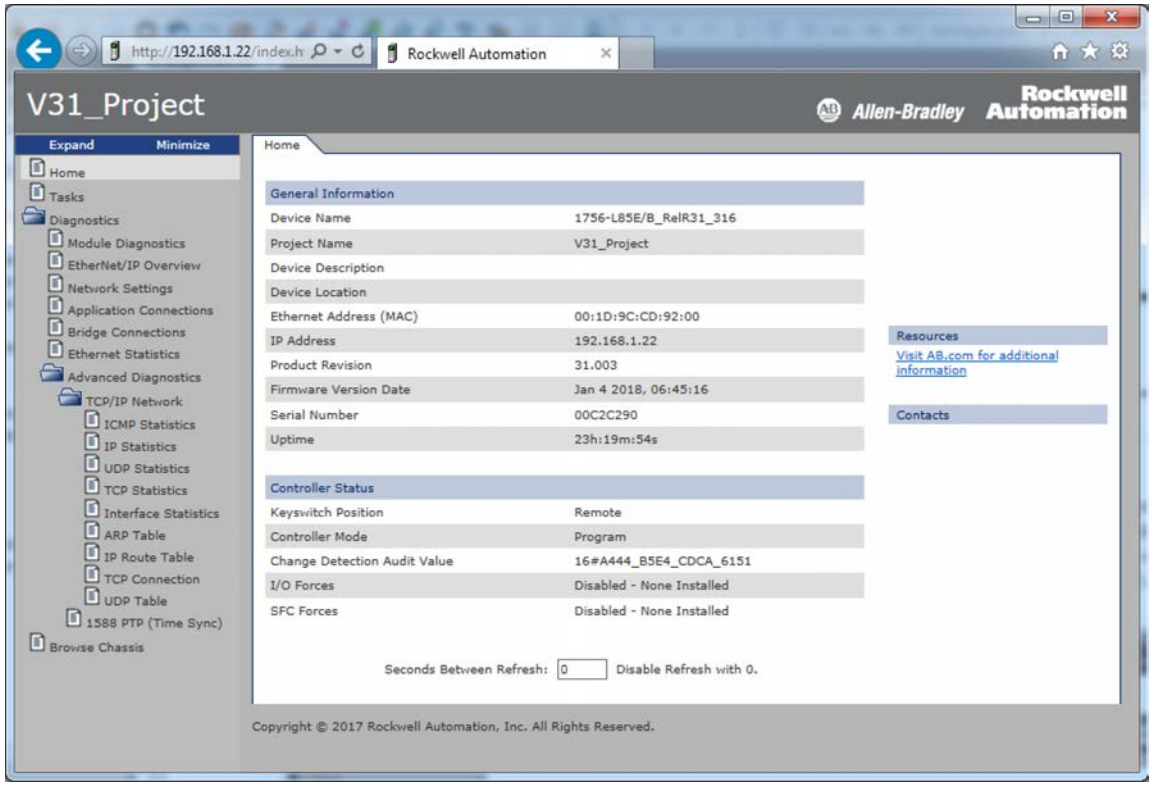
1. Open your web browser.
2. In the Address field, type the IP address of the controller and press Enter.

To access the diagnostic web pages, open the Diagnostics folder in the left-most navigation bar, and click the link for each diagnostic web page that you want to monitor.

- The Diagnostics web pages provide communications and messaging data for the controller.
- The Advanced diagnostics web pages provide data about the TCP/IP Network and Precision Time Protocol.

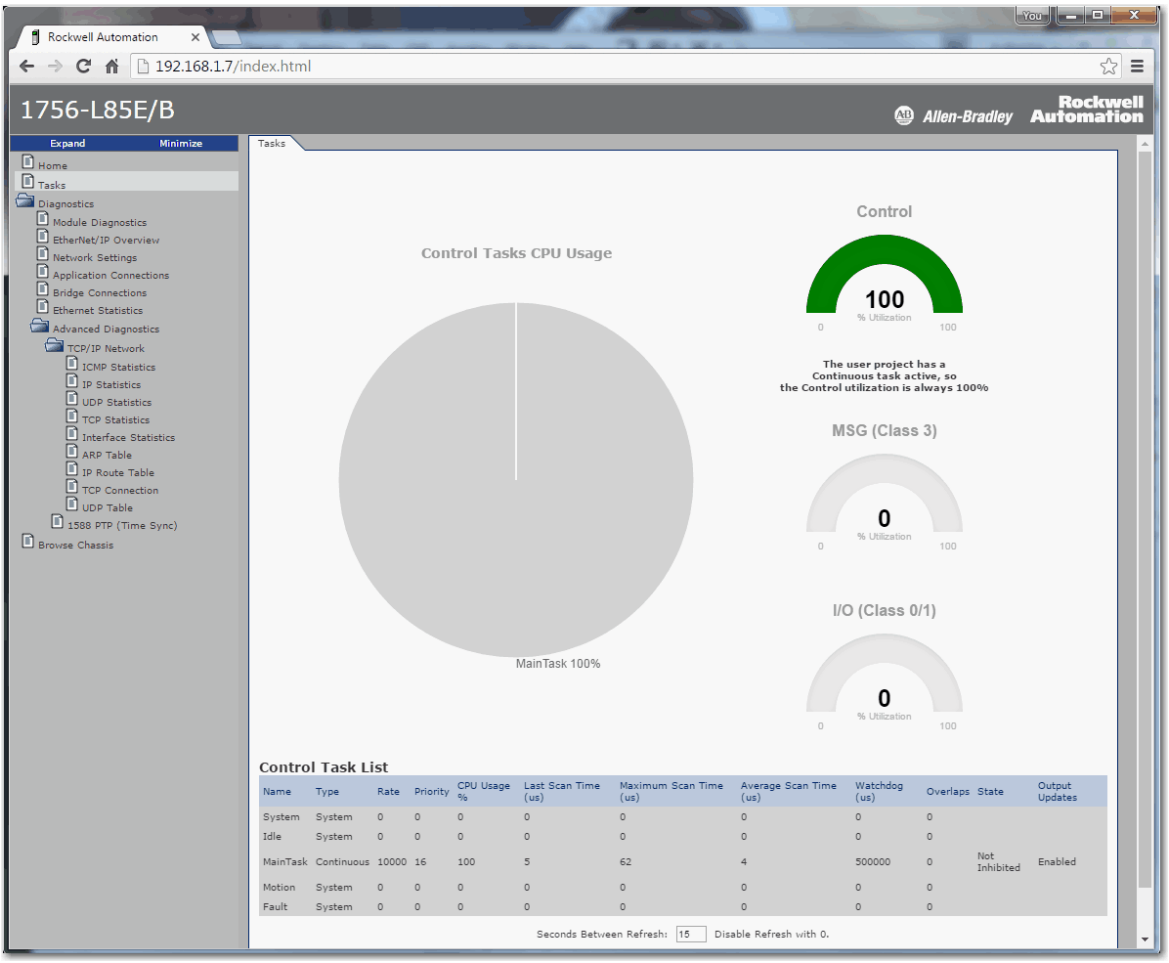
Home Web Page

The Home page provides device information and controller status.



Tasks Web Page

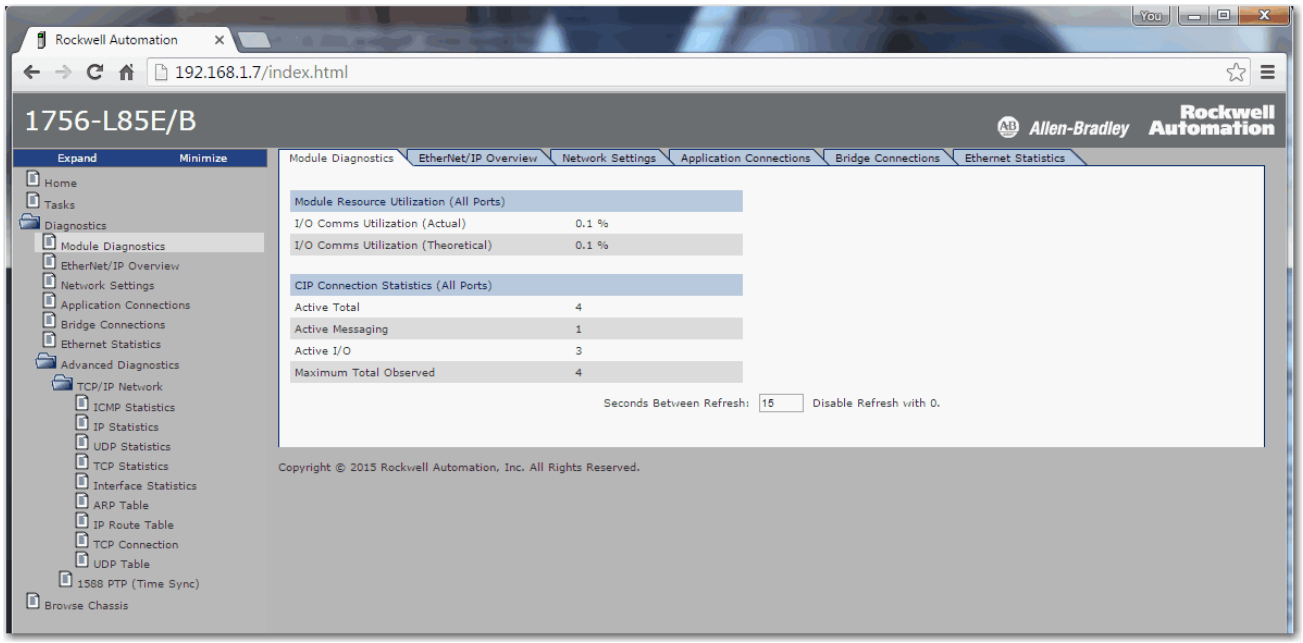
On the Tasks web page, the pie chart shows the percentage of the control core's CPU consumed by the tasks that are on that core. The gauges show the CPU utilization of the control and communications cores. The table shows the tasks that are running on the Control core (all system tasks are summarized as one task).



Diagnostics Web Pages

The Diagnostics web pages use a series of tabs to provide information about the following:

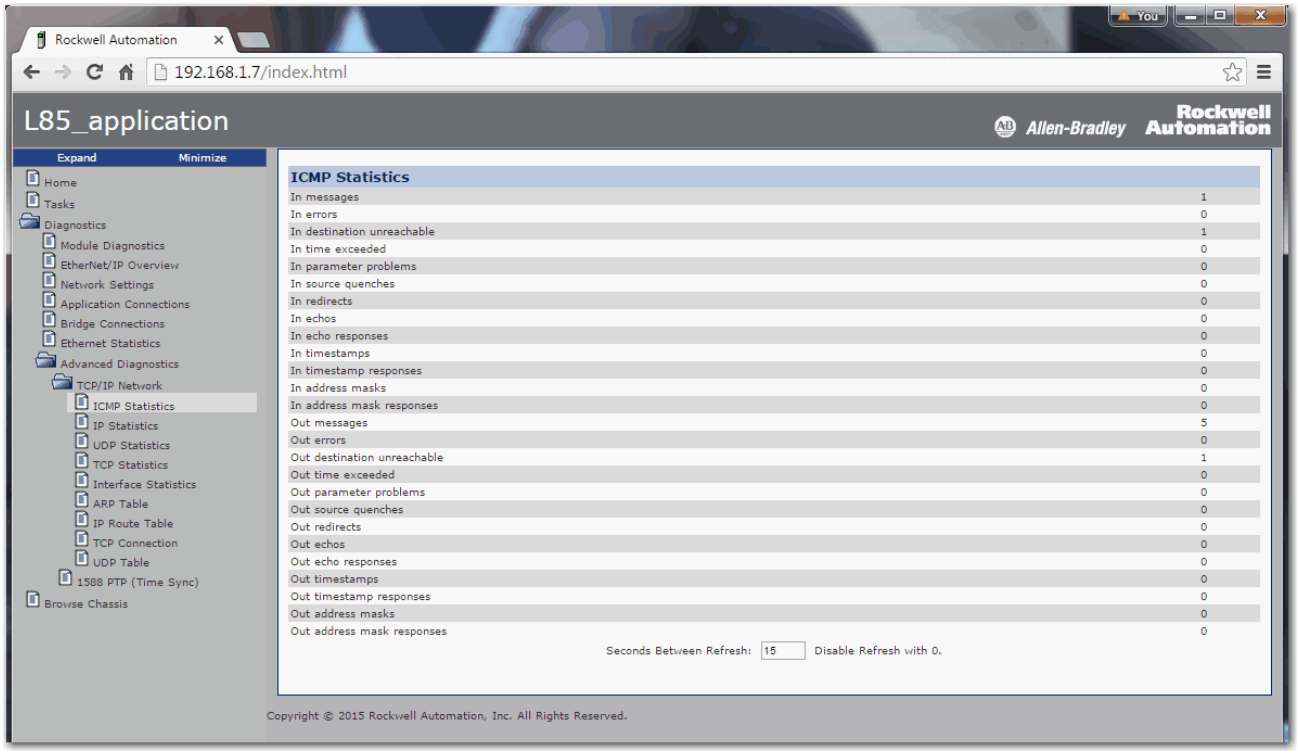
- Module Diagnostics
- EtherNet/IP™ Overview
- Network Settings
- Application Connections
- Bridge Connections
- Ethernet Statistics



Advanced Diagnostics Web Pages

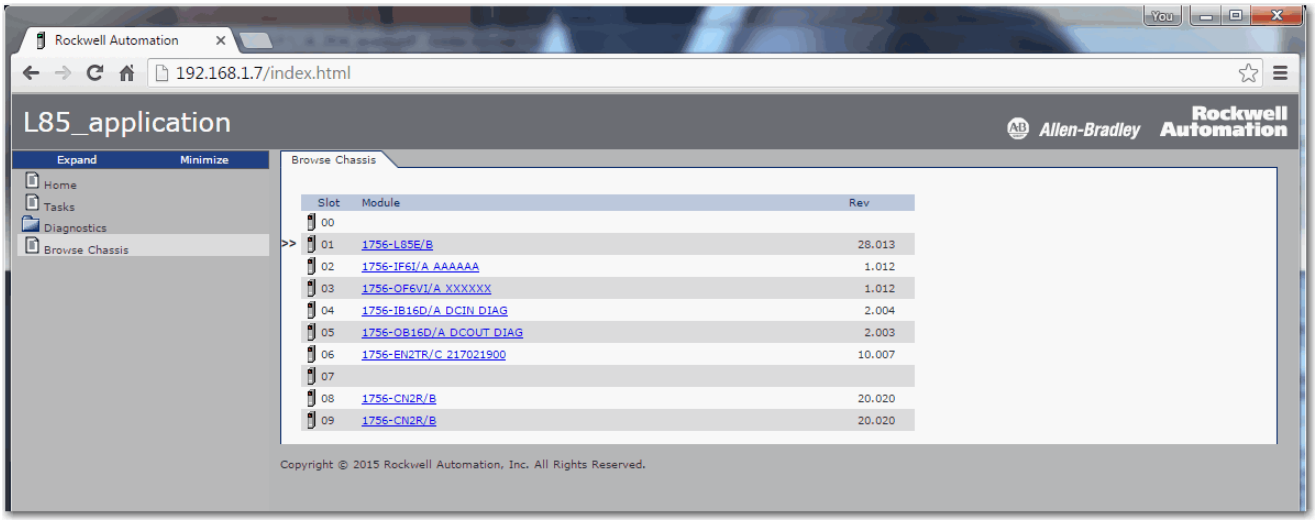
The Advanced Diagnostics web pages provide information about the following:

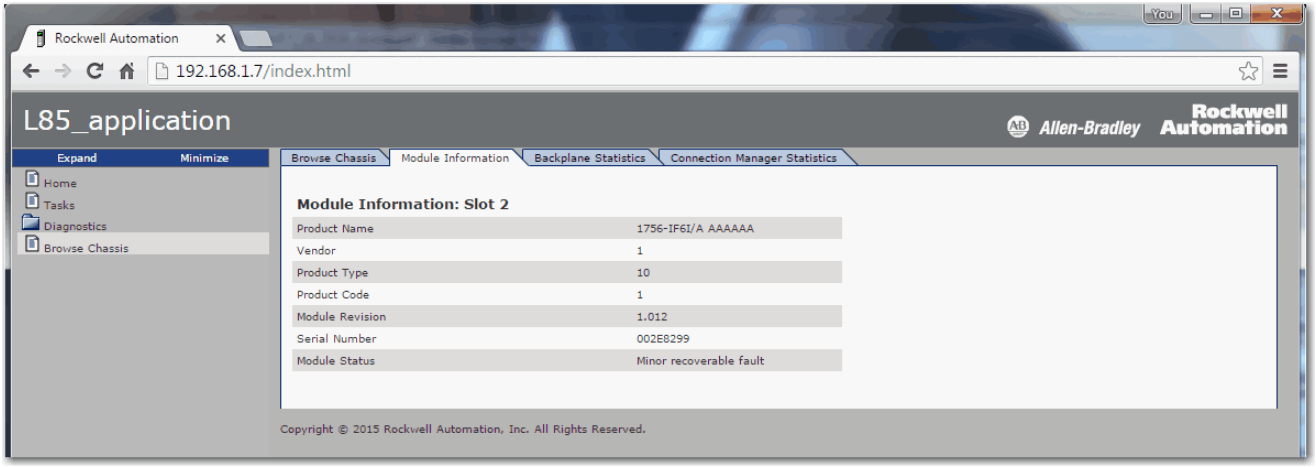
- TCP/IP Network - Provide information about the following:
  - ICMP Statistics
  - IP Statistics
  - UDP Statistics
  - TCP Statistics
  - Interface Statistics
  - ARP Table
  - IP Route Table
  - TCP Connection
  - UDP Table
- 1588 PTP (Time Sync)



Browse Chassis Web Page

Browse Chassis lets you view module information, backplane statistics, and connection statistics for modules in the local chassis.





Diagnostics and Status Indicators with CompactLogix Systems

This chapter features these controllers, and where applicable, the controllers are known as:

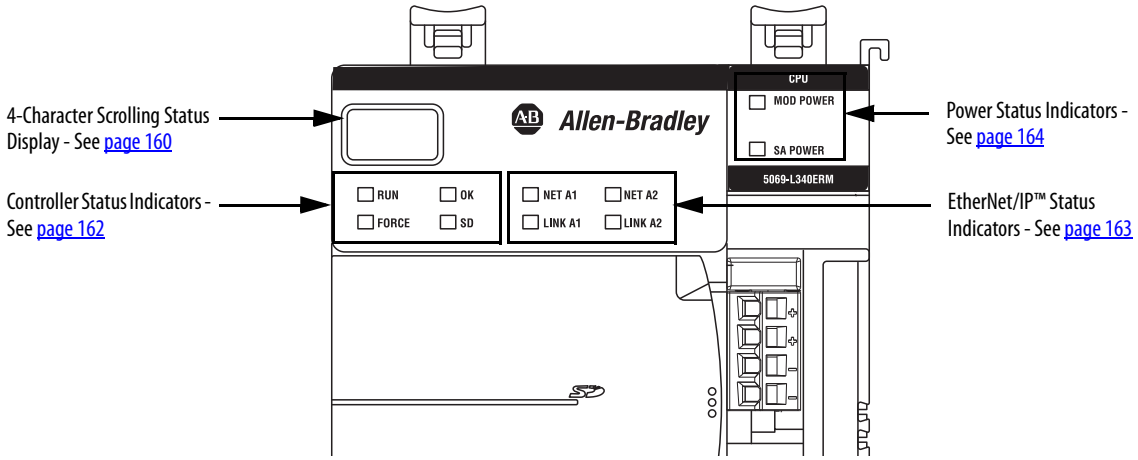
Controller Family	Includes these controllers
5380 controllers	CompactLogix™ 5380, Compact GuardLogix® 5380 SIL 2, and Compact GuardLogix 5380 SIL 3 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers

For information on replacing CompactLogix 1769-L3 or CompactLogix 1768-L4 controllers, see Replacement Considerations for 1768-L4 and 1769-L3 Controllers on page 175.

The status indicators on the 5380 controllers differ from status indicators on the 5370 controllers. 5380 controllers provide the following:

- 4-character display that shows messages to provide information about the controller, for example, the firmware revision
- MOD Power and SA Power status indicators

Figure 21 - Status Display and Indicators



You can diagnose and troubleshoot the 5380 Controllers with:

- Controller Status Display and Indicators on page 160
- Controller Web Pages on page 165

Controller Status Display and Indicators

The 5380 controllers provide the following:

- 4-Character Display
- Controller Status Indicators
- EtherNet/IP Status Indicators
- Power Status Indicators

4-Character Display

The 5380 controllers use a 4-character display that scrolls messages about the controller. The display provides easy access to information that you can use to monitor or troubleshoot the controller operation.

IMPORTANT The 5370 controllers do not have a 4-character display.

The 4-character display messages provide information about the following:

- General controller status
- General fault information, if a fault has occurred on the controller
- Major fault information, if a major fault has occurred on the controller
- I/O fault codes, if an I/O fault has occurred in the 5380 system

This table lists the general status messages that can scroll across the display. For information about more detailed controller conditions, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

Table 20 - General Status Messages

Message	Interpretation
No message is indicated	The controller is Off. • Check the MOD POWER status indicator to see if power is applied to the system. • Check the OK indicator to determine if the controller is powered and to determine the state of the controller.
TEST	The controller is conducting power-up tests.
CHRG	The embedded energy storage circuit is charging.
PASS	Power-up tests have completed successfully.
Saving...Do Not Remove SD Card	The controller is about to save an image to the SD card.
SAVE	A project is being saved to the SD card. Let the save operation complete before you take the following actions: • Remove the SD card. • Disconnect the power. **IMPORTANT**: Do not remove the SD card while the controller is saving to the SD card. Let the save complete without interruption. If you interrupt the save, data corruption or loss can occur.
One of the following: • LOAD • Loading . . . Do Not Remove SD Card	A project is being loaded from the SD card. Let the load operation complete before doing the following: • Remove the SD card • Disconnect the power **IMPORTANT**: Do not remove the SD card while the controller is loading from the SD card. Let the load complete without interruption. If you interrupt the load, data corruption or loss can occur.

Table 20 - General Status Messages (continued)

Message	Interpretation
UPDT	A firmware update is being conducted from the SD card upon powerup. If you do not want the firmware to update upon powerup, change the Load Image property of the controller.
Rev *XX.xxx*	The firmware major and minor revision of the controller.
5069-L3xxx	The controller catalog number and series.
Link A*x* Down	Message appears when an Ethernet port does not have a network connection. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
Link A*x* Disabled	Message appears when you have disabled an Ethernet port. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
DHCP- 00:00:XX:XX:XX:XX	Message appears when the controller is set for DHCP, but not configured on a network. The message shows the MAC address of the controller. Message scrolls continuously during operation if no IP address is set. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
Ethernet Port Rate/Duplex State	The current port rate and duplex state when an Ethernet port has a connection. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
IP Address	The IP address of the controller. Appears on powerup and scrolls continuously during operation. If the IP address is not yet set, the MAC address appears. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
Duplicate IP - 00:00:XX:XX:XX:XX	Message appears when the controller detects a device with the same IP Address on the network. The message shows the MAC address of the device with the duplicate IP Address. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
DHCP-Address Lost	The controller has communicated with the DHCP server to renew the IP address. The server either did not reply or did not renew the IP address. The controller continues to operate, but with no Ethernet connectivity out of this port. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
IP Address/Mask/Gateway/DNS Invalid	The DHCP server responded with an unusable combination. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
IP Address Invalid	The IP address that is used in the port configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
Mask Invalid	The Subnet/Network Mask used in the port configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.
Gateway Invalid	The Gateway address that is used in the port IP configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each port, that is, Port A1 and Port A2. The port name appears before the information.

Table 20 - General Status Messages (continued)

Message	Interpretation
DNS Invalid	The DNS used in the port IP configuration is not valid.
No Project	No project is loaded on the controller. To load a project, complete one of the following tasks: • Use the Studio 5000 Logix Designer® application to download the project to the controller • Use an SD card to load a project to the controller
Project Name	The name of the project that is loaded on the controller.
BUSY	The I/O modules that are associated with the controller are not yet fully powered. Let powerup and I/O module self-testing complete.
Corrupt Certificate Received	The security certificate that is associated with the firmware is corrupted. Go to http://www.rockwellautomation.com/support/ and download the firmware revision to which you are trying to update. Replace the firmware revision that you have previously installed with that posted on the Technical Support website.
Corrupt Image Received	The firmware file is corrupted. Go to http://www.rockwellautomation.com/support/ and download the firmware revision to which you are trying to update. Replace the firmware revision that you have previously installed with that posted on the Technical Support website.
Backup Energy HW Failure - Save Project	A failure with the embedded storage module has occurred. If a power is lost to the controller, the controller cannot save the program. If you see this message, save your program to the SD card before you remove power and replace the controller.
Backup Energy Low - Save Project	The embedded storage module does not have sufficient energy to enable the controller to save the program if power is lost to the controller. If you see this message, save your program to the SD card before you remove power and replace the controller.
Flash in Progress	A firmware update that is initiated via ControlFLASH™, ControlFLASH Plus™, or AutoFlash utilities is in progress. Let the firmware update complete without interruption.
Firmware Installation Required	The controller currently uses boot firmware, that is, revision 1.*xxx*, and requires a firmware update.
SD Card Locked	An SD card that is locked is installed.

Controller Status Indicators

The controller status indicators on the 5380 controllers are the same as the controller status indicators on the 5370 controllers. The controller status indicators include the following:

- RUN
- FORCE
- OK
- SD

Controller status indicators function the same on 5380 and 5370 controllers.

EtherNet/IP Status Indicators

The 5380 and 5370 controllers provide status indicators for EtherNet/IP™ network status and EtherNet/IP link status.

EtherNet/IP Network Status

The EtherNet/IP network status indicators on the 5380 controllers and the 5370 controllers **differ in appearance**.

- 5380 controllers have a separate EtherNet/IP network status indicator for each EtherNet/IP port on the controller. The indicators are NET A1 and NET A2.

  IMPORTANT The NET A1 and NET A2 indicators are used when the controller operates in Dual-IP mode. Only the NET A1 indicator is used when the controller operates in DLR/Linear mode.

- 5370 controllers have one EtherNet/IP network status indicator. The indicator is NS.

The EtherNet/IP network status indicators **function the same way** on the 5380 controllers as the 5370 controllers.

For example, if the 5380 controller NET A1 status indicator is steady green, the controller has an IP address and at least one connection is established. The same is true for the 5370 controller NS status indicator.

EtherNet/IP Link Status

The EtherNet/IP link status indicators on the 5380 controllers are **slightly different** from the EtherNet/IP link status indicators on the 5370 controller **in appearance**.

On the 5380 controller, the EtherNet/IP link status indicators are labeled LINK A1 and LINK A2. The same indicators on the 5370 controllers are labeled LINK 1 and LINK 2.

The EtherNet/IP link status indicators **function the same way** on the 5380 controllers as the 5370 controllers.

For example, if the 5380 controller LINK A1 or the 5370 controller LINK 1 status indicator is flashing green, an EtherNet/IP link exists and there is activity.

Power Status Indicators

The 5380 controllers use power status indicators show the status of MOD power and SA power.

MOD Power Indicator

Table 21 describes the MOD Power indicator on a 5380 controller.

Table 21 - MOD Power Indicator

State	Description
Off	Module Power is not present
Steady green	Module Power is present(1)

(1) Although unlikely, it is possible that there is enough Module Power present for the indicator to turn steady green but the power is not valid. Valid power is 18…32V DC to operate a 5380 system. If the system does not power up and operate successfully, Module Power can be invalid.
If Module Power is invalid, we recommend that you make sure that the external power supply is working correctly, properly sized for your application and that all wiring is correct.

SA Power Indicator

Table 22 describes the SA Power indicator on a 5380 controller.

Table 22 - SA Power Indicator

State	Description
Off	One of the following: • Sensor Actuator Power is not present • Status of Sensor Actuator power is unknown
Steady green	Sensor Actuator Power is present(1)

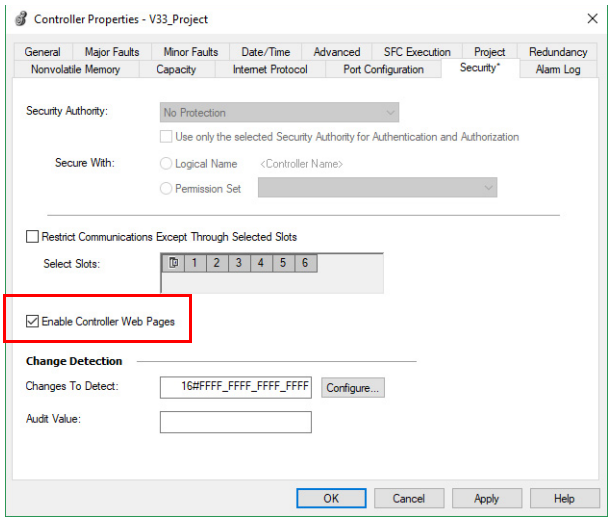
(1) Although unlikely, it is possible that there is enough Sensor/Actuator Power present for the indicator to turn steady green but the power is not valid. Valid power is 18…32V DC in applications that require DC voltage and 18…240V AC in applications that require AC voltage.
If Sensor/Actuator Power is invalid, we recommend that you make sure that the external power supply is working correctly, properly sized for your application and that all wiring is correct.

Controller Web Pages

The 5380 controllers and 5370 controllers provide diagnostic web pages that track controller performance, network performance, and backplane performance.

IMPORTANT With the Studio 5000 Logix Designer application version 33.00.00 and later, controller web pages are disabled by default.

- To enable the controller web pages, select the checkbox on the Logix Designer Controller Properties Security tab.



Differences Between 5380 and 5370 Controllers

The primary difference between the 5380 and 5370 controller web pages is the organization of content on the browser.

For example, the Diagnostic Overview tab is in the Ethernet Port A1/A2 folder for 5380 controllers. The same tab is in the Diagnostics folder for 5370 controllers.

The new Tasks web page shows the control tasks that are running on the control core, usage of the control core's CPU consumed by the tasks that are on that core, and the CPU utilization of the control and communications cores.

EtherNet/IP Mode Affect on 5380 Controller Web Pages

The 5380 controller web pages look different and provide different information based on the EtherNet/IP mode that is used.

For example, consider the following:

- When the controller operates in Linear/DLR mode, the left-side navigation bar displays an Ethernet Port A1/A2 folder with three tabs.
- There is one Ethernet Port web page for both ports, and the controller web pages provide one set of Ethernet data.
- When the controller operates in Dual-IP mode, the left-side navigation bar displays an Ethernet Port A1 folder and an Ethernet Port A2 folder. Each folder has three tabs.
- There is an Ethernet Port web page for each port. The controller web pages provide one set of Ethernet data for port A1 and another set of Ethernet data for port A2.

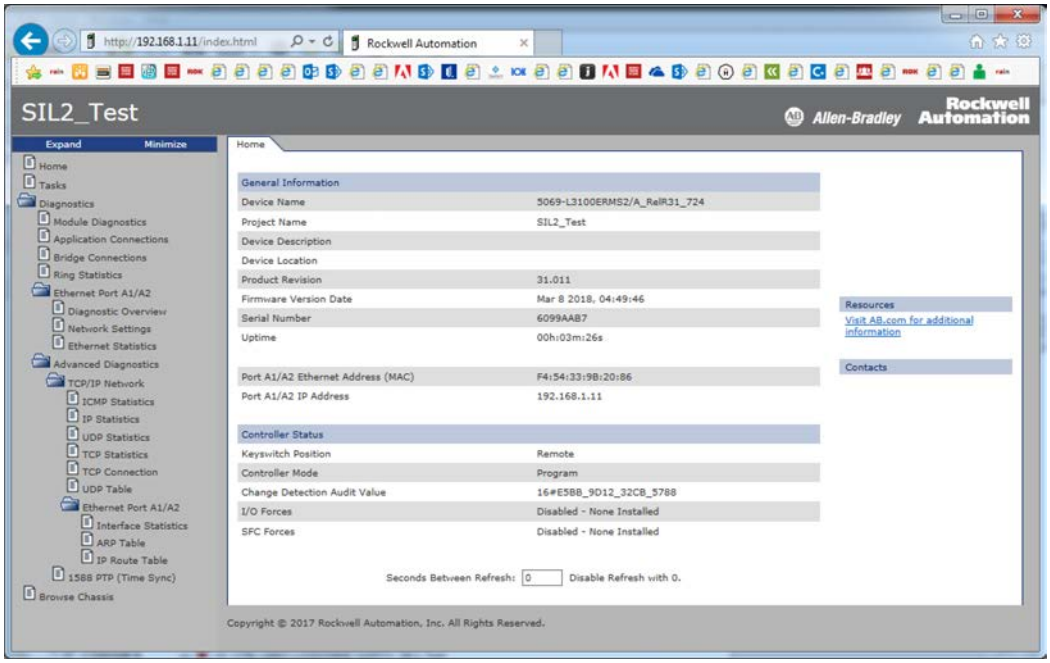
To access the diagnostic web pages, follow these steps.

1. Open your web browser.
2. In the Address field, type the IP address of the controller and press Enter.
3. To access the information that you need, use the links in the left-side navigation bar.

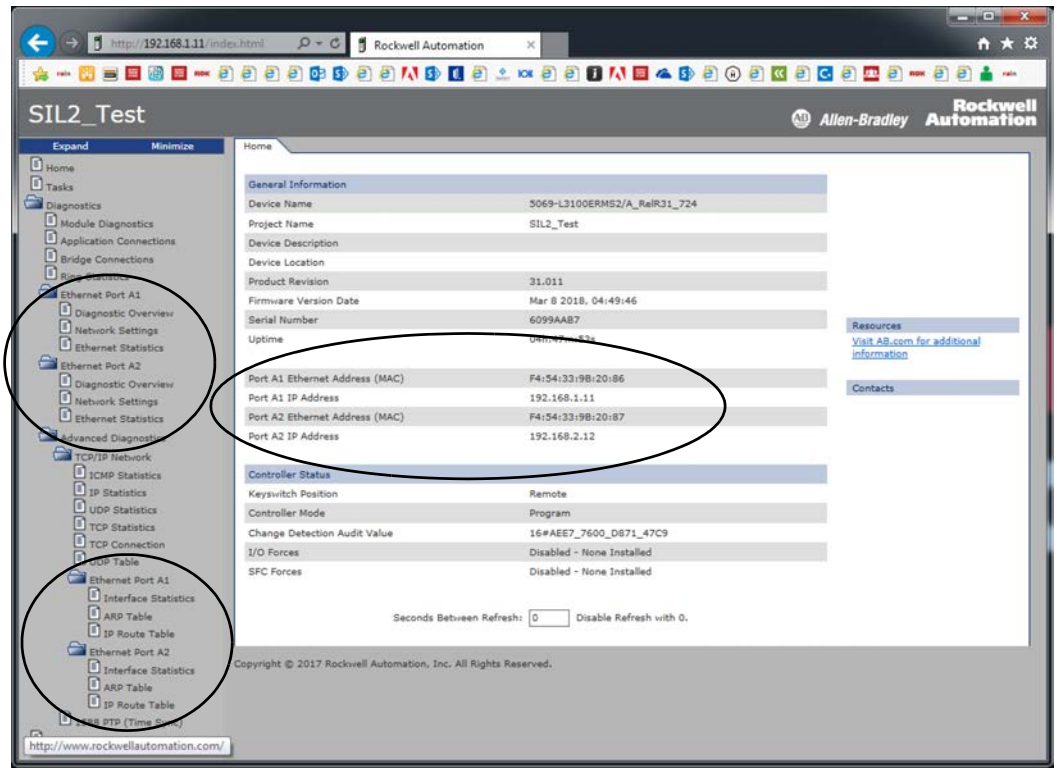
Home Web Page

The Home web page provides device information and controller status.

Linear/DLR Mode



Dual-IP Mode

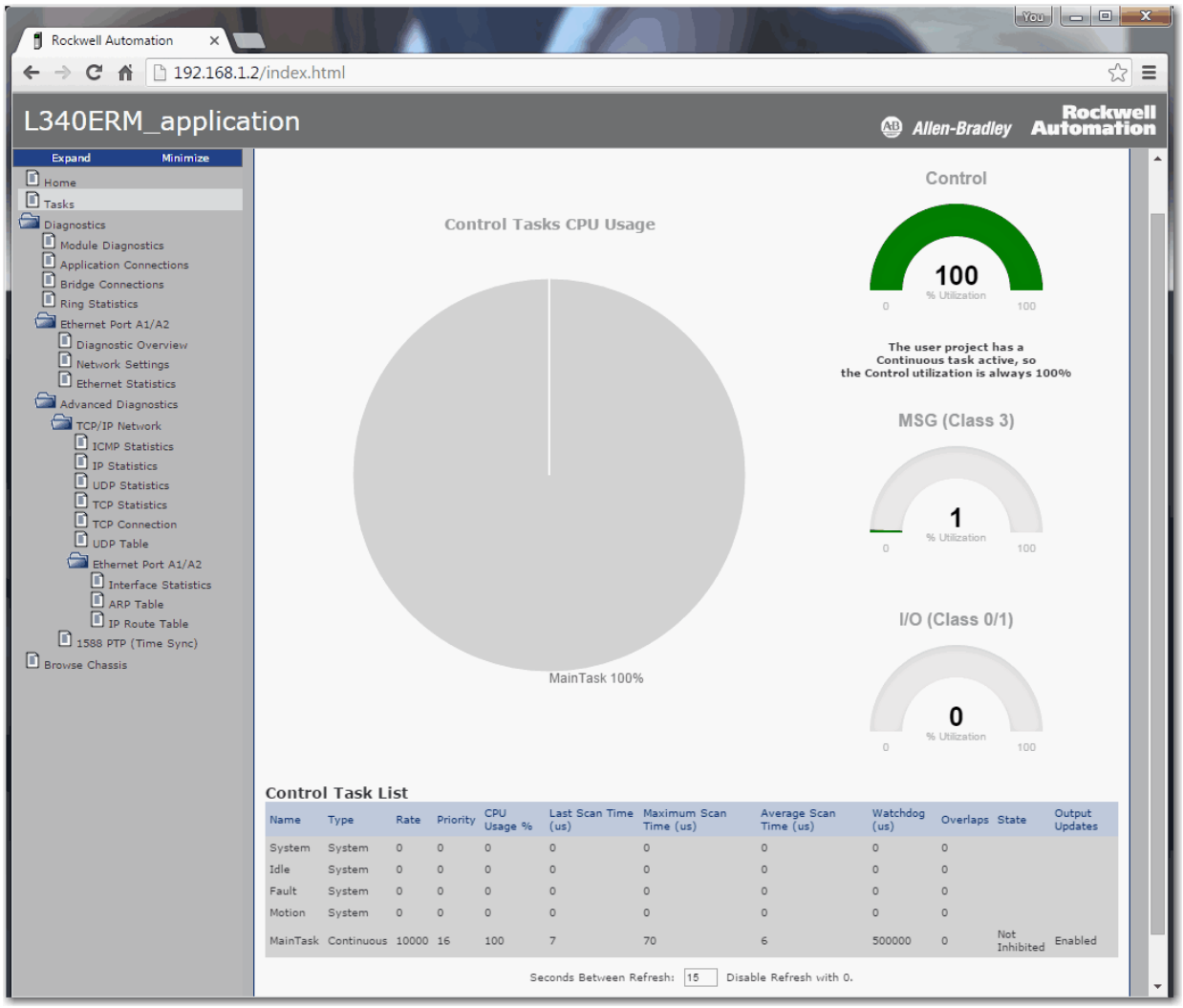


Tasks Web Page

IMPORTANT This web page is not available with the 5370 controllers.

On the Tasks web page, the pie chart shows the percentage of the control core's CPU consumed by the tasks that are on that core. The gauges show the CPU utilization of the control and communications cores.

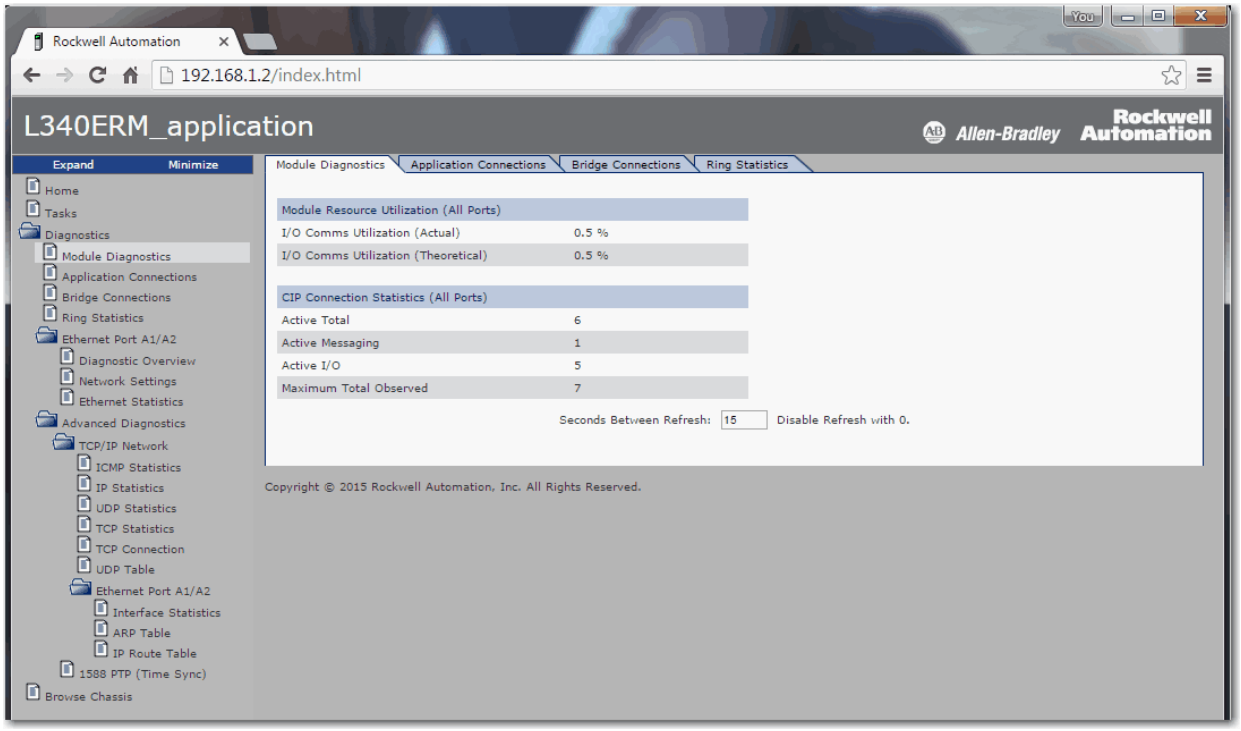
The table shows the tasks that are running on the Control core (all system tasks are summarized as one task).



Diagnostics Web Pages

The Diagnostics web pages use a series of tabs to provide information about the following:

- Module Diagnostics
- Application Connections
- Bridge Connections
- Ring Statistics

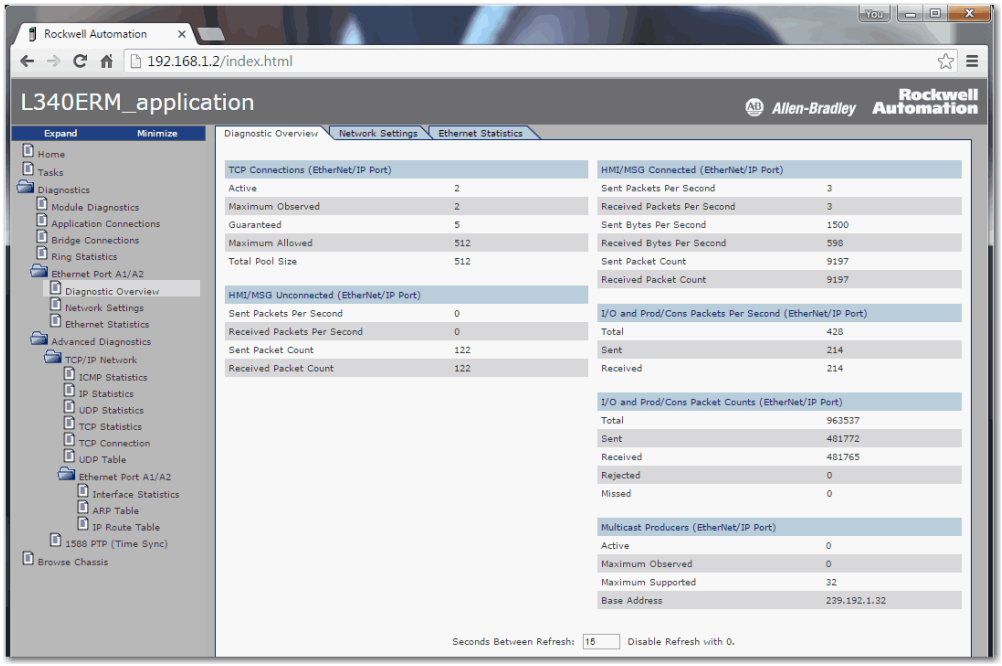


Ethernet Port A1/A2 Web Pages

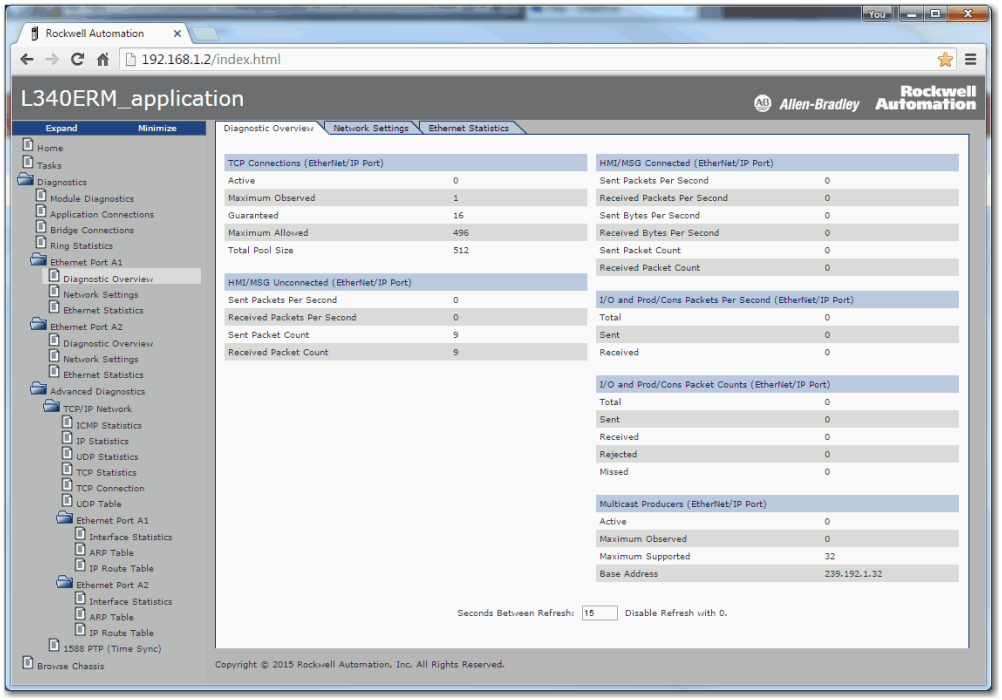
The Ethernet Port A1/A2 web pages use a series of tabs to provide information about the following:

- Diagnostic Overview
- Network Settings
- Ethernet Statistics

Linear/DLR Mode



Dual-IP Mode

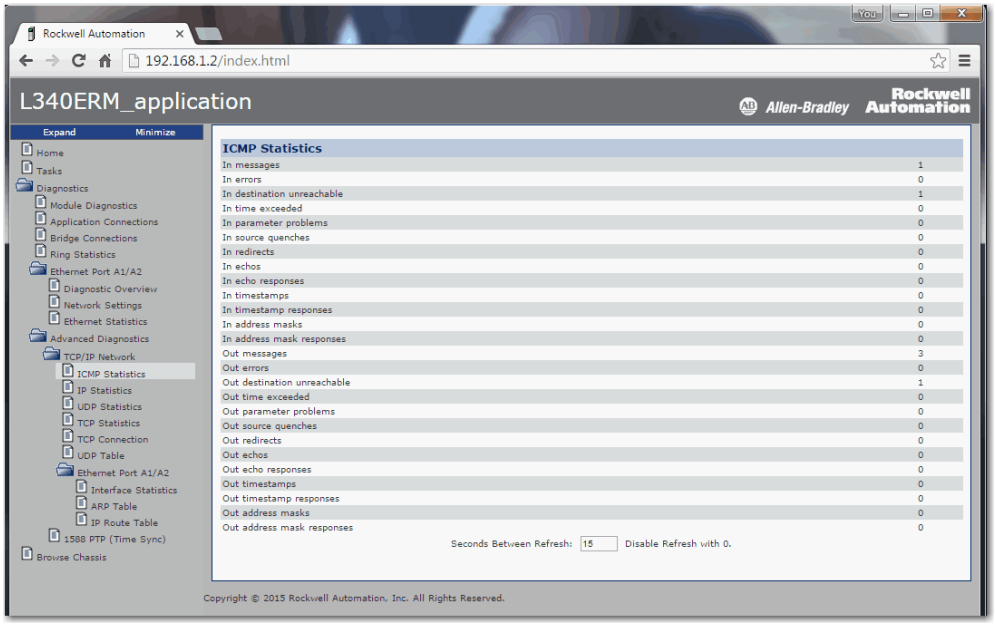


Advanced Diagnostics Web Pages

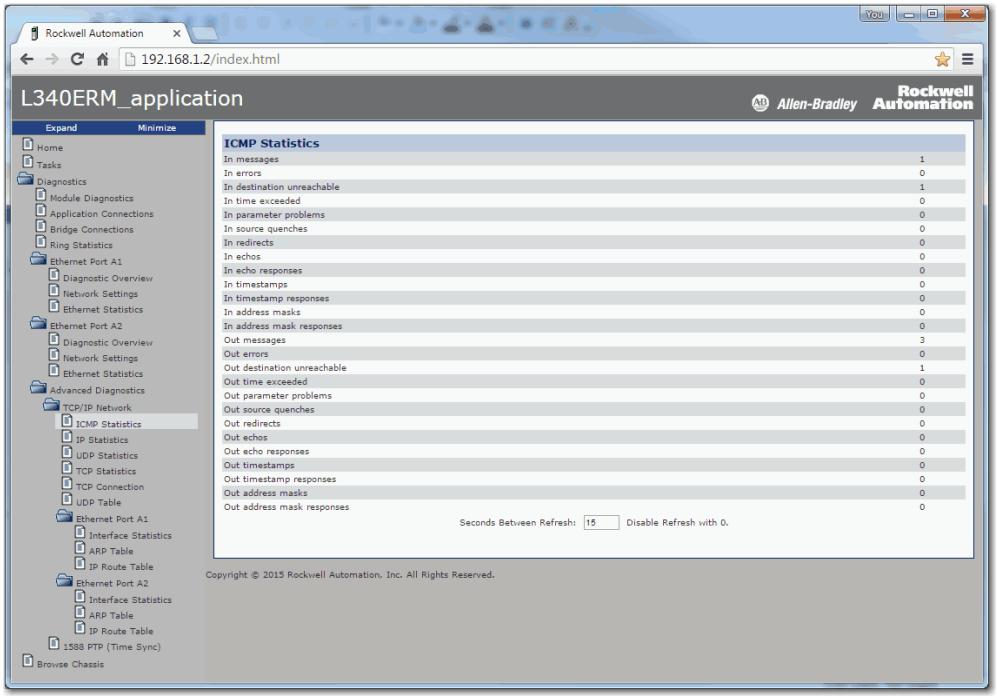
The Advanced Diagnostics web pages provide information about the following:

- TCP/IP Network - Provide information about the following:
  - ICMP Statistics
  - IP Statistics
  - UDP Statistics
  - TCP Statistics
  - TCP Connection
  - UDP Table
- Ethernet Port A1/A2- Provide information about the following:
  - Interface Statistics
  - ARP Table
  - IP Route Table
- 1588 PTP (Time Sync)

Linear/DLR Mode

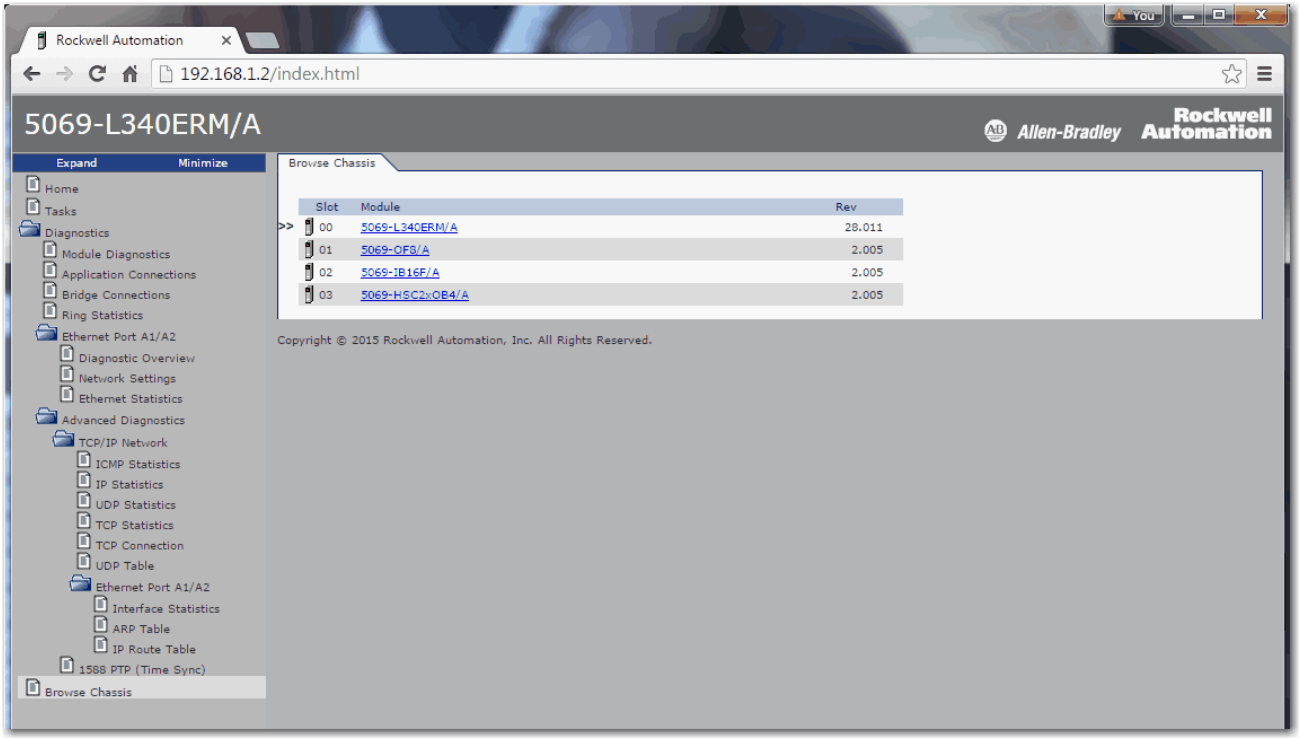


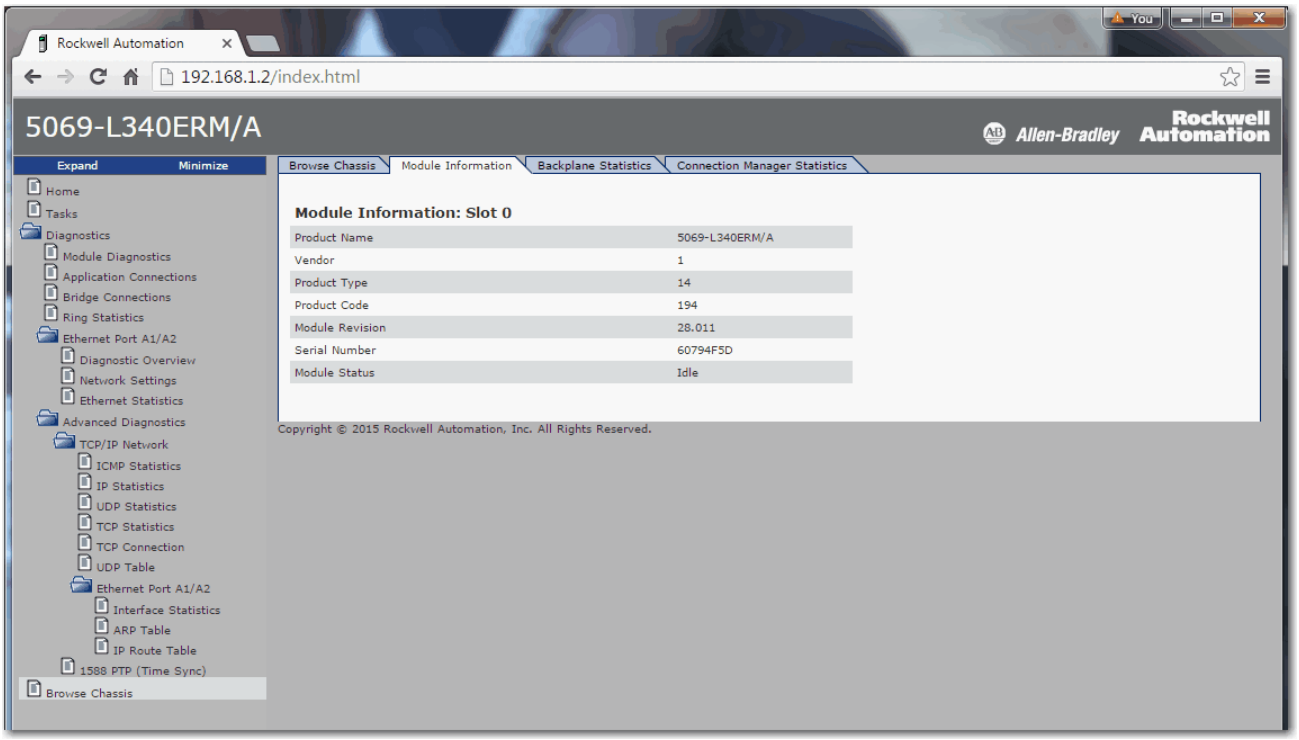
Dual-IP Mode



Browse Chassis Web Page

The Browse Chassis provides information about the devices in the system. You can click the link for each catalog number to access more information about that device.





Notes:

Replacement Considerations for 1768-L4 and 1769-L3 Controllers

Minimum Requirements	176
Product Comparison	176
Controller Spacing	181
Controller Dimensions	183
Connectors and Status Indicators	186
Power the Controller	189
Nonvolatile Memory	190
Communication Options	191

This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes These Controllers
5380 controllers	CompactLogix™ 5380 and Compact GuardLogix® 5380 controllers
1769-L3 controllers	CompactLogix 1769-L31, 1769-L32C, 1769-L32E, 1769-L32EK, 1769-L35CR, 1769-L35E controllers
1768-L4 controllers	CompactLogix L4 and Compact GuardLogix L4 controllers

The content in the previous chapters that describers features and functions of CompactLogix 5380 and Compact GuardLogix 5380 controllers applies when migrating. This appendix provides specific considerations for 1769-L3 and 1768- L4 controllers.

Replacing a 1769-L3 and 1768-L4 controller with a 5380 controller is an engineering replacement. This requires engineering changes to existing applications. Form, fit, or function have changed and are NOT backward-compatible, requiring engineering effort that can include additional software/hardware tools and products or architectural modifications.

Minimum Requirements

The controllers have these minimum requirements.

CompactLogix Controllers Minimum Requirements

Requirement, Minimum	CompactLogix 1769-L3 controllers	CompactLogix 1768-L4 Controllers	CompactLogix 5380 Controllers
Programming Software	Studio 5000 Automation Engineering & Design Environment®, Versions 16.00.00 . . . 20.00.00	Studio 5000 Automation Engineering & Design Environment, Versions 16.00.00 . . . 20.00.00	Studio 5000 Logix Designer® Application, Version 28.00.00 or later(1)

(1) Most CompactLogix 5380 controllers are first available in version 29.00.00. Also, you must use version 29 or later to use Dual-IP mode with CompactLogix 5380 controllers.

Compact GuardLogix Controllers Minimum Requirements

Requirement, Minimum	Compact GuardLogix 1768-L4 Controllers	Compact GuardLogix 5380 Controllers
Programming Software	Studio 5000 Automation Engineering & Design Environment, Versions 18.00.00 . . . 20.00.00	Studio 5000 Logix Designer Application, Version 31.00.00 or later

Product Comparison

The 5380 controllers operate similar to the 1769-L3 and 1768-L4 controllers, with these differences.

CompactLogix Controllers Product Comparison

Table 23 - Technical Specifications

Attribute	CompactLogix 1769-L3 Controller	CompactLogix 1768-L4 Controller	CompactLogix 5380 Controller
Memory	1769-L31: 512 Kbytes 1769-L32C, 1769-L32E: 750 Kbytes 1769-L35CR, 1769-L35E: 1.5 Mbytes	1768-L43: 2 MB 1768-L45: 3 MB	5069-L306ER, 5069-L306ERM: 0.6 MB 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM: 1 MB 5069-L320ER, 5069-L320ERM: 2 MB 5069-L330ER, 5069-L330ERM: 3 MB 5069-L340ER, 5069-L340ERM: 4 MB 5069-L350ERM: 5 MB 5069-L380ERM: 8 MB 5069-L3100ERM: 10 MB
Local I/O modules supported	1769 Compact I/O™ Number of local I/O modules that are supported varies by controller catalog number	1768 communication modules, 1769 Compact I/O Number of local I/O modules that are supported varies by controller catalog number	Compact 5000™ I/O Standard modules only Number of local I/O modules that are supported varies by controller catalog number
Communication options	1769-L31: Serial 1769-L32C, 1769-L35CR: ControlNet®, Serial 1769-L32E, 1769-L35E: EtherNet/IP™, Serial	1768-CNET: ControlNet 1768-EN2T, 1769-EWEB: EtherNet/IP	Embedded EtherNet/IP port
Unconnected message buffers	3 incoming unconnected buffers. 10 outgoing unconnected buffers. You can increase this to 40 by using a CIP™ Generic message instruction.	No fixed limits, as long as the controller can allocate the buffer at will.	320 - Any combination of outbound and inbound messages
Concurrent cached message instructions in the running state	32, drawn from the 250 total connections supported by the controller.	32, drawn from the 250 total connections supported by the controller.	256 dedicated buffers
HMI and Messaging (Class 3)	Drawn from the 100 total connections supported by the controller.	Drawn from the 250 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	Not supported	SERCOS	EtherNet/IP network

Table 23 - Technical Specifications (continued)

Attribute	CompactLogix 1769-L3 Controller	CompactLogix 1768-L4 Controller	CompactLogix 5380 Controller
Motion axes	Not supported	1768-L43: As many as 4 axes with the use of two SERCOS modules 1768-L45: As many as 8 axes with the use of four SERCOS modules	5380 controllers supports from 2 to 32 axes depending on catalog number. Any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives As many as 32 Axes/ms when you use the built-in EtherNet/IP port at 1 Gbps. **IMPORTANT**: Not all CompactLogix 5380 controllers support Integrated Motion over an EtherNet/IP network.
Voltage and current ratings	1769-L31: 330 mA@ 5V DC, 40 mA@ 24V DC 1769-L32C: 650 mA@ 5V DC, 40 mA@ 24V DC 1769-L32E: 660 mA@ 5V DC, 90 mA@ 24V DC 1769-L35CR: 680 mA@ 5V DC, 40 mA@ 24V DC 1769-L35E: 660 mA@ 5V DC, 90 mA@ 24V DC	1768-L43 Backplane current: 1.3 A @ 24V DC 1768 backplane current output: 2.8 A @ 5.2V DC 1769 backplane current output: 2.0 A @ 5.2V DC Total 1768 and 1769 backplane current output: 4.8 A @ 5.2V DC 1768-L45 Backplane current: 2 A @ 24V DC 1768 backplane current output: 5.6 A @ 5.2V DC 1769 backplane current output: 2.0 A @ 5.2V DC Total 1768 and 1769 backplane current output: 7.6 A @ 5.2V DC	MOD Power: 450 mA @ 18…32V DC MOD Power Inrush: 850 mA for 125 ms SA Power: 10 mA @ 0…32V DC 25 mA @ 0…240V AC, 47…63 Hz ATEX/IECEX, 125V AC Max MOD Power (Passthrough)[2]: 9.55 A @ 18…32V DC SA Power (Passthrough)[3]: 9.95 A @ 0…32V DC 9.975 A @ 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC Max
Energy storage module	1769-BA Battery	Not applicable. Energy stored in the 1768 power supply maintains controller power long enough to store the program to internal flash memory (not the external CompactFlash card).	Non-removable
Weight, approx	1769-L31: 0.30 kg (0.66 lb) 1769-L32C: 0.32 kg (0.70 lb) 1769-L32E: 0.30 kg (0.66 lb) 1769-L35CR: 0.32 kg (0.70 lb) 1769-L35E: 0.30 kg (0.66 lb)	0.34 kg (0.75 lb)	0.394 kg (.868 lb)
Wire category[1]	2 - on communication ports	2 - on communication ports	3 - on USB port 1 - on power ports 2 - on Ethernet port

Table 23 - Technical Specifications (continued)

Attribute	CompactLogix 1769-L3 Controller	CompactLogix 1768-L4 Controller	CompactLogix 5380 Controller
Wire size	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m	Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2
Removable terminal block	Not Applicable	Not Applicable	Kit 5069-RTB64-SCREW or kit 5069-RTB64-SPRING You must order the kit separately. RTBs do not ship with the controller. 5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5...1.5 mm^2 (22. . . 16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5...1.5 mm^2 (22. . . 16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only
Reset Button	If press the Channel 0 default communication push button after power is applied to the controller, the controller resets the RS-232 configuration setting to the defaults.	If you access the button after power is applied to the controller, the controller resets the RS-232 configuration setting to the defaults If you access the button while the controller is powering up, the controller clears the user program from controller memory.	A Stage 1 reset clears the application program and memory, but retains the IP address and all object attributes designated as non-volatile. A Stage 1 reset occurs only if the controller contains a user application. A Stage 2 reset returns the controller to out-of box settings, including firmware, and clears all network settings. A Stage 2 reset occurs only if the controller does not contain a user application, and the current controller firmware is not a 1.x revision. For information on how to use the reset button, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

(1) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(2) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(3) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

Compact GuardLogix Controllers Product Comparison

Table 24 - Technical Specifications

Attribute	Compact GuardLogix 1768-L4 Controller	Compact GuardLogix 5380 Controller
Memory	1768-L43S: 2 MB + 0.5 MB Safety 1768-L45S: 3 MB + 1 MB Safety	5069-L306ERS2, 5069-L306ERMS2, 5069-L3100ERMS3: 0.6 MB + 0.3 MB Safety 5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3: 1 MB + 0.5 MB Safety 5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERMS3: 2 MB + 1 MB Safety 5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERMS3: 3 MB + 1.5 MB Safety 5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3: 4 MB + 2 MB Safety 5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERMS3: 5 MB + 2.5 MB Safety 5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3: 8 MB + 4 MB Safety 5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3: 10 MB + 5 MB Safety
Local I/O modules supported	• 1769 Compact I/O only • Number of local I/O modules that are supported varies by controller catalog number	• Compact 5000 I/O Standard and Safety modules only • Number of local I/O modules that are supported varies by controller catalog number
Safety I/O support	• 1734 POINT Guard I/O™, 1732 ArmorBlock® Guard I/O™, 1791 CompactBlock™ Guard I/O™ • Can only communicate to safety I/O through the embedded Ethernet ports.	• Compact 5000 I/O Safety modules, 1734 POINT Guard I/O, 1732 ArmorBlock Guard I/O, 1791 CompactBlock Guard I/O, 1756 ControlLogix® Digital Safety I/O • Can communicate to local safety I/O through the backplane, and also communicate to distributed safety I/O through the embedded Ethernet ports. • Can communicate to DeviceNet® safety I/O nodes with the 1788-EN2DNR Ethernet to DeviceNet linking device.
Ethernet performance	• No embedded Ethernet port, you must use a 1768 EtherNet/IP communication module. • The communication rate of 1768 EtherNet/IP communication modules is 10/100 Mbps. • Dual -IP moder is not supported. • 1768-L4 controllers use connections, not Ethernet nodes. Each 1768-ENBT or 1768-EWEB module in an EtherNet/IP network can provide messaging support for 128 Logix connections and 64 TCP/IP connections.	• Embedded EtherNet/IP port • 10/100/1000 Mbps communication rate • Support for Dual-IP mode with the Logix Designer application, version 31 or later • EtherNet/IP nodes, instead of connections. For information on EtherNet/IP nodes, see Nodes on an EtherNet/IP Network on page 59.
Unconnected message buffers	No fixed limits, as long as the controller can allocate the buffer at will.	320 - Any combination of outbound and inbound messages
Concurrent cached message instructions in the running state	32, drawn from the 250 total connections supported by the controller.	256 dedicated buffers
HMI and Messaging (Class 3)	Drawn from the 250 total connections supported by the controller.	512 dedicated messages (256 incoming messages and 256 outgoing messages)
Integrated motion	Not supported	EtherNet/IP network
Motion axes	Not supported	5380 controllers supports from 2 to 32 axes depending on catalog number. Any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives As many as 32 Axes/ms when you use the built-in EtherNet/IP port at 1 Gbps. **IMPORTANT**: Not all CompactLogix 5380 controllers support Integrated Motion over an EtherNet/IP network.

Table 24 - Technical Specifications (continued)

Attribute	Compact GuardLogix 1768-L4 Controller	Compact GuardLogix 5380 Controller
Voltage and current ratings	**1768-L43S** Backplane current: 1.4 A @ 24V DC 1768 backplane current output: 2.8 A @ 5.2V DC 1769 backplane current output: 2.0 A @ 5.2V DC Total 1768 and 1769 backplane current output: 4.8 A @ 5.2V DC **1768-L45S** Backplane current: 2.1 A @ 24V DC 1768 backplane current output: 5.6 A @ 5.2V DC 1769 backplane current output: 2.0 A @ 5.2V DC Total 1768 and 1769 backplane current output: 7.6 A @ 5.2V DC	**Compact GuardLogix 5380 SIL 2 controllers**: • MOD Power:475 mA @ 18…32V DC • MOD Power Inrush:1200 mA for 125 ms • SA Power: 10 mA @ 0…32V DC • MOD Power (Passthrough)(2):4.525 A @ 18…32V DC • SA Power (Passthrough)(3):9.99 A @ 0…32V DC **Compact GuardLogix 5380 SIL 3 controllers**: • MOD Power:475 mA @ 18…32V DC • MOD Power Inrush:1200 mA for 125 ms • SA Power: 10 mA @ 0…32V DC • MOD Power (Passthrough)(4):4.525 A @ 18…32V DC • SA Power (Passthrough)(5):9.99 A @ 0…32V DC
Energy storage module	Not applicable. Energy stored in the 1768 power supply maintains controller power long enough to store the program to internal flash memory (not the external CompactFlash card).	Non-removable
Weight, approx	0.45 kg (0.99 lb)	**Compact GuardLogix 5380 SIL 2 controllers**: 0.768 kg (1.693 lb) **Compact GuardLogix 5380 SIL 3 controllers**: 1.2 kg (2.645 lb)
Wire category(1)	2 - on communication ports	3 - on USB port 1 - on power ports 2 - on Ethernet port
Wire size	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m	Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2
Removable terminal block	Not applicable	Kit 5069-RTB64-SCREW or kit 5069-RTB64-SPRING You must order the kit separately. RTBs do not ship with the controller. 5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5...1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only
Reset Button	If you access the button after power is applied to the controller, the controller resets the RS-232 configuration setting to the defaults If you access the button while the controller is powering up, the controller clears the user program from controller memory.	A Stage 1 reset clears the application program and memory, but retains the IP address and all object attributes designated as non-volatile. A Stage 1 reset occurs only if the controller contains a user application. A Stage 2 reset returns the controller to out-of box settings, including firmware, and clears all network settings. A Stage 2 reset occurs only if the controller does not contain a user application, and the current controller firmware is not a 1.x revision. For information on how to use the reset button, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

(1) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(2) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(3) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(4) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

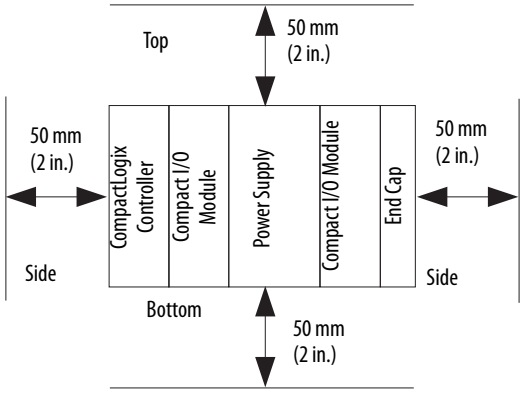
(5) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

Controller Spacing

Controller spacing differs between the 1769-L3 and 1768-L4 controllers and the 5380 controllers. The graphics in this section are not to scale.

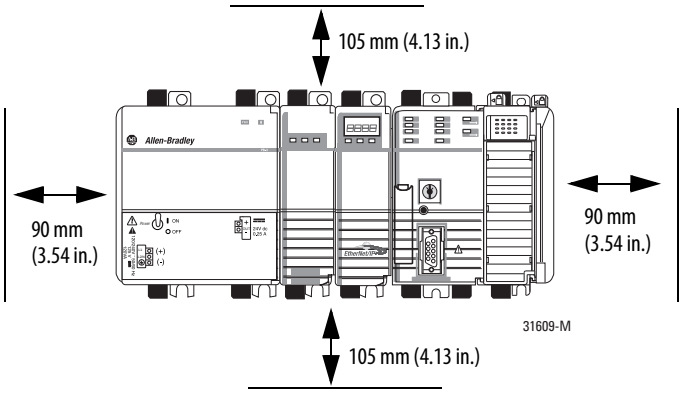
CompactLogix 1769-L3 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment. Allow 50 mm (2 in.) of space on all sides, as shown. This provides ventilation and electrical isolation.



CompactLogix 1768-L4 and Compact GuardLogix 1768-L4 Spacing

Allow for the minimum clearance from enclosure walls, wireways, and other equipment.

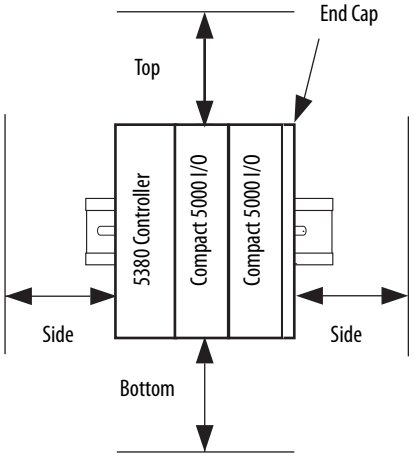


CompactLogix 5380 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment.

The minimum distance on all sides of the CompactLogix 5380 system varies based on the operating temperature, as follows:

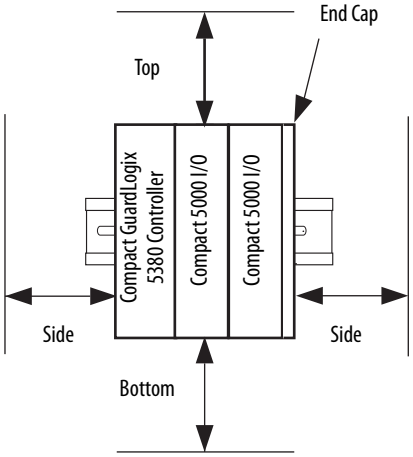
- 50.80 mm (2.00 in.) at 55 °C (131 °F)
- 101.60 mm (4.00 in.) at 60 °C (140 °F)



Compact GuardLogix 5380 Spacing

Maintain spacing from enclosure walls, wireways, and adjacent equipment. The minimum distance on all sides of the Compact GuardLogix 5380 system varies based on the operating temperature, as follows:

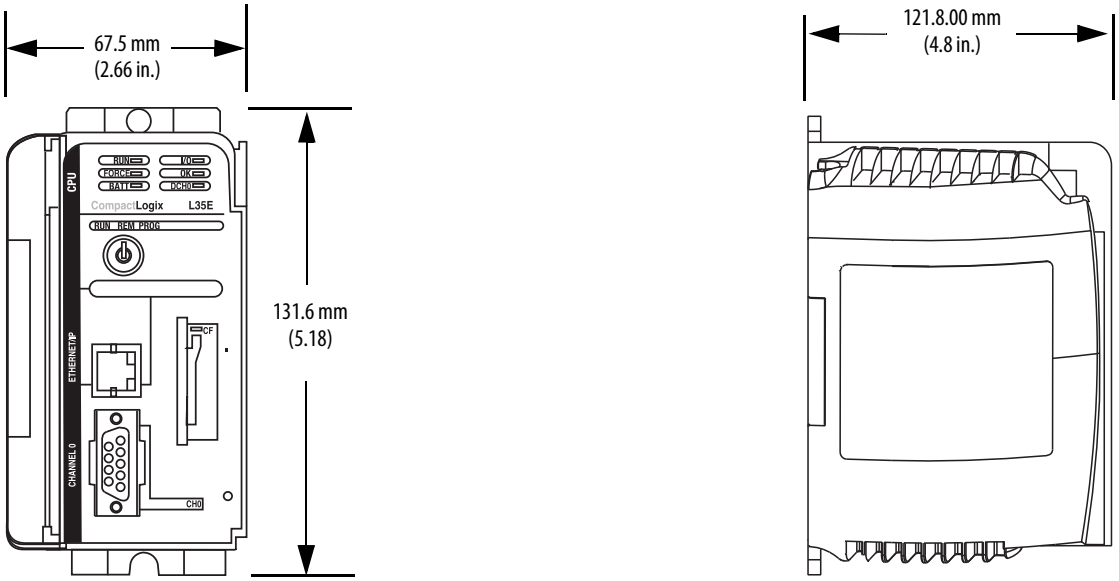
Compact GuardLogix SIL2 Controllers	Series A catalog numbers: • 50.80 mm (2.00 in.) at 50 °C (131 °F) • 101.60 mm (4.00 in.) at 55 °C (122 °F) • 152.40 mm (6.00 in.) at 60 °C (140 °F) Series B catalog numbers: • 50.8 mm (2.00 in.) at 55 °C (131 °F) • 101.6 mm (4.00 in.) at 60 °C (140 °F)



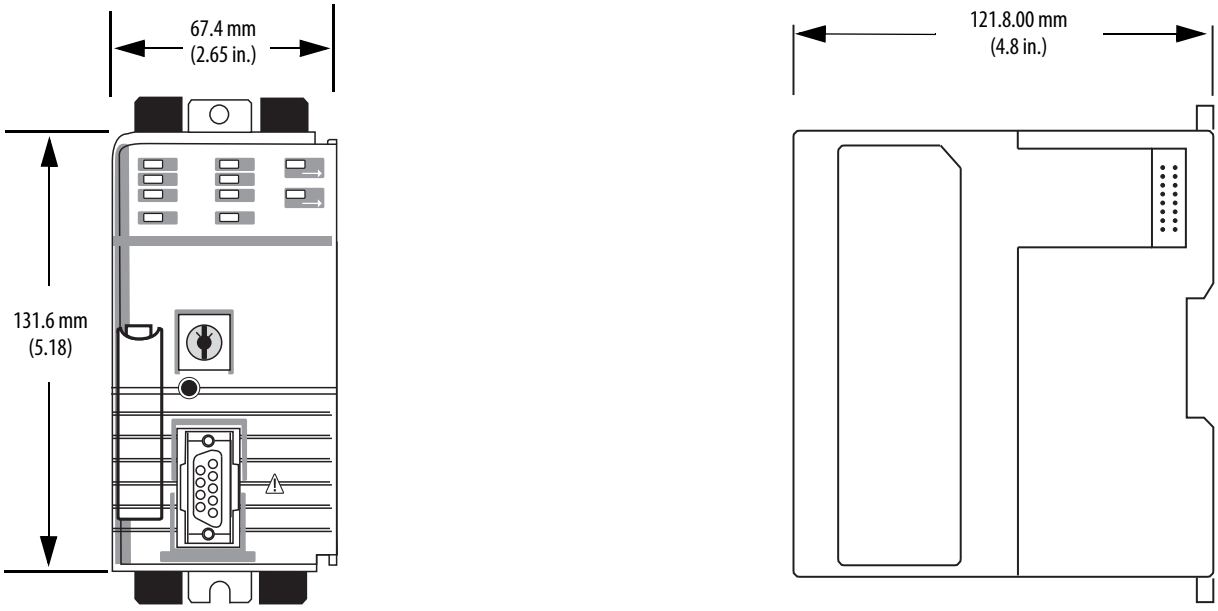
Controller Dimensions

This section shows dimensional differences.

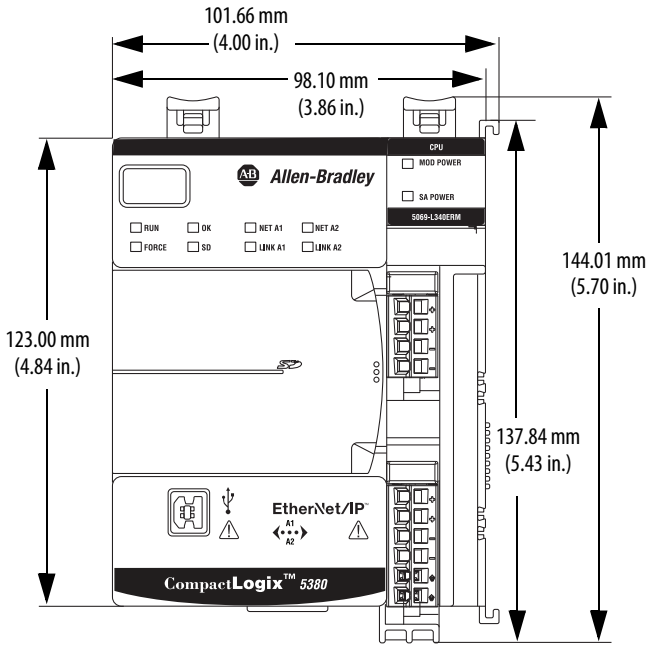
CompactLogix 1769-L3 Dimensions

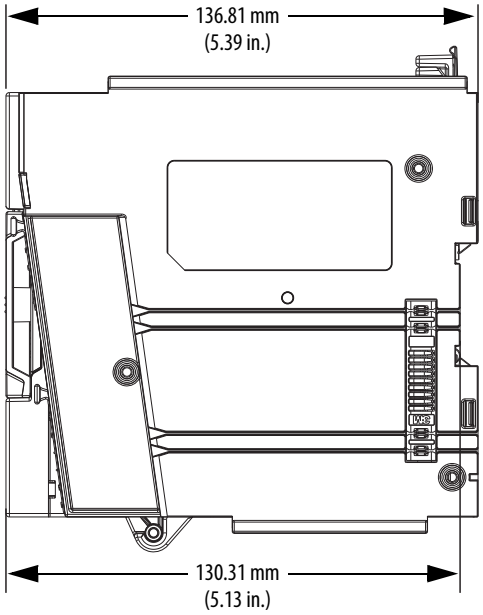


CompactLogix 1768-L4 Dimensions

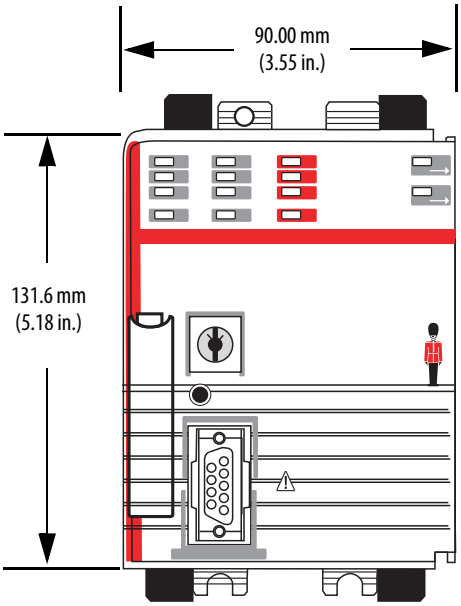


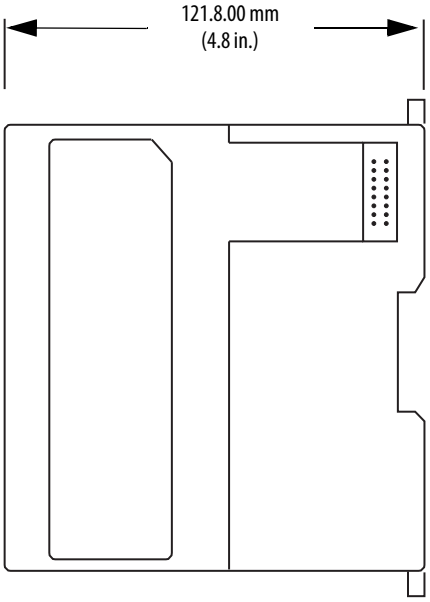
CompactLogix 5380 Dimensions



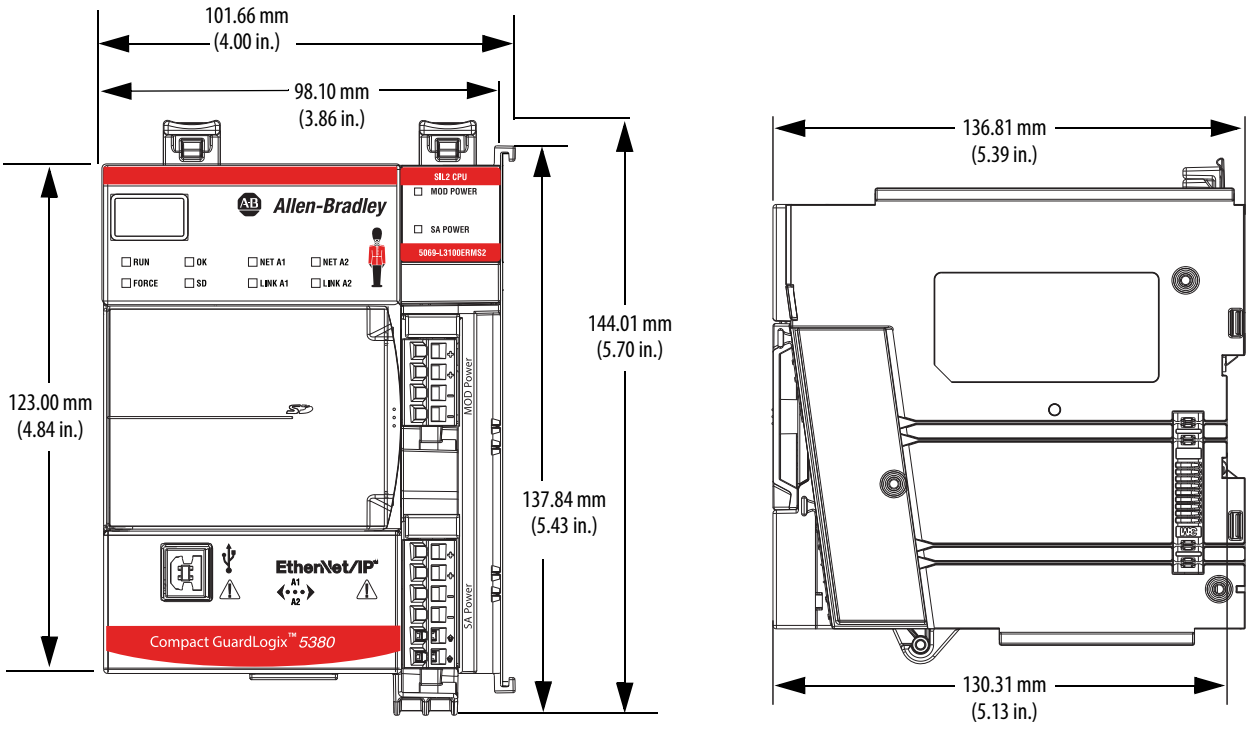


Compact GuardLogix 1768-L4 Dimensions





Compact GuardLogix 5380 SIL 2 Controller Dimensions

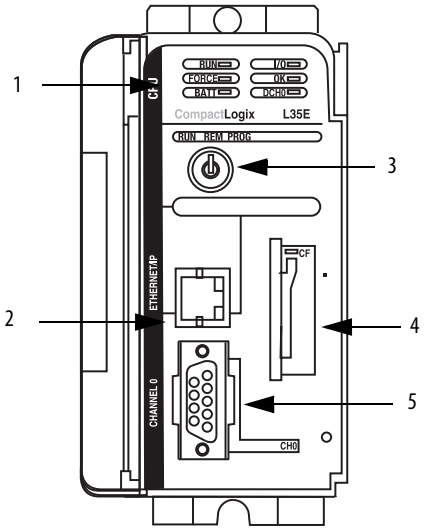


Connectors and Status Indicators

The following tables shows the differences between the connectors and status indicators.

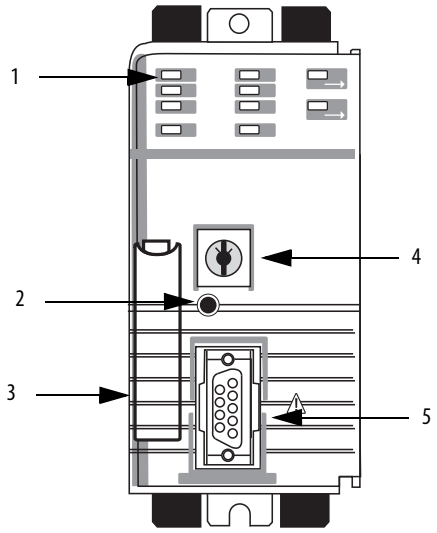
For more information on the controller status indicators and reset button, see Chapter 9, Diagnostics and Status Indicators with CompactLogix Systems on page 159.

CompactLogix 1769-L3



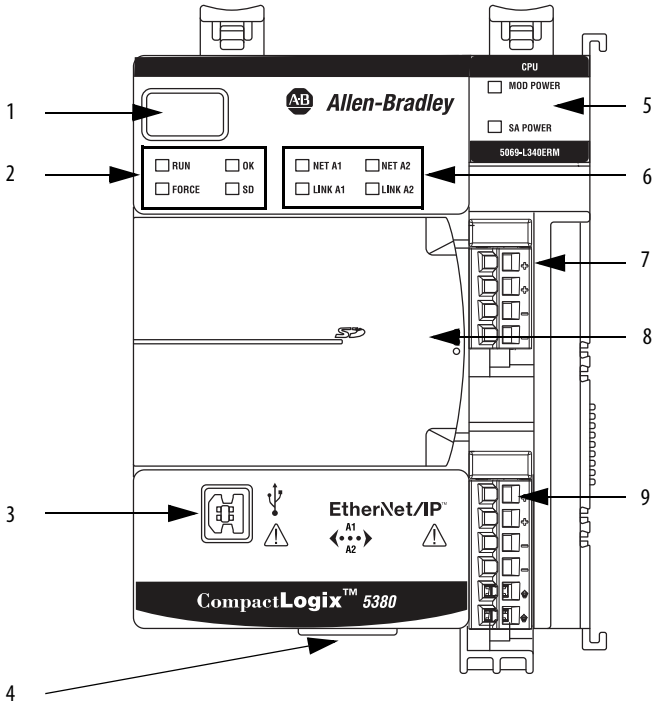
Item	Description
1	Status Indicators
2	Communication port (Ethernet or ControlNet depending on catalog number).
3	RUN REM PROG mode switch
4	Compact Flash card slot
5	Serial Port

CompactLogix 1768-L4



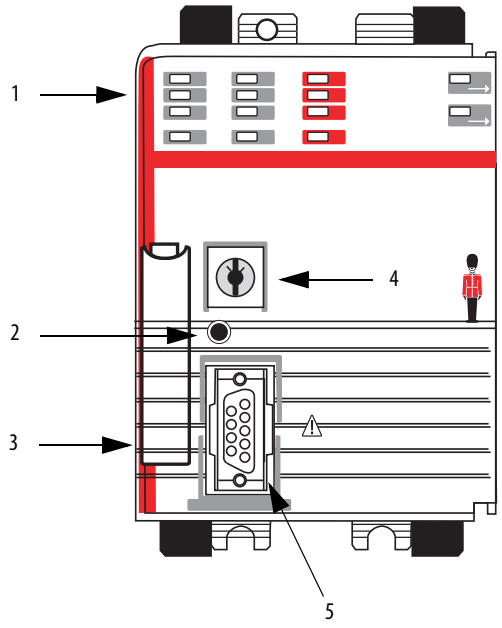
Item	Description
1	Status Indicators
2	Reset button
3	Compact Flash card slot behind the door
4	RUN REM PROG mode switch
5	Serial Port

CompactLogix 5380



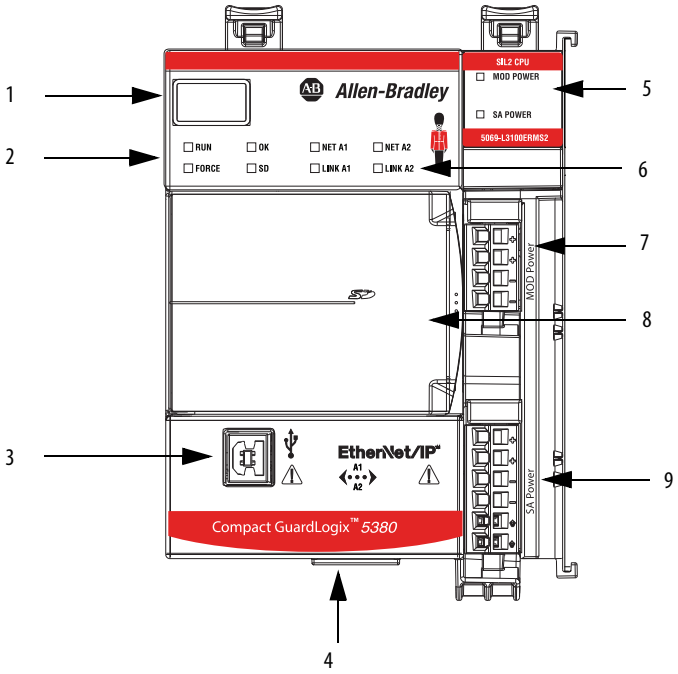
Item	Description
1	4-character display
2	Controller Status Indicators
3	USB port
4	Ethernet ports 1 and 2
5	Power Status Indicators
6	EtherNet/IP Status Indicators
7	MOD power connection
8	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
9	SA power connection

Compact GuardLogix 1768-L4



Item	Description
1	Status Indicators
2	Reset button
3	Compact Flash card slot behind the door
4	RUN REM PROG mode switch
5	Serial Port

Compact GuardLogix 5380 SIL 2



Item	Description
1	4-character display
2	Controller Status Indicators
3	USB port
4	Ethernet ports 1 and 2
5	Power Status Indicators
6	EtherNet/IP Status Indicators
7	MOD power connection
8	Behind the door: • RUN REM PROG mode switch • Reset button • SD card slot
9	SA power connection

Power the Controller

There are differences in how to power the 5380 controllers versus the 1769-L3 and 1768-L4 controllers. Table 25 highlights some of the power differences.

For information on how to power your system, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

Table 25 - Power Differences

	CompactLogix 1769-L3System	CompactLogix 1768-L4 System, Compact GuardLogix 1768-L4 System	CompactLogix 5380 System	Compact GuardLogix 5380 System
Power source	External power supply	External power supply	External power supply	
Power source location	Compact I/O power supplies distribute power from either side of the power supply.	The 1768 CompactLogix power supply distributes power from the right side of the supply and must be the leftmost module in the system.	Separate from the system and connected to RTBs on controller The modules installed in the system do not impact the power supply location. Power is transferred to the system via removable terminal blocks (RTBs) on the controller.	
Power types provided	System-side power.	System-side power. With a 1768-L4 controller installed, the 1768-PA3 and 1768-PB3 power supplies also offer a 24V DC external power source. • The power supply sends 24V DC to the controller in slot 0. • The controller converts the 24V DC to 5V DC and 24V DC, and distributes the power as needed. – 5V/24V power to 1769 I/O modules on the right side of the controller – 5V power to communication or motion modules on the left side of the controller	• System-side power via MOD Power RTB • Field-side power via SA Power RTB **IMPORTANT**: RTBs do not ship with the controller. The RTBs are available in kits that you must order separately. Kit 5069-RTB64-SCREW contains screw-type RTBs that are used for MOD power and SA power. Kit 5069-RTB64-SPRING contains spring-type RTBs that are used for MOD power and SA power.	
Current type provided	Field-side power - AC or DC as dictated by system design.	DC only.	• System-side power - DC only • Field-side power - AC or DC as dictated by system design	• System-side power - DC only • Field-side power - DC only at the controller, AC only through the use of a local 5069-FPD, Field Potential Distributor module.
Special requirement	• The CompactLogix 1769-L3 controller has a power supply distance-rating of four modules. • The controller must be the leftmost module in the first bank of the system.	• 1769 modules have a power supply distance rating from 4…8 modules, depending on the module. • 1768 modules do not have a distance rating to the 1768 power supply. • Place 1769 modules to the right of the 1768 backplane. • Place 1768 modules between the power supply and the controller.	• Must track the system-side and field-side power consumption to properly size the external power supplies that provide each power type. • Must use 5069-FPD, Field Potential Distributor if SA Power consumption is exceeded before reaching max of 31 local I/O modules. • Must use Field Potential Distribution module to change SA Power potential between AC and DC.	

Nonvolatile Memory

5380 controllers use a Secure Digital (SD) card, while 1769-L3 and 1768-L4 controllers use a Compact Flash card.

The 5380 controller has changed some behavior when loading a project from the SD card into a controller. The changes facilitate an easier commissioning of new, out-of box controllers. All Logix 5000™ controllers ship from the factory with firmware revision 1.x.

With 5380 controllers, the Load Image setting On Uninitialized Memory is available. This setting replaces the On Corrupt Memory setting that is available with 1769-L3 and 1768-L4 controllers.

The general behavior is the same for both settings. The only difference is the controller behavior when it is in the out-of-box condition.

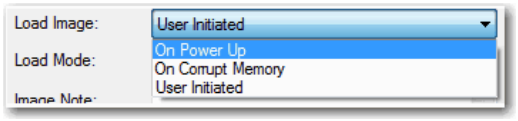
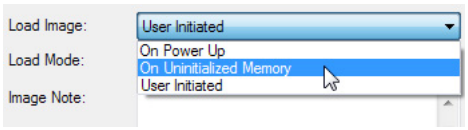
Table 26 shows what happens at power-up when you insert an SD card that contains an image into a 5380 controller.

Table 26 - 5380 SD Card Settings and Controller Power-up Behavior

Image Setting	Controller is in Out-of-Box Condition (Firmware Revision 1.*x*)	Firmware > 1.x and Internal Nonvolatile Memory is Not Valid(2)	Firmware > 1.x and Internal Nonvolatile Memory is Valid(2)
User Initiated	Loads Firmware Only(1)	Does Nothing	Does Nothing
On Power Up	Loads both Firmware and Application	• Loads Firmware if there is a revision mismatch • Loads Application	• Loads Firmware if there is a revision mismatch • Loads Application
On Uninitialized Memory	Loads both Firmware and Application(1)	• Loads Firmware if there is a revision mismatch • Loads Application	Does Nothing

(1) Indicates change in behavior from 1769-L3 and 1768-L4 controllers.

(2) "Valid" includes the No Project condition.

1769-L3, 1768-L4 Controllers	5380 Controllers
	

Communication Options

The 5380 controllers can operate on EtherNet/IP networks. 1769-L3 and 1768-L4 controllers can operate on EtherNet/IP, ControlNet, and DeviceNet networks.

IMPORTANT Be aware of the following:

- The 5380 controllers do not support for half-duplex communications on Ethernet at any speed.

Application Type	1769-L3, 1768-L4 Controllers Support	5380 Controllers Support
Network communication option	• EtherNet/IP • ControlNet • DeviceNet (1769-L3 controllers and standard 1768-L4 controllers only)	EtherNet/IP
EtherNet/IP mode options	Can be used in linear and star topologies. Does not support for Dual-IP mode.	• Linear/DLR mode • Dual-IP mode - Available with the Logix Designer application, version 29 or later Both modes can be used in linear, DLR, and star topologies.
Integrated Motion	1769-L3 controllers: Not Supported 1768-L4 standard controllers: SERCOS	EtherNet/IP
Control of distributed I/O	• EtherNet/IP • ControlNet • DeviceNet (1769-L3 controllers and standard 1768-L4 controllers only)	EtherNet/IP
Produce/consume data between controllers	• EtherNet/IP • ControlNet	EtherNet/IP
Messaging to and from other devices, including access to the controller via Logix Designer application	• EtherNet/IP • DeviceNet, only to devices (1769-L3 controllers and standard 1768-L4 controllers only) • ControlNet network • Serial networks • DH-485 networks	EtherNet/IP

EtherNet/IP Communication

Attribute	CompactLogix 1769-L3 Controller	CompactLogix 1768-L4 Controller	CompactLogix 5380 Controller
Ethernet performance	• Embedded EtherNet/IP port • 10/100 Mbps communication rate • Can be used in linear and star topologies. • Does not support Dual-IP mode. • 1769-L3 controllers use connections, not Ethernet nodes.	• No embedded Ethernet port, you must use a 1768 EtherNet/IP communication module. • The communication rate of 1768 EtherNet/IP communication modules is 10/100 Mbps. • Dual -IP moder is not supported. • 1768-L4 controllers use connections, not Ethernet nodes. Each 1768-ENBT or 1768-EWEB module in an EtherNet/IP network can provide messaging support for 128 Logix connections and 64 TCP/IP connections. • Can be used in linear and star topologies. • Does not support for Dual-IP mode.	• Embedded EtherNet/IP port • 10/100/1000 Mbps communication rate • Support for Dual-IP mode with the Logix Designer application, version 29 or later • EtherNet/IP nodes, instead of connections. For information on EtherNet/IP nodes, see Nodes on an EtherNet/IP Network on page 59. • Linear/DLR mode • Dual-IP mode - Available with the Logix Designer application, version 29 or later Both modes can be used in linear, DLR, and star topologies.

ControlNet Communication

The 5380 controllers do not support ControlNet communication, you must redesign your application to use EtherNet/IP communication.

For more information, see these publications:

- ControlNet to EtherNet/IP Migration Reference Manual, publication CNET-RM001.
- For EtherNet/IP information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001

Serial Communication

The 5380 controllers do not have a serial port, so you must add a 5069-SERIAL module for serial communication.

For how to use the 5069-Serial Module, see the Compact 5000 I/O Serial Module User Manual, publication 5069-UM003.

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Additional Resources

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

Resource	Description
EtherNet/IP Network Devices User Manual, publication ENET-UM006 ControlLogix EtherNet/IP Network Devices User Manual, publication 1756-UM004 ControlNet Network Configuration User Manual, publication CNET-UM001 ControlNet to EtherNet/IP Migration Reference Manual, publication CNET-RM001. DeviceNet Network Configuration User Manual, publication DNET-UM004	EtherNet/IP™, ControlNet®, and DeviceNet® Networks
Logix 5000 Controllers Common Procedures Programming Manual, publication 1756-PM001 Logix Controllers Instructions Reference Manual, publication 1756-RM009 Logix 5000 Controllers Advanced Process Control and Drives Instructions Reference Manual, publication 1756-RM006 Logix 5000 Controllers Motion Instructions Reference Manual, publication MOTION-RM002 Logix 5000 Controllers Import/Export Reference Manual, publication 1756-RM084	Logix 5000™ Software and Programming
1756 ControlLogix Controllers Technical Data, publication 1756-TD001 ControlLogix 5580 Controllers Installation Instructions, publication 1756-IN043 ControlLogix 5580 and GuardLogix 5580 Controllers User Manual, publication 1756-UM543 ControlLogix 5580 Redundant Controller User Manual, publication 1756-UM015 ControlLogix 5570 Redundancy User Manual, publication 1756-UM535 High Availability System Reference Manual, publication HIGHAV-RM002 ControlLogix Power Supply Installation Instructions, publication 1756-IN619 ControlLogix Redundant Power Supply Installation Instructions, publication 1756-IN620 ControlLogix Chassis Installation Instructions, publication 1756-IN621 1756 ControlLogix Chassis Specifications Technical Data, publication 1756-TD006	ControlLogix® and GuardLogix®, Controllers, Chassis, and Power Supply
CompactLogix 5380 Controller Specifications Technical Data, publication 5069-TD002 CompactLogix 5380 Controllers Installation Instructions, publication 5069-IN013 CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001 CompactLogix 5370 Controllers User Manual, publication 1769-UM021 CompactLogix 5370 L3 Controllers Quick Start, publication IASIMP-QS023 1768 CompactLogix Controller User Manual, publication 1768-UM001 Compact GuardLogix User Controllers Manual, publication 1768-UM002 CompactLogix Performance and Capacity Quick Reference, publication IASIMP-QR007	CompactLogix™ and Compact GuardLogix Controllers
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	rok.auto/pcdc

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at rok.auto/pec.

Allen-Bradley, ArmorBlock, Compact 5000, Compact I/O, CompactBlock, CompactLogix, ControlFLASH, ControlFLASH Plus, ControlLogix, Data Highway Plus, DH+, expanding human possibility, FactoryTalk, FLEX, FLEX 5000, Guard I/O, GuardLogix, Integrated Architecture, Kinetix, Logix 5000, PanelView, PhaseManager, PLC-2, PLC-5, POINT I/O, POINT Guard I/O, PowerFlex, Rockwell Automation, Rockwell Software, RSLogix 5000, SequenceManager, SLC, Stratix, Studio 5000, Studio 5000 Automation Engineering & Design Environment, Studio 5000 Logix Designer, and SynchLink are trademarks of Rockwell Automation, Inc.

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