

Replacement Guidelines: Logix 5000 Controllers

ControlLogix 5570 to ControlLogix 5580 GuardLogix 5570 to GuardLogix 5580 CompactLogix 5370 to CompactLogix 5380 Compact GuardLogix 5370 to Compact GuardLogix 5380





Important User Information

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

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

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

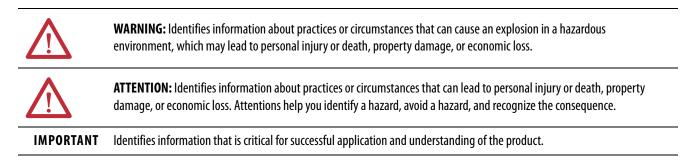
In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

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

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



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.
- CompactLogix[™] 5370 L3 controller with a CompactLogix 5380 controller
- GuardLogix° 5560 or GuardLogix 5570 controller with a GuardLogix 5580 controller.
- Compact GuardLogix 5370 L3 controller with a Compact GuardLogix 5380 controller

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

Topic	Page
Added information regarding GuardLogix 5580 and Compact GuardLogix 5380 controllers.	Throughout
Added Chapter 4: Replacement Considerations with Safety Applications	83
Added information on the AXIS_CIP_Drive Data Type for Studio 5000 Logix Designer® V31.00.00	108

Additional Resources

Summary of Changes

These resources contain information about related products from Rockwell Automation.

These documents contain more information about Logix 5000™ controllers.

Table 1 - Additional Resources

Resource	Description
 EtherNet/IP[™] Communication Modules in Logix 5000[™] Control Systems, publication <u>ENET-UM004</u> 	Networks
EtherNet/IP Network Configuration User Manual, publication ENET-UM001	
 ControlNet[®] Network Configuration User Manual, publication <u>CNET-UM001</u> 	
DeviceNet® Network Configuration User Manual, publication <u>DNET-UM004</u>	
Logix 5000 Controllers Common Procedures Programming Manual, publication <u>1756-PM001</u>	Logix 5000 Software and Programming
Logix Controllers Instructions Reference Manual, publication <u>1756-RM009</u>	
Logix 5000 Controllers Advanced Process Control and Drives Instructions Reference Manual, publication <u>1756-RM006</u>	
Logix 5000 Controllers Motion Instructions Reference Manual, publication <u>MOTION-RM002</u>	
Logix 5000 Controllers Import/Export Reference Manual, publication <u>1756-RM084</u>	

Table 1 - Additional Resources

Resource	Description
1756 ControlLogix Controllers Technical Data, publication <u>1756-TD001</u>	ControlLogix Controllers, Chassis, and Power Supply
ControlLogix 5580 Controllers Product Information, publication <u>1756-PC405</u>	
 ControlLogix 5580 and GuardLogix 5580 Controllers User Manual, publication <u>1756-UM543</u> 	
ControlLogix Chassis and Power Supply, publication <u>1756-IN005</u>	
 1756 ControlLogix Chassis Specifications Technical Data, publication <u>1756-TD006</u> 	
CompactLogix 5380 Controller Specifications Technical Data, publication <u>5069-TD002</u>	CompactLogix Controllers
CompactLogix 5380 Controllers Installation Instructions, publication <u>5069-IN013</u>	
 CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication <u>5069-UM001</u> 	
CompactLogix 5370 Controllers User Manual, publication <u>1769-UM021</u>	
CompactLogix 5370 L3 Controllers Quick Start, publication <u>IASIMP-QS023</u>	
CompactLogix Performance and Capacity Quick Reference, publication <u>IASIMP-QR007</u>	

You can view or download publications at http://www.rockwellautomation.com/literature/.

To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Websites

Resource	Description
https://ab.rockwellautomation.com/	Product Selection Information
Product Compatibility and Download Center (PCDC)	Product-related downloads including firmware, release notes, associated software, drivers, tools, and utilities (product serial number required)
http://samplecode.rockwellautomation.com	Studio 5000 Logix Designer Sample Code

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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 and Compact GuardLogix 5380 controllers	
5570 controllers	ControlLogix 5570 and GuardLogix 5570 controllers	
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 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, <u>1756-PM020</u> .
	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:
	• 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 <u>http://www.rockwellautomation.com/rockwellautomation/support/</u> <u>pcdc.page</u> .

New and Future Features

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

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	1769-L30ERMS1769-L33ERMS	New controllers in version 28: • 5069-L320ER • 5069-L340ERM
	New controllers in version 29: • 1756-L81E • 1756-L82E • 1756-L84E • 1756-L84E	• 1769-L36EKMS	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-L82ES • 1756-L83ES • 1756-L84ES		New controllers in version 30: • 5069-L350ERM • 5069-L380ERM • 5069-L3100ERM
		• 1/30-L84E3	New controllers in version 31: • 1769-L37ERM • 1769-L37ERMS • 1769-L38ERM • 1769-L38ERMO • 1769-L38ERMO • 1769-L38ERMOS	New controllers in version 31: 5069-L306ERS2 5069-L306ERMS2 5069-L310ERS2 5069-L310ERMS2 5069-L320ERMS2 5069-L320ERMS2 5069-L330ERMS2 5069-L340ERMS2 5069-L340ERMS2 5069-L350ERS2 5069-L350ERS2 5069-L380ERS2 5069-L380ERS2 5069-L3100ERS2 5069-L3100ERMS2
1 Gbps Ethernet port	Not applicable	Single embedded Ethernet port that supports up to 1 Gbps communication rate	Not supported	Dual, embedded Ethernet port that each support up to 1 Gbp 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 Controller Version 28 or later - DLR/Linear mode
				CompactLogix 5380 Controller 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 ⁽³⁾	Version 28 or later ⁽³⁾
SERCOS motion	All versions	Version 31 or later	Not supported	Not supported
Analog motion	All versions	Version 31 or later	Not supported	Future

Table 2 - New and Future Features

Table 2 - 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
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 <u>1756-RM001</u> .	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-L310ERMS2 • 5069-L310ERMS2 • 5069-L310ERMS2 • 5069-L320ERMS2 • 5069-L320ERMS2 • 5069-L330ERMS2 • 5069-L340ERMS2 • 5069-L340ERMS2 • 5069-L350ERMS2 • 5069-L380ERMS2 • 5069-L380ERMS2 • 5069-L3100ERS2 • 5069-L3100ERMS2 • 5069-L3100ERMS2
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-L85P	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	Future
PanelView [™] 5000 graphic terminal support	Version 27 or later	Version 29 or later	Version 27 or later	Version 29 or later
Redundancy	ControlLogix 5570 controllers - Versions 19, 20, and 24 ControlLogix 5560 controllers - Versions 19 and 20	Future	Not supported	Not supported
PhaseManager™	All versions	Future	All versions	Future
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	Future	Version 30 or later	Future
Controller-based Audit Log	Version 30 or later	Future	Version 30 or later	Future
Component Change Detection	Version 30 or later	Future	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) 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: <u>http://www.rockwellautomation.com/rockwellautomation/products-</u> <u>technologies/integrated-architecture/tools/overview.page?</u>
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 <u>MIGRAT-BR002</u>.

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.

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

ControlLogix Controllers Minimum Requirements

GuardLogix Controllers Minimum Requirements

Requirement, Minimum	GuardLogix 5570 Controller	GuardLogix 5580 Controller
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17
	Series A, Series B, and Series C	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:
		$0 \degree C < Ta < +60 \degree C (+32 \degree F < Ta < +140 \degree F)$ 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	Studio 5000 Logix Designer Application Version 31.00.00 or later
	RSLogix 5000 Software Version 20.00.00 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.

Attribute ControlLogix 5570 Controller ControlLogix 5580 Controller Memory 4...32 MB user memory 1756-L81E: 3 MB 1756-L82E: 5 MB 1756-L83E: 10 MB 1756-L84E: 20 MB 1756-L85E: 40 MB 0.98 MB Not applicable⁽²⁾ I/O Memory 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 Logix Designer application, version 28: • 1756-L83E: 100 EtherNet/IP nodes, max I/O and Ethernet Messaging. 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: 1756-L81E: 100 EtherNet/IP nodes, max 1756-L82E: 175 EtherNet/IP nodes, max 1756-L83E: 250EtherNet/IP nodes, max 1756-L84E: 250 EtherNet/IP nodes, max 1756-L85E: 300 EtherNet/IP nodes, max Ethernet performance Ethernet I/O (Class 0/1): 128,000 packets per second Not applicable Ethernet Messaging (Class 3): 2000 messages per second⁽³⁾ Unconnected message buffers 20 outgoing buffers, configurable to 40 320 - Any combination of outgoing or incoming unconnected buffers. 4 incoming buffers Concurrent cached message instructions 32, drawn from the 500 total connections supported by the 256 dedicated buffers. in the running state controller. 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 EtherNet/IP network Analog options (encoder input, LDT input, SSI input) SERCOS interface⁽⁴) Analog options (encoder input, LDT input, SSI input)⁽⁴⁾ EtherNet/IP network Motion axes 128, any combination of these supported axis types: 256, any combination of these supported axis types: CIP™ CIP Consumed Consumed • Virtual . Virtual Position loop drives • Position loop drives Servo Servo drive Generic Axes/ms over backplane 8 19

Table 3 - Technical Specifications

Table 3 - Technical Specifications

Attribute	ControlLogix 5570 Controller	ControlLogix 5580 Controller
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	1.2 A @ 5.1V DC
	5.0 mA @ 1.2V 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 ⁽¹⁾	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) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication <u>1770-4.1</u>.

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

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

(4) 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 4 - 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
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⁾
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⁾

Attribute	GuardLogix 5570 Controller	GuardLogix 5580 Controller		
Unconnected message buffers	20 outgoing buffers, configurable to 40 4 incoming buffers	320 - Any combination of outgoing or incoming unconnect 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 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 ⁽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. 		

Table 4 - Features and Specifications

(1) For more information on Ethernet nodes, see <u>Nodes on an EtherNet/IP Network on page 27</u>.

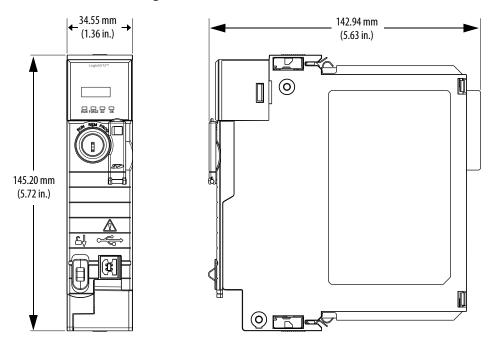
(2) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication <u>1770-4.1</u>.

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

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

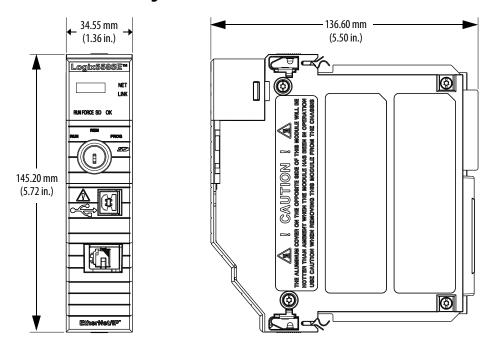
Controller Dimensions

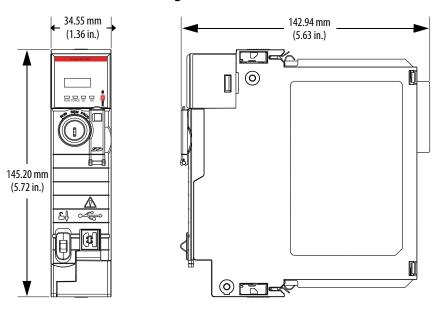
This section shows dimensional differences.



ControlLogix 5570 Dimensions

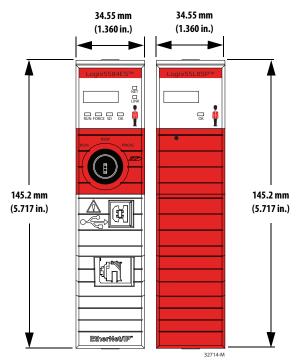
ControlLogix 5580 Dimensions





GuardLogix 5570 Dimensions





Side view: GuardLogix 5580 Controller, GuardLogix 5580 Safety Partner

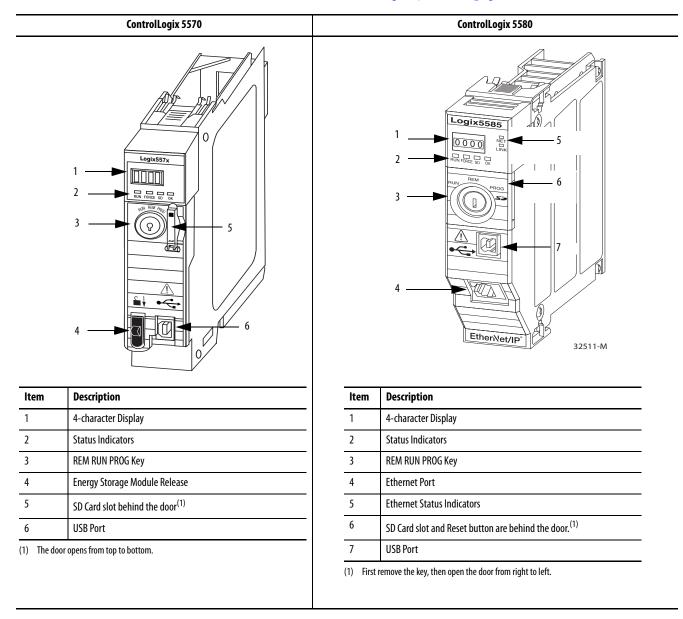
139.6 mm

(5.50 in.)



Connectors and Status Indicators

This section shows the front plate differences. For more information on the status indicators and reset button, see Chapter 7, <u>Diagnostics and Status</u> Indicators with ControlLogix Systems on page 141.



	GuardLogix 5570	GuardLogix 5580 and Safety Partner
		1 - 2 - 3 - 4 - 5 - 6 - 1 4-character display 2 Status Indicators 3 Mode switch (Remote, Run, Program)
ltem	Description	4 SD card slot and Reset Button behind the door ⁽¹⁾
1	4-character Display	5 USB Port
2	Status Indicators	6 Ethernet Port
3	REM RUN PROG Key	7 Ethernet Status Indicators
4	Energy Storage Module Release	8 Safety Partner Reset Button
5	SD Card slot behind the door ⁽¹⁾	(1) First remove the key, then open the door from right to left.
6	USB Port	
(1) The doc	or opens from top to bottom.	

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 <u>Figure 3 on</u> page 32. <u>Table 5</u> lists the EtherNet/IP node limits for 5580 controllers.

Table 5 - 5580 Controller EtherNet/IP Node Guidelines

Cat. No.	Maximum Number of EtherNet/IP Nodes Supported				
	Logix Designer Application, Version 28			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.

Revision	28 -	
Channin	1758-A10 10-Slot ControlLogix Chassis •	
Slot	6 v	
Security Authorit		
	$\hfill \Box$ Use only the selected Security Authority for authentication and authorization	
Secure With:	O Logical Name «Controller Name»	
	O Permission Set	
Description		

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 <u>Advanced Tab on</u> page 30			
SFC Execution	Same functionality as 5570 controllers.			
Project	Same functionality as 5570 controllers.			
Redundancy	Currently not available for 5580 controllers.			
Nonvolatile Memory	Same functionality as the 5570 controllers.			
Memory (Logix Designer application, version 28)	The tabs indicate the same information but are named differently between the Logix Designer application versions.			
Capacity (Logix Designer application, version 29 and later)	Indicates data usage. Data usage is indicated with one value that combines Data and Logic memory usage and I/O memory usage. See <u>Memory Tab on page 31</u> or <u>Capacity Tab on page 32</u> .			
Internet Protocol	New for 5580 controllers. See Internet Protocol Tab on page 34.			
Port Configuration	New for 5580 controllers. See Port Configuration Tab on page 35.			
Security	Now has additional security parameters. See <u>Security Tab on page 36</u> .			
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 <u>Minor Fault on Overflow</u> <u>on page 128</u>.
- System Overhead Time Slice is no longer required for 5580 controllers, and the parameter is removed.

5570 Controllers Example	5580 Controllers Example				
Controller Properties - tester/24 Project Redundancy Nonvolatile Memory Memory Security Alarm Log General Major Faults Minor Faults Date/Time Advanced SFC Execution Controller Fault Fault Controller Security Reserve for System Tasks, eg Communications Match Project to Controller Serial Number: 007/403A8 Allow Consumed Tags to Use RPI Provided by Producer	Controller Properties - bwTestProject				
OK Cancel Apply Help	OK Cancel Apply Help				

Figure 1 - Controller Properties Dialog Box - Advanced Tab

Memory Tab

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

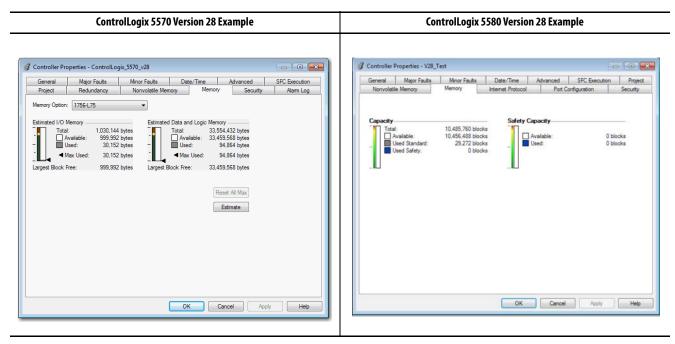
• **5570 controllers** - Data usage is indicated with two values. The tab shows I/O memory and Data and Logic memory separately.

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.





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.

ControlLogix 5570 Example	ControlLogix 5580 Example
Controller Properties - ControlLogio5570_project General Major Faults Mnor Faults Date/Time Advanced SFC Execution Project Redundancy Nonvolatile Memory Capacity Security Alam Log Memory Option: 10756-L75 Estimated I/O Memory Total: 1.030.144 bytes Used: 31.720 bytes Used: 33.467.552 bytes Used: 33.467.552 bytes	Controller Properties - V31_Project General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Nonvolatile Memory Capacity Internet Protocol Pot Configuration Security Alam Log Capacity Total: 41,943,040 blocks Vaviable: 41,908,350 blocks Used: 34,680 blocks
Beset Al Max Estimate	Ehernet Nodes Recommended Maximum: 300 nodes Used: 0 nodes OK Cancel Acoly Hep

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

GuardLogix 5570 Version 28 Example	GuardLogix 5580 Version 31 or later Example			
Controller Properties - GuardLogix_5570	Controller Properties - SIL_3_Safety_Project General Major Faults Mnor Faults Date/Time Advanced SFC Execution Project Safet Nonvolatile Memory Capacity Internet Protocol Pot Configuration Security Alarm Log			
Aemory Option: 1756-L72S	Standard Capacity Total: 20.971.520 blocks Available: 20.82.432 blocks Used: 89.028 blocks Safety Capacity Total: 6.291.456 blocks Used: 5.155 blocks Used: 5.155 blocks			
Angent Block Free: 2.096.088 bytes	Ethernet Nodes Maxmun: 250 nodes Used: 5 nodes			
OK Cancel Apply Hep	OK Cancel Acoly Help			

Figure 4 - GuardLogix Controller Properties Dialog Box - Capacity Tab

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

	Major Faults	Minor Faults	Date/Time A	dvanced	SFC Execution	Project
Nonvolatil	e Memory	Memory	Internet Protocol	Port C	onfiguration	Security
IP settings if the netw Manua Obtain	vork supports this o lly configure IP set IP settings automa	configured or can b apability. tings tically using BOOTF	e automatically configured	I		
Obtain	IP settings automa	tically using DHCP				
IP Setting	s Configuration	on —				
IP Addres	s: 192 . 16	8.1.10	Subnet Mask:	255 . 2	55 . 255 . 0	
			Gateway Address:	0.	0.0.0	
Domain N	lame:		Primary DNS Server Address:	0.	0.0.0	
Host Nan	ne:		Secondary DNS Server Address:	0.	0.0.0	

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

		erties - BW						
General Major Faults		Minor Fault	s Date/Time		Advanced			
Nonvolatile Memory		Memory	Internet Protoco		Port Co	onfiguration	Security	
Port Enable Link Status		Auto- Negotiate	Speed Selected Current		Selected	plex Current	Port Diagnostics	
1	1	Active	V	-	1 Gbps	-	Full	

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 <u>1756-UM543</u>.

nterface Counters		Media Counters					
Octets Inbound:	0	Alignment Errors:					
Octets Outbound:	218150	FCS Errors:					
Unicast Packets Inbound:	0	Single Collisions:					
Unicast Packets Outbound:	0	Multiple Collisions:					
Non-unicast Packets Inbound:	0	SQE Test Errors:					
Non-unicast Packets Outbound:	3891	Deferred Transmissions:					
Packets Discarded Inbound:	0	Late Collisions:					
Packets Discarded Outbound:	0	Excessive Collisions:					
Packets With Errors Inbound:	0	MAC Transmit Errors:					
Packets With Errors Outbound:	0	MAC Receive Errors:					
Unknown Protocol Packets Inbound:	0	Carrier Sense:					
		Frame Too Long:					
		F	leset Counters				
Close							

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.

5570 Controllers Example					5580 Controllers Example						
											General Project
Security Author Restrict Cor Select Soci Change Dete Change To Di Audit Value:	Use munications Except 1 s: 5	tection only the selected Secur Through Selected Sites 1 2 3 4 5 1 #FFFF_FFFF_FFF_FFF	6 7 8 9	toation and Author	nior	Security Authority : Secure With: Restrict Communication Select State : Change Detection — Changes To Detect: Audt Value :	Logical Name Permission Set	4 5 6 7 1		n and Authorization	
		(ок	ancel App	ly Help			ОК	Cancel	Jeply .	Halp

Figure 7 - Controller Properties Dialog Box - Security Tab

-

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.

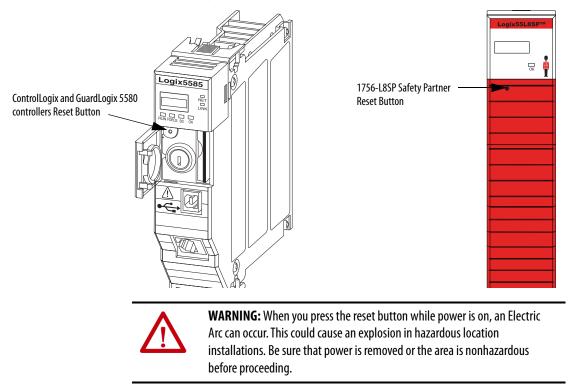
For information on how to perform this procedure, see Knowledgebase Answer ID 450803, 1756-L7x: Clearing Memory/Resetting Processor to Factory Default, accessible at <u>https://rockwellautomation.custhelp.com</u>

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 <u>1756-UM543</u>.



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 <u>Table 6</u>.

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 powerup the image loads both the controller firmware and controller application.

5570 Controllers Example			5580 Controllers Example
Load Image:	User Initiated	Load Image:	User Initiated
Load Mode:	On Power Up On Corrupt Memory	Load Mode:	On Power Up On Uninitialized Memory
Image Note:	User Initiated	Image Note:	User Initiated 1/3

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 6 - 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.

Tag Read/Write	UID/UIE		CPS		Periodic Task	
Source	5580 Controllers	5570 Controllers	5580 Controllers	5570 Controllers	5580 Controllers	5570 Controllers
НМІ	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

Table 7 - ControlLogix 5570 and ControlLogix 5580 Controller Behavior Differences

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.

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.

<u>Downloading Workflow Change on page 42</u> provides an explanation of the download changes.

Download the Program to the Controller

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.

All power to the controller is disabled except Threshold for controller to declare a `Hardware Preservation to run the red OK status indicator and Power to the controller is disabled Fault', and reset the module and disable power. monitor the temperature. In the disabled power condition, only the OK status indicator is illuminated, and it is red. The module does not apply power until it has cooled below the Hardware Preservation Hysteresis Power does not limit. The module then enters fault mode, records the fault in become enabled the major fault log, and displays `CPU Temperature Fault' on when in this range Hardware Preservation the front panel. Hysteresis Limit Threshold for controller to declare a `CPU Temperature Fault' major recoverable fault. If a fault handler does not clear the fault, then the module enters fault mode, records the fault in the major fault log, and displays `T17:C34 CPU Temperature Fault' on the front panel. Temperature Threshold for controller to declare a `T17:C35 Controller internal temperature is approaching operating limit' minor fault and set the Diagnostics minor fault bit. The fault is recorded in the minor fault log, but is not displayed on the front panel. If the temperature returns to an acceptable range, the Diagnostics minor fault bit clears, but the minor fault record remains.

Figure 8 - Controller Thermal Fault Behavior

Notes:

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 controllers when used with the Studio 5000 Logix Designer application, version 31 or later.

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
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	Studio 5000 Logix Designer Application, Version 31.00.00 or later	

Product Comparison

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

CompactLogix Controllers Product Comparison

Table 8 - 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: 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 [™] 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: 40 5069-L330ER, 5069-L330ERM: 60 5069-L340ER, 5069-L340ERM: 90 5069-L350ERM: 120 5069-L380ERM: 150 5069-L3100ERM: 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 ⁽²⁾
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	 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 Any combination of these supported axis types: CIP™ Consumed Virtual Position loop drives 	5069-L306ERM: As many as 2 axes 5069-L310ERM: As many as 4 axes 5069-L320ERM: As many as 8 axes 5069-L330ERM: As many as 16 axes 5069-L340ERM: As many as 20 axes 5069-L350ERM: As many as 24 axes 5069-L350ERM: As many as 28 axes 5069-L3100ERM: As many as 32 axes Any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives
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.

Table 8 - Technical Specifications

Attribute	CompactLogix 5370 L3 Controller	CompactLogix 5380 Contro	ller
Voltage and current ratings	Controller power: 500 mA @ 5.1V DC and 225 mA @ 24V DC	MOD Power:	450 mA @ 1832V DC
		MOD Power Inrush:	850 mA for 125 ms
		SA Power:	10 mA @ 032V DC
			25 mA @ 0240V AC, 4763 Hz
		(3)	ATEX/IECEX, 125V AC Max
		MOD Power (Passthrough) ⁽³⁾ : SA Power (Passthrough) ⁽⁴⁾ :	9.55 A @ 1832V DC
		SA Power (Passtnrougn) **:	9.95 A @ 032V DC 9.975 A @ 0240V AC, 4763 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 ⁽¹⁾	3 - on USB port	3 - on USB port	
	2 - on Ethernet port	1 - on power ports	
		2 - on Ethernet port	
Wire size	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e	Ethernet connections:	
	minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702	Ethernet Cabling and Installat IEC 61784-5-2	ion according to IEC 61918 and
Removable terminal block	Not Applicable	Kit 5069-RTB64-SCREW or kit	
		You must order the kit separat controller.	ely. RTBs do not ship with the
		5069-RTB4-SCREW, 5069-RTB	6-SCREW connections:
		0.51.5 mm ² (2216 AWG)	
		rated at 105 °C (221 °F), or gre diameter including insulation,	
		5069-RTB4-SPRING, 5069-RTE	6-SPRING connections:
		0.51.5 mm ² (2216 AWG)	
		rated at 105 °C (221 °F), or gre diameter including insulation,	
Reset Button	Clears the user application and memory but retains the firmware	A stage 1 reset clears the user	
	revision and all network settings	memory, but retains the contr A stage 2 reset returns the con	
		(including firmware), and clea	irs all network settings.

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

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

(3) 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.

(4) 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 9 - 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: 0.6 MB + 0.3 MB Safety 5069-L310ERS2, 5069-L310ERMS2: 1 MB + 0.5 MB Safety 5069-L320ERS2, 5069-L320ERM: 2 MB + 1 MB Safety 5069-L330ERS2, 5069-L330ERM: 3 MB + 1.5 MB Safety 5069-L340ERS2, 5069-L340ERMS2: 4 MB + 2 MB Safety 5069-L350ERS2, 5069-L350ERMS2: 5 MB + 2.5 MB Safety 5069-L380ERS2, 5069-L380ERMS2: 8 MB + 4 MB Safety 5069-L380ERS2, 5069-L3100ERMS2: 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 1791 CompactBlock[™] Guard I/O[™] Can only communicate to safety I/O through the en Ethernet ports. 		 Compact 5000 I/O Safety modules, 1734 POINT Guard I/O, 1732 ArmorBlock Guard I/O, 1791 CompactBlock Guard 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-EN2DN 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: 16 5069-L310ERS2, 5069-L310ERMS2: 24 5069-L320ERS2, 5069-L320ERMS2: 40 5069-L330ERS2, 5069-L330ERMS2: 60 5069-L340ERS2, 5069-L340ERMS2: 90 5069-L350ERS2, 5069-L350ERMS2: 120 5069-L380ERS2, 5069-L380ERMS2: 150 5069-L3100ERS2, 5069-L3100ERMS2: 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 ⁽²⁾
Dual-IP mode	Not supported	Supported with the Logix Designer application, version 31 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	

Table 9 - Technical Specifications

Attribute	Compact GuardLogix 5370 Controller	Compact GuardLogix 5380 Controller		
Motion axes	 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 Any combination of these supported axis types: CIP Consumed Virtual Position loop drives 	5069-L306ERMS2: As many as 2 axes 5069-L310ERMS2: As many as 4 axes 5069-L320ERMS2: As many as 4 axes 5069-L320ERMS2: As many as 8 axes 5069-L30ERMS2: As many as 16 axes 5069-L30ERMS2: As many as 20 axes 5069-L350ERMS2: As many as 20 axes 5069-L30ERMS2: As many as 24 axes 5069-L30ERMS2: As many as 24 axes 5069-L3100ERMS2: As many as 28 axes 5069-L3100ERMS2: As many as 32 axes Any combination of these supported axis types: • CIP • Consumed • Virtual • Position loop drives		
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	MOD Power: 475 mA @ 1832V DC MOD Power Inrush: 1200 mA for 125 ms SA Power: 10 mA @ 032V DC MOD Power (Passthrough) ⁽³⁾ : 4.525 A @ 1832V DC SA Power (Passthrough) ⁽⁴⁾ : 9.99 A @ 032V DC		
Energy storage module	Non-removable	Non-removable		
Weight, approx	0.54 kg (1.18 lb)	0.768 kg (1.693 lb)		
Wire category ⁽¹⁾	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: 0.51.5 mm ² (2216 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: 0.51.5 mm ² (2216 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) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication <u>1770-4.1</u>.

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

(3) 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.

(4) 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.

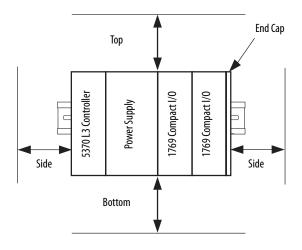
Controller Spacing

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.

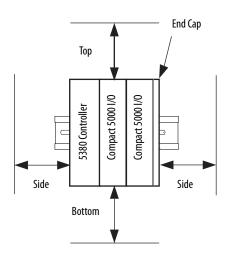


CompactLogix 5380 Spacing

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)

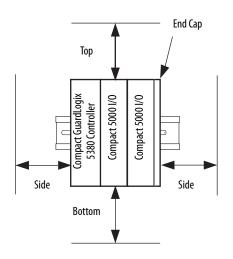


Compact GuardLogix 5380 Spacing

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

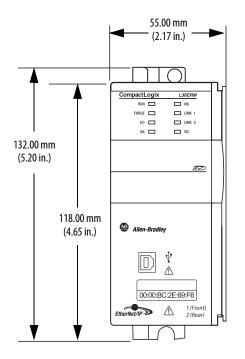
The minimum distance on all sides of the Compact GuardLogix 5380 system varies based on the operating temperature, as follows:

- 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)



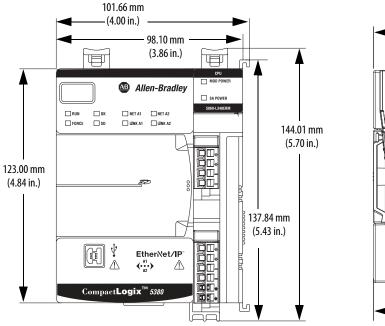
Controller Dimensions

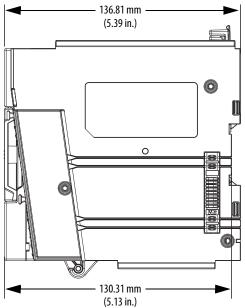
This section shows dimensional differences.



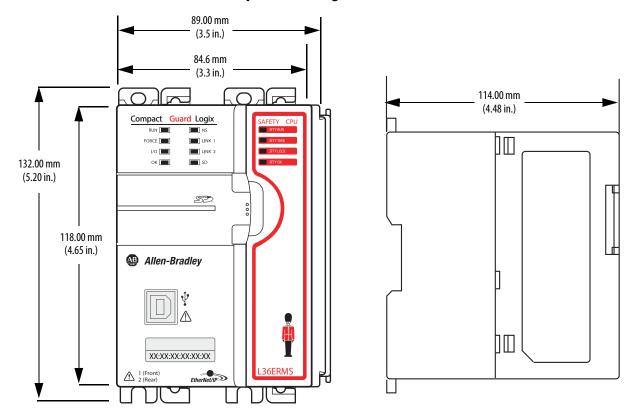
105.00 mm (4.13 in.)

CompactLogix 5380 Dimensions



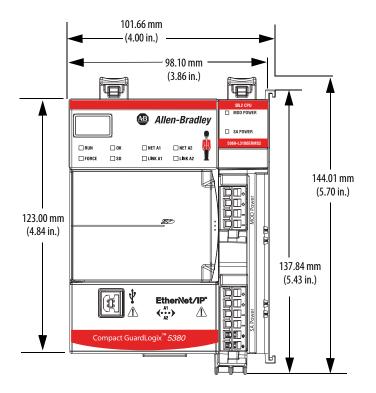


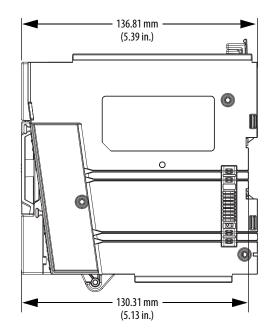
CompactLogix 5370 L3 Dimensions



Compact GuardLogix 5370 Dimensions

Compact GuardLogix 5380 Dimensions

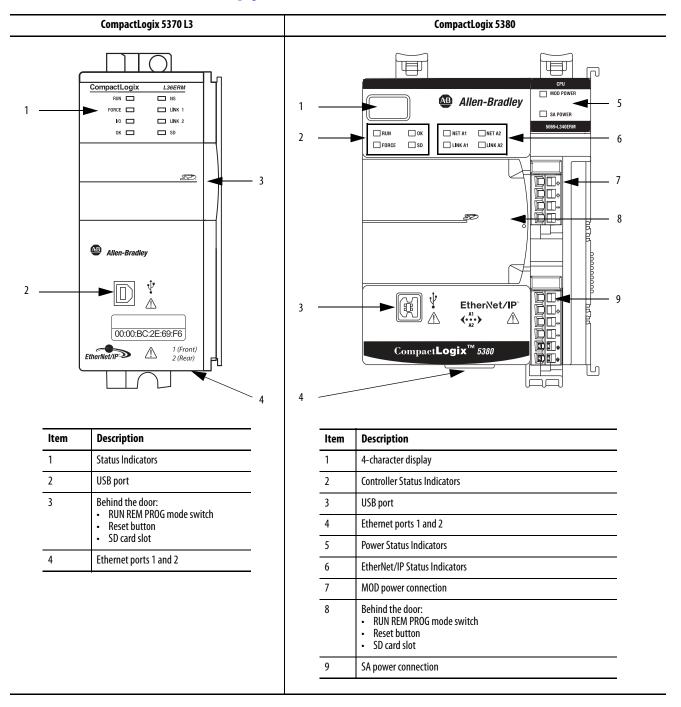


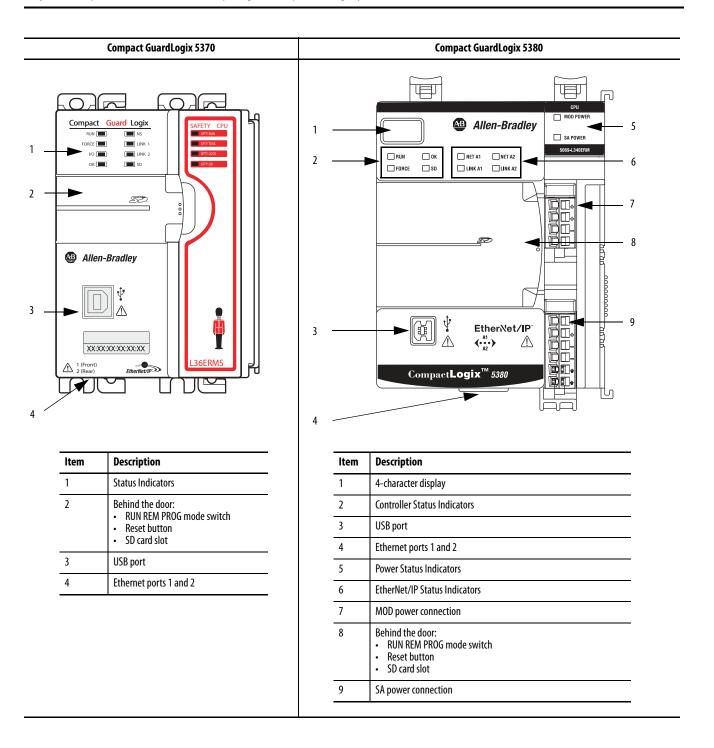


Connectors and Status Indicators

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 8, <u>Diagnostics and Status Indicators with CompactLogix Systems on</u> page 149.





Power the Controller

There are differences in how to power the 5380 controllers versus the 5370 controllers. <u>Table 10</u> 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 <u>5069-UM001</u>.

Table 10 - 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	System-side power - DC only		
		Field-side power - AC or DC as dictated by system design	 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 the system-side and field-side power consumption to properly size the external pow supplies that provide each power type.			
	 Must track power consumption in the local bank and on both sides of the power supply 	 Must use 5069-FPD, Field Potential Distributor if SA Power consumption is exceeded before reaching max of 31 local I/O modules. 			
	poner suppry	Must use Field Potential Distribution module to change SA Power potential between AC and DC.			

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.
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 <u>Figure 12 on</u> page 65.

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

- <u>CompactLogix Controllers Product Comparison on page 47</u>
- <u>Compact GuardLogix Controllers Product Comparison on page 49</u>

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.

			? x
ompactLogix™ 5380 Controlle ™	r		
29 🔻			
No Protection		•	J I
Use only the selected Security A authorization	uthority for authe	ntication and	
Controller Name < Controller Name	=>		
Permission Set		•	j
Cancel	Back	Next	Finish
	29 • No Protection Use only the selected Security A authorization Controller Name Permission Set	29 No Protection Use only the selected Security Authority for auther authorization Logical Name <controller name=""> Permission Set</controller>	29 • No Protection • Use only the selected Security Authority for authentication and authorization Controller Name> Permission Set •

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 <u>page 62</u> .
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 <u>page 63</u> .
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 <u>Memory Tab on page 64</u> or <u>Capacity Tab on page 65</u> .
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 <u>page 66</u> .
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 <u>Minor Fault on Overflow</u> <u>on page 128</u>.
- 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
Controller Properties - Migration_work Nonvolatile Memory Memory Internet Protocol Port Configuration Network Security Alam Log General Major Faults Major Faults Minor Faults Date/Time Advanced SFC Execution Project Controller Fault Handler:	Controller Properties - Controller_Project_5380
OK Cancel Apply Help	OK Cancel Apply Help

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
Controller Properties - Migration_work Nonvolatile Memory Internet Protocol Port Configuration Network Security Alarm Log General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Name: Major Faults Minor Faults Date/Time Advanced SFC Execution Project Name: Major Faults Oncoments/Projects/OneDinve - Rockwell / Created: 5/10/2016 239.23 PM Created: 5/10/2016 239.33 S PM @ Ownload Project Documentation and Extended Properties Pass-Through Display @ Show Pass-Through Properties @ Append To Base Tag Description ØK Cancel Apply Help	Controller Properties - Controller_Project_5380 Norwolatile Memory Internet Protocol Port Configuration Network Security General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Name: Controller_Project_5380.ACD Path: C:\Users\vaskoj\Dektop\CompactLogx 5380 documentatio Created: 2/29/2016 2:53.28 PM Edited: 3/1/2016 4:03:03 PM Download Cutomentation and Estended Properties Download Project Documentation and Estended Properties Download Cutomentation and Estended Properties Pass-Through Display Show Pass-Through Properties Append To Base Tag Description OK Cancel Apply Help

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.

Figure 11 - Controller Properties Dialog Box - Memory Tab

CompactLogix 5370 L3 Version 28 Example	CompactLogix 5380 Version 28 Example
Controller Properties - Migration_work Image: Control of the second	Capacity Capacity Variable: Variabl
OK Cancel Apply Help	OK Cancel Apply Help

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
Controller Properties - CompactLogix5370_L3_v29 General Major Faults Mnor Faults Date/Time Advanced SFC Execution Project Norvolatile Memory Capacity Internet Protocol Port Configuration Network Security Alarm Log Memory Option: 1769L36ERM	Controller Properties - CompactLogis5380_project General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Nonvolatile Memory Capacity Internet Protocol Port Configuration Security Aliam Log
Estimated I/O Memory Total: 1,048,576 bytes Available: 3,073,360 bytes WaxUed: 6,640 bytes Largest Block Free: 1,041,936 bytes MaxUed: 72,368 bytes Largest Block Free: 3,073,360 bytes Estimated Data and Logic Memory Available: 3,073,360 bytes Used: 72,368 bytes Largest Block Free: 3,073,360 bytes Estimate Estimated Data and Logic Memory WaxUed: 72,368 bytes Largest Block Free: 3,073,360 bytes Estimate	Capacity Safety Capacity Total: 4.194.304 blocks Deed Standard: 32.520 blocks Used Stafety: 0 blocks Used Stafety: 0 blocks Ethernet Nodes
OK Cancel Apply Help	OK Cancel Apply Help

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	Pro	perties	Dialog	Box -	Security	/ Tab

5370 Controllers	5380 Controllers
Controller Properties - Migration_work General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Nonvolatile Memory Memory Internet Protocol Pot Configuration Network Security Alarm Log Security Authonty: No Protection	Controller Properties - Controller, Project 5380 General Major Faults Minor Faults Date/Time Advanced SFC Execution Project Nonvolatile Memory Memory Internet Protocol Post Configuration Network Security Security Authority: No Protection
Security Authority. No Protection Use only the selected Security Authority for Authentication and Authorization Restrict Communications Except Through Selected Slots Select Slots: 30 1 2 3 4 5 6 7 8 9 Change Detection	Secury Kullidy: IND Protection V Image:
Ohanges To Detect: 16#FFFF_FFFF_FFFFF Configure	Change Detection Changes To Detect: 16#FFFF_FFFF_FFFF Configure Audit Value: 16#C4CE_0720_80E9_0E12
OK Cancel Apply Help	OK Cancel Apply Help

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.

Config	ure Changes to Detect	X
ΨP	roject stored to removable media	
V 0	nline edits modified controller program	
VT	ransaction committed	
🔽 S	FC forces enabled	Ξ
VS	FC forces disabled	
V S	FC forces removed	
V S	FC element force value changed	
V I/	O forces enabled	
V 1/	O forces disabled	
V I/	O forces removed	
V I/	O forces modified	
🗸 Fi	mware update attempted	
🔽 Fi	mware update from removable media attempted	
🗸 R	emote mode change	
V K	eyswitch mode change	-
	OK Cancel Help	

For more information on Security settings, see the FactoryTalk[®] Security System Configuration Guide, publication <u>FTSEC-QS001</u>.

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 11 describes the differences between the reset stages.

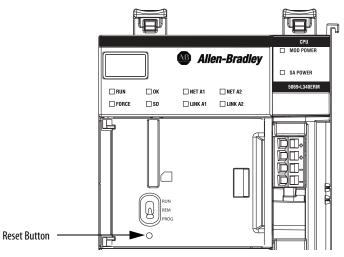
Table 11 - Reset Button Descriptions

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.	Supported	Supported
	A Stage 1 reset occurs only if the controller contains a user application.		
Stage 2	A Stage 2 reset returns the controller to out-of box settings, including firmware, and clears all network settings.	Not supported	Supported
	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.		

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 12.

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			
Load Image: Load Mode: Image Note:	User Initiated On Power Up On Corrupt Memory User Initiated	Load Image: Load Mode: Image Note:	User Initiated On Power Up On Uninitialized Memory User Initiated		

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 12 - 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.
- We recommend that you consider some factors that affect how to set EtherNet/IP network communication rate in your application during design. For more information, see <u>Network Communication Rate</u> <u>Considerations on page 169</u>.

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 late Both modes can be used in linear, DLR, and star topologies. 	
Integrated Motion	EtherNet/IP	I	
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 13 - Behavior Differences

	Tag Access						
Tag Read/	UID/UIE			CPS		Periodic Task	
Write Source	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

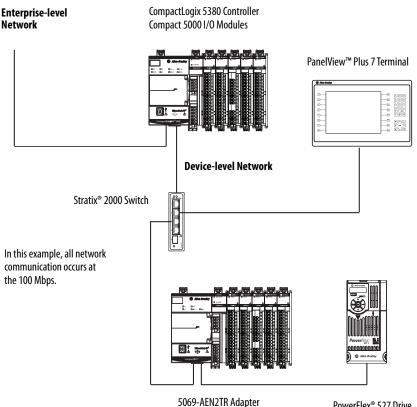
For more information on how to use EtherNet/IP modes, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, publication 5069-UM001.

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. For more examples of how to use the controllers that use Dual-IP mode in EtherNet/IP topologies, see <u>Dual-IP</u> Mode in EtherNet/IP Topologies on page 173.

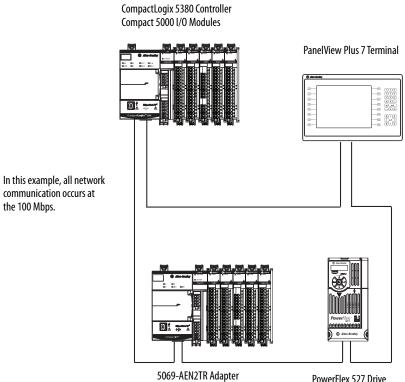


Compact 5000 I/O Modules

PowerFlex® 527 Drive

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.



Compact 5000 I/O Modules

PowerFlex 527 Drive

Use I/O Modules in CompactLogix Systems

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

	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-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM: 8 5069-L320ER, 5069-L320ERM: 16 5069-L330ER⁽¹⁾, 5069-L330ERM, 5069-L340ER, 5069-L340ERM, 5069-L350ERM, 5069-L380ERM, 5069-L3100ERM: 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, <u>Controller Spacing</u> on page 51	50 mm (2 in.) of space on all sides	Varies based on the operating temperature: • 50.80 mm (2.00 in.) at 55 °C (131 °F) • 101.66 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 tha 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 SA power use by the local I/O modules in a system
	 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	

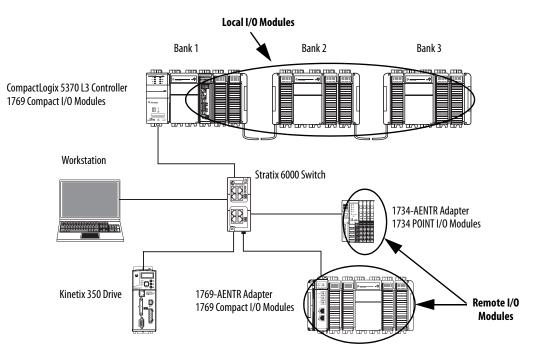
The following is information about how you can use I/O modules in different applications.

(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 the Rockwell Automation® Knowledgebase article #942580, '5380 CompactLogix controllers limited to 16 local 5069 modules in V29 of Studio 5000®.'The document is available at http:// www.rockwellautomation.com/knowledgebase.

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

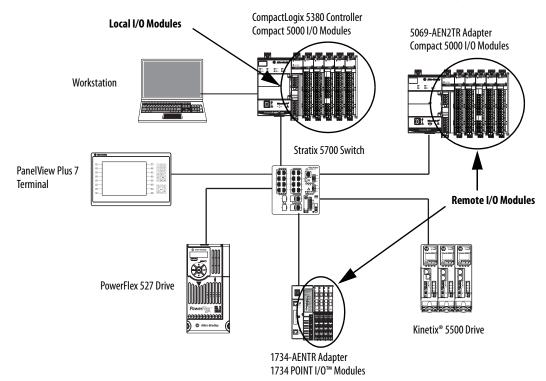
CompactLogix 5370 L3 System

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 μ s. 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.

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

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 <u>5000-UM004</u>.

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 <u>5000-UM004</u>.

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

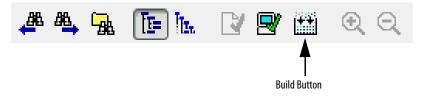
Download the Program to the Controller

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.

<u>Downloading Workflow Change on page 80</u> 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.

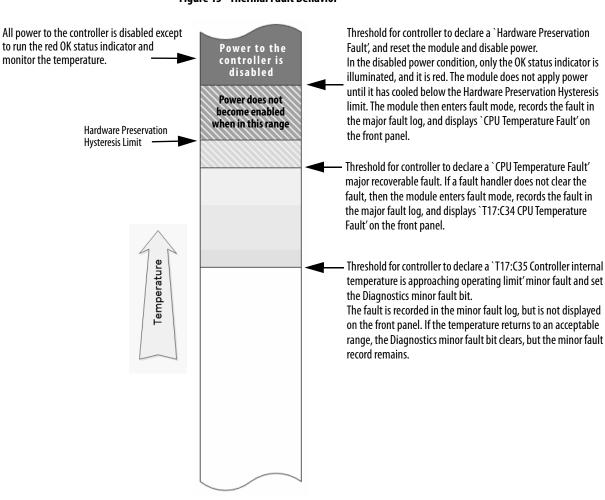


Figure 15 - Thermal Fault Behavior

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Replacement Considerations with Safety Applications

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.

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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.

Safety Standard IEC-61508 Part-1, Section 7.16 (Overall modification and retrofit) states as follows:

7.16.2.3.- An impact analysis shall be carried out that shall include an assessment of the impact of the proposed modification or retrofit activity on the functional safety of any E/E/PE safety-related system. The assessment shall include a hazard and risk analysis sufficient to determine the breadth and depth to which subsequent overall, E/E/PE system or software safety lifecycle phases will need to be undertaken. The assessment shall also consider the impact of other concurrent modification or retrofit activities, and shall also consider the functional safety both during and after the modification and retrofit activities have taken place.

See the Machinery Safebook 5 - Safety related control systems for machinery Reference Manual, publication <u>SAFEBK-RM002C-EN-P</u>.

Safety Application Conversion

Replace Producer Controller

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 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	Compact GuardLogix 5380 and GuardLogix 5580 Controllers

Compact GuardLogix 5380 and GuardLogix 5580 Controllers Safety Signature ID			
Safety Signature ID			
8D3D3D27 - 18A9EAC7 - 890D652A - 268E54D8 - 88EAFE5F - A884DDC8 - 64D2A1D1 - 117884D6 📴			

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=""></am>

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

 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.



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

====SAFETY SIGNATURES=====
The Safety Signature
of the RCS
GSV
Class Name Safety
Instance Name
Attribute Name SafetySignatureDateTime
Dest RCS_SAFETY_SIGNATURE

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		
1756 Backplane, 1756-A10	411D_02E2_C259	1756 Backplane, 1756-A7	4078_02CE_BC08 3/9/2017 8:05:02.984 AM	
		Ethernet	407D_03BE_85C6 3/14/2017 1:26:57.734 PM	
GuardLogix 5570 cc backplane commur	ontrollers have one SNN for the nications.		80 requires two SNNs, one for the t port, and one for the backplane	
Comr	pact Guardl ogix 5370	Com	pact Guardi ogix 5380	
Comp	pact GuardLogix 5370	Comp	pact GuardLogix 5380	
Comp	411D_02D8_AE11	Comp 5069 Backplane	411D_02D5_DD2E	
	411D_02D8_AE11		411D_02D5_DD2E 8/21/2017 9:12:50.222 AM	
	411D_02D8_AE11	5069 Backplane	411D_02D5_DD2E 8/21/2017 9:12:50.222 AM 411D_02D5_DD2F	

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

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. 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.

IMPORTANTThe 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.
- The project also changes from a SIL3 (only SIL3 possible in Compact GuardLogix 5370) project in 5370 to a SIL2/PLd project in 5380 (only SIL2 possible in Compact GuardLogix 5380 at this time).
- 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.

a. From the File menu, choose Save As.

File	Edit View Search Logic	Communications	s Tools Window Help
	<u>N</u> ew	Ctrl+N	· #6 #6, 5% TE
i i i	Open	Ctrl+O	
	Close		Path: <none></none>
	Save	Ctrl+S	• H H H H H +F +F +()-
	Save As		I → Yevorites Add-On A Program
	New Component		•
	Import Component		•

b. 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.

Save in:	Projects		•	G 🦸 🖻 🛄 -		
(Au	Name			Date modified	Туре	Size
~	BW BW			9/23/2015 1:54 PM	File folder	
Recent Places	CMX5370			7/27/2016 11:41 AM	File folder	
-	L Controller	Dnly		3/7/2016 2:55 PM	File folder	
-	🍌 dhcp			9/10/2015 4:22 PM	File folder	
Desktop	📕 Enable			10/29/2015 2:59 PM	File folder	
1500	🔒 gad			11/16/2015 10:59	File folder	
1000	Proj_Enabl	e_Port		10/29/2015 3:04 PM	File folder	
Libraries	🍌 proj2_28			9/4/2015 4:38 PM	File folder	
-	Project_V2	9		7/12/2016 10:19 AM	File folder	
	SafetyProje	ect		5/5/2017 11:45 AM	File folder	
Computer	SIL_3_Safet	y_Project		6/2/2017 2:53 PM	File folder	
-	Sil2_Safety	Project		5/8/2017 4:38 PM	File folder	
	🍌 test			1/9/2017 12:27 PM	File folder	
Network	b test2			6/30/2016 9:26 AM	File folder	
	V29_Test			2/29/2016 4:12 PM	File folder	
	V31_Projec	t		6/2/2017 3:03 PM	File folder	
	Producer_\	/28_export.L5K		4/26/2018 11:41 AM	Logix Designer Im	5
	1		_			
	File name:	Safety_Application L5K	¢		•	Save
	Save as type:	Logix Designer Import/	Export File (*	L5K)	•]	Cancel
	V Encode Sour	e Protected Content		43		Help

- c. 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.
- d. 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.

刘 🔄 👍 🕨 Computer 🕨 OSDisk (C:) 🕨 Proje		- 47	Search Projects		_
Organize New folder			85	• 💷	i.
Name	Date modified	Туре	Size		
🎍 proj2_28	9/4/2015 4:38 PM	File folder			
Project_V29	7/12/2016 10:19 AM	File folder			
3 SafetyProject	5/5/2017 11:45 AM	File folder			
SIL_3_Safety_Project	6/2/2017 2:53 PM	File folder			
Sil2_SafetyProject	5/8/2017 4:38 PM	File folder			
🕌 test	1/9/2017 12:27 PM	File folder			
🕌 test2	6/30/2016 9:26 AM	File folder			
V29_Test	2/29/2016 4:12 PM	File folder			
V31_Project	6/2/2017 3:03 PM	File folder			
Producer_V28_export.L5K	4/26/2018 11:41 AM	Logix Designer Im	5 KB		
Safety_Application.L5K	7/2/2018 4:20 PM	Logix Designer Im	12 KB		
File name: Safety_Application.	15K	• 1	ogix Designer (*.l	5k=*.15x=*.xm	1

d. Click Open.

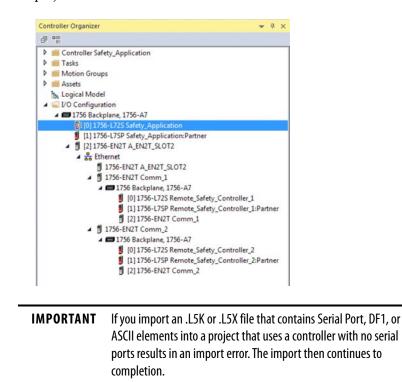
e. The Save Imported Project As dialog opens.

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

Look in:		n of the project file to create.	0 👔 📴 🗔 -		
LUOK II.	Name		Date modified	Туре	Size
Recent Places	@ Producer_	V31.ACD Trion_Blend_Circle_Diamond_Squa	4/26/2018 4:58 PM	Type Logix Designer Pr Logix Designer Pr	1,986 K 1,935 K
Computer			III		,
	File name:	Safety_Application.ACD		•	Import
Network	Files of type:	Logix Designer Project Files (* ACD)		•	Cancel
					Help
Revision From: 28.1 To: 31	1				Help

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.



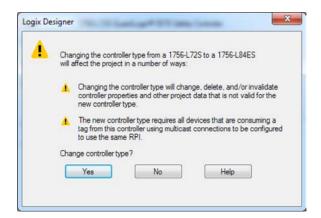
- 3. Change the GuardLogix 5570/Compact GuardLogix 5570 controller to a GuardLogix 5580/Compact GuardLogix 5580 controller.
- **IMPORTANT** If you change from a GuardLogix 5570 safety controller with a SIL 3/PLe application to a Compact GuardLogix 5380 controller, the application changes to SIL 2/PLd.
 - If you change from a GuardLogix 5570 safety controller with a SIL 3/PLe application to a 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.

ontroller Organizer 🛛 👻 🕂 🗙	3 Controller Pro	perties - Safe	ty_Application					×
Controller Safety, Application Controller Safety, Application Assets Cogical Model D'Configuration D'D'Son D'Stafety, Application D'D'Son D'Stafety, Application B'D'Son D'D'Son D'D'Son D'Son D'D'Son D'Son D'D'Son D'	Safety General Vendor: Type: Revision: Name: Description: Chassis Type: Slot:	Major Faults Rockwell Aut	volatile Memory Minor Faults tomation/Alem-Bradie JuardLogix® 5570 Saf ication 7-Slot ControlLogix C Safety Partner Slo	ety Controller	Advanced	Curty SFC Ex	Aiam Aiam Aiam Aiam Aiam Aiam Aiam Aiam	Project
				ОК	Cancel		pply 📄 💼	Help

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

	roller properties and roller type.	other project data that is not valid for the new
From Type:	1756-L72S	GuardLogix® 5570 Safety Controller
Software Version:	31.00	
То		
Type:	1756-L84ES	GuardLogix® 5580 Safety Controller
Software Version:	31.00 💌	

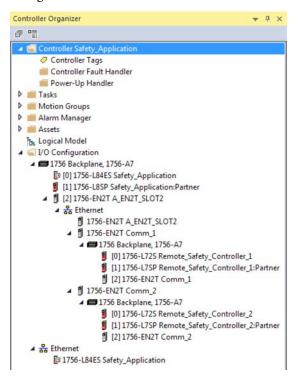
c. On the confirmation dialog, read the and be aware of the warning messages.



- 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.

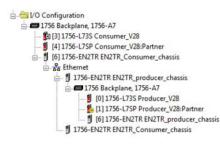
The data appears properly, but there is a yellow yield sign (signifying a fault) next to the partner because the partner does not exist. Since there are no singleslot safety controllers available in the Studio 5000 Logix Designer application version 28, you cannot resolve the issue by selecting another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

Here is the fault for the non-existent partner:

- 🔤 Add-On Instructions	Module Properties Report: EN2TR_producer_chassis:1 (1756-L7SP 28.001)	×
⊣	General Connection Module Info Backplane	
	Requested Packet Interval (RPI): 0 + ms	
[0] 1756-L73S Producer_V28	Module Fault	
 [1] 1756-L7SP Producer_V28:Partner [6] 1756-EN2TR EN2TR_EN2TR_producer_chass [1] 1756-EN2TR EN2TR_Consumer_chassis 	(Code 16#0204) Connection Request Error: Connection request timed out.	
	Status: Faulted OK Cancel Apply	Help

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.



田 [][[]]	5 IB IB	abed ab a	6 	1.	сні (Х	14	Ъ	¥.	₩	¥	顿	*/	∛	0)-	
0								Ci In: At	et Sys ass N stance ttribute burce	ame e Nar e Nar	Value ne P		<u> </u>	Module Partner Mode rce_tag 4 ¢	

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.

Standard	Application	Conversion
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Topic	Page
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Late Binding of I/O Data	103
I/O Data Manipulation	104
Motion Applications	105
Pending Edits	107

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 and Compact GuardLogix 5380 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 <u>1756-RM084</u>.
- Logix 5000 Controllers Import/Export Project Components Programming Manual, publication <u>1756-PM019</u>.

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. <u>Table 14</u> provides more information.

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		Verify that one of the following exists:			
or later		• 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	CompactLogix 5380	Verify that one of the following exists:			
or later	controller, version 28 or later	• 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. 			

Table 14 - Proper Configuration of Multicast Consumers of a Produced Tag

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

Name:	Sample	Data_Structure		Data Type Size: 16 by	tes 🗠	Properties 👻		
					- 12	Extended Propert	ies	
escription:			Used for Produced / Consumed Tags		E	General Data Type Siz	ε 16 byte	
/lembers:						Description	Used for Produ	
Nam	e	Data Type	Description			Name	Sample_Data_Str	
Elem	ent_1	DINT			*			
Elem	ent_2	DINT						
Elem	ent_3	LINT						
🙀 A	dd Membe	er						
					Ŧ			
			OK Cancel	Apply				

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

🔛 Data Typ	e: UD	T								-	×
Name:	I.	UDT					Data Type Si	ze: 40 hytes	Properties		т Ц
		bata type size: 40 bytes						Extended Properti	es	•	
Description	n:				a LINT in a				General		
				5580	Project				Data Type	INT	
Members:									Description		
A N	ame		Data Type	Description					External Acces		•
Lin	mitA		BOOL					*	Name	Interlock	
Lii	mitB		BOOL						Style	Decimal	•
Pr	ofile		REAL[3]								
In	terlock	k	INT								
м	yLint		LINT								
Sp	beed		REAL								
	Add	Member									
10											
								-			
					ОК	Cancel	Apply	Help			
J					JK	cuncer		ricip			

<u>Table 15</u> 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 15 - Data Structure for Logix Designer Projects, Version 26 or Earlier

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

<u>Table 16</u> 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.

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

Table 16 - Hidden Padding Added for Logix Designer Projects, Version 27 or Later

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

lame: UE	T			Data Type Size: 40 bytes	Properties		Ŧ
				Data Type Size. 40 bytes	Extended Properti	es	
escription:			h a LINT in a		🖻 General		
		558	0 Project		Data Type	DINT	
lembers:					Description		
Name	Data Type	Description			External Acces		
LimitA	BOOL			*	Name	UnusedDint2 Decimal	2
LimitB	BOOL				Style	Decimal	
Profile	REAL[3]						
Interlock	INT						
UnusedDi	nt1 DINT						
MyLint	LINT						
Speed	REAL						
UnusedDi	nt2 DINT						
🐐 Add M	lember						
			OK Cance	Apply Help			

<u>Table 17</u> illustrates how this data structure maps in all types of Logix 5000 controller projects:

Table 17 - Memory Map in All Project Types

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

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 <u>Instruction Error and Fault Changes on</u> page 122.

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 (64bit) 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 singlebit 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 "790954 - Invalid data type error when using 5069 I/O modules" for a suitable migration path forward.

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 18 describes the motion networks that are available.

Table 18 - 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 19 - New Axis Menu

5580 Controllers Version	5570 Controllers			
Alarm Manage Assets Logical Model ✓ U/O Configurat ✓ U/O Configurat ✓ U/O Configurat ✓ U/O Configurat ✓ ① Copy Ctrl+C ⓒ [0] 1756 ② Paste Ctrl+V ✓ ☆ Ethernet ⓒ 1756-L85E V31_Project	AXIS_CONSUMED AXIS_SERVO AXIS_SERVO_DRIVE AXIS_GENERIC AXIS_GENERIC_DRIVE AXIS_CIP_DRIVE AXIS_VIRTUAL	Motion Groups Motion Groups Add-On Instr Data Types User-Defin Strings Add-On-t Paste Module-Defined Trends	System Ctrl+X Ctrl+C Ctrl+V	AXIS_CONSUMED AXIS_SERVO AXIS_SERVO_DRIVE AXIS_GENERIC AXIS_GENERIC_DRIVE AXIS_CIP_DRIVE AXIS_VIRTUAL

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

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 20 axes of integrated motion. The number of axes that a controller supports is based on the Ethernet node limit for the specific controller. The 20 axes can be any combination of the following axis types:

- CIP As many as 20 Position Loop axes are supported
- Virtual

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.

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

Motion Groups			
Ungrouped	New Axis	N Y	AXIS_CONSUMED
Add-On Instru	New Coordinat	e System	AXIS_SERVO
User-Defin X	Cut	Ctrl+X	AXIS_SERVO_DRIVE
Strings	Сору	Ctrl+C	AXIS_GENERIC
Add-On-D	1.2	Ctrl+V	AXIS_GENERIC_DRIVE
⊕ 🙀 Predefined	- usee	Carry	AXIS_CIP_DRIVE
	d		AXIS_VIRTUAL
intends			- 1 30 H

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.

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.

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

Pending Edits

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

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 <u>Table 20</u>.

Table 20 - 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

Торіс	Page
Math-related Instructions	110
Structural Changes to Execution	116
Instruction Error and Fault Changes	122
Operand Changes	134
Copy/File Instructions	135
GSV/SSV Instructions	139
MCT/MCTP Instructions	140

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 and Compact GuardLogix 5380 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:

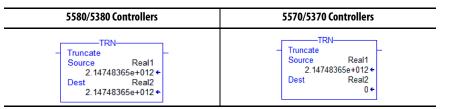
- <u>TRN Instruction Changes</u>
- Improved Math Instruction Accuracy
- <u>SQR/SQRT Adjustment</u>
- <u>X Mod 0</u>
- AND, NOT, OR, and XOR Support for REAL
- Floating Point Literals
- <u>XPY Instruction</u>
- <u>0.0 div 0.0</u>

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

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.



Mitigation

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

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

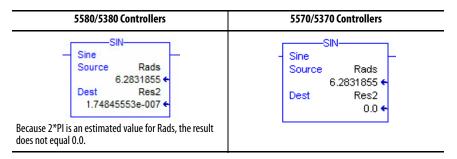
Improved Math Instruction Accuracy

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 polynomial algorithm to an industry-standard algorithm. 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.



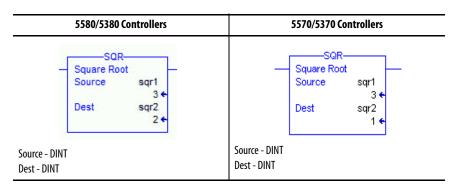
Mitigation

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

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.





N/A

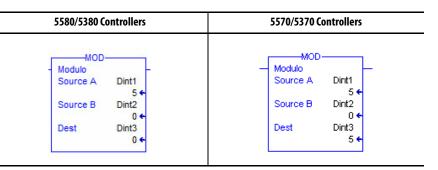
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes

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

X Mod 0

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.



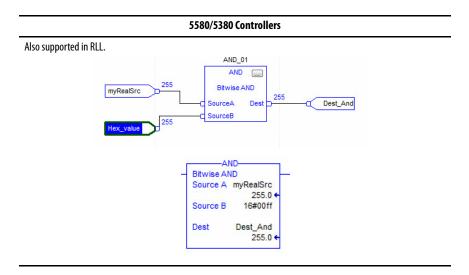
Mitigation

N/A

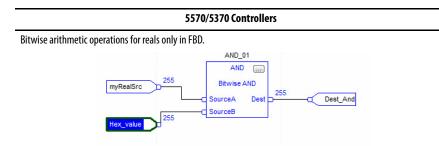
AND, NOT, OR, and XOR Support for REAL

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.

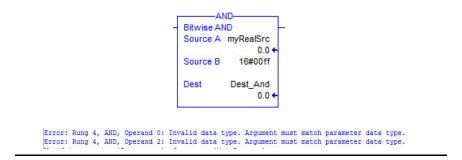
This implementation helps to make programming for these instructions consistent across all languages.



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



When used in RLL, you get this error: 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.

5580/5380 Controllers

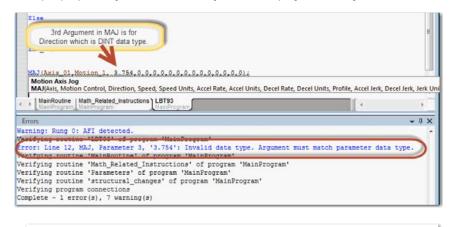
If an instruction only verifies with tags of type DINT, it also only verifies with literal values that are Integers.

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

Affected

Yes

Yes

Yes Yes⁽¹⁾

Language Ladder Logic (RLL)

Structured Text (ST)

Function Blocks (FBD)

Sequential Function Chart (SFC) Yes (1) Only affects embedded Structured Text.

This implementation mate	hes the indı	ustry standa	ard bel	navior f	or raising X to
the power of Y.					

5580/5380 Coi	ntrollers	5570/5370 Controllers	
XPY- X To Power O Source X Source Y Dest	DfY RL1 0.0 ← RL2 0.0 ← RL3 1.0 ←	XPY - X To Power Of Y Source X RL1 0.0 ← Source Y RL2 0.0 ← Dest RL3 1.#QNAN ←	_
XPY- X To Power O Source X Source Y Dest	OfY - RL1 -2.0 ← RL2 3.0 ← RL3 -8.0 ←	XPY X To Power Of Y Source X RL1 -2.0 € Source Y RL2 3.0 € Dest RL3 8.0 €	_

Mitigation

N/A

0.0 div 0.0

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.	
DIV Divide Source A Real_1 0.0 ← Source B Real_2 0.0 ← Dest Dest 1.#QNAN ←	DIV Divide Source A Real_1 0.0 ← Source B Real_2 0.0 ← Dest Dest 1.\$ ←	

Mitigation

Inspect your applications for the Divide operation and correct accordingly.

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

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
- <u>Max Number of InOut Parameters for an Add-On Instruction</u>
- Jump to Label Must Be Present
- <u>MCR Placement</u>
- 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.

5580/5380 Controllers	5570/5370 Controllers					
1 major fault since last cleared. Recent Faults:	1 major fault since last cleared. Recent Faults:					
1/19/2015 5:56:57 PM (Type 04) Program Fault (Code 94) Nesting limits exceeded. Task: MainTask Program: MainProgram Routine: structural_changes Location: Rung 4	1/4/1998 3:19:48 AM (Type 04) Program Fault (can be trapped by a fault routine) (Code 24) Stack overflow. Stack too small to perform operation. Task: MainTask Program: MainProgram Routine: structural_changes Location: Rung 4					

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⁾

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.

JSR Routine Name Parameters Input Par P1 Input Par P2 Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7 Input Par P9 Input Par P9 Input Par P10 Input Par P11	Jump To Subroutine Routine Name Parameters Input Par P1 Input Par P2 Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P6 Input Par P8
Input ParP1Input ParP2Input ParP3Input ParP4Input ParP5Input ParP6Input ParP7Input ParP8Input ParP9Input ParP10Input ParP11	Input Par P1 Input Par P2 Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7
Input Par P2 Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P2 Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7
Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P3 Input Par P4 Input Par P5 Input Par P6 Input Par P7
Input Par P4 Input Par P5 Input Par P6 Input Par P7 Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P4 Input Par P5 Input Par P6 Input Par P7
Input Par P5 Input Par P6 Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P5 Input Par P6 Input Par P7
Input Par P6 Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P6 Input Par P7
Input Par P7 Input Par P8 Input Par P9 Input Par P10 Input Par P11	Input Par P7
Input Par P8 Input Par P9 Input Par P10 Input Par P11	
Input Par P9 Input Par P10 Input Par P11	input Par Po
Input Par P10 Input Par P11	Input Par P9
Input Par P11	Input Par P10
	Input Par P11
	Input Par P12
Input Par P12	Input Par P13
Input Par P13	Input Par P14
Input Par P14 Input Par P15	Input Par P15
	Input Par P16
Input Par P16 Input Par P17	Input Par P17
Input Par P18	Input Par P18
Input Par P19	Input Par P19
Input Par P20	Input Par P20
Input Par P21	Input Par P21
Input Par P22	Input Par P22
Input Par P23	Input Par P23
Input Par P24	Input Par P24
Input Par P25	Input Par P25
Input Par P26	Input Par P26
Input Par P27	Input Par P27
Input Par P28	Input Par P28 Input Par P29
Input Par P29	Input Par P29 Input Par P30
Input Par P30	Input Par P30
Input Par P31	Input Par P31
Input Par P32	Input Par P33
Input Par P33	Input Par P34
Input Par P34	Input Par P35
Input Par P35	Input Par P36
Input Par P36	Input Par P37
Input Par P37 Input Par P38	Input Par P38
	Input Par P39
Input Par P39 Input Par P40	Input Par P40
Input Par P40	Input Par P41
Input Par P41	Input Par P42
Input Par P43	Input Par P43
least Dec D44	Input Par P44
	Input Par P45

Mitigation

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⁾

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							
Logix De	signer		₽	ken Run Io Forces Io Edts	Run Mode Controller OK Gonzoller OK Resert	· ·		0E HE K) (0) (1)			
1	Failed to save of The number of	changes. InOut parameters exceeds	maximum 40.		toller Instruction_Testing_	* # X	General Parameter	Local Tags	Scan Modes	Sgrad		
					introller Fags introller Fault Handler		Name + A21	Usage	Data Type DINT	Ala		
		011		- Pa	wer-Up Handler		+ A22	hOut	DINT			
		OK Help		E Cartasks			+ A23	NOR	DINT			
					ein Task			hOut	DINT			
	-						+ A24	20,08				
Error 10132					MainProgram	1997	+ A24 + A25	and a	DINT			
					MainProgram	Tags			DINT			
Error 10132 A37	InOut	DINT			MainProgram	l Tags	+ A25	InOut	DINT			

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:	Previously, controllers let you continue to nest until they ran out of stack space and faulted.
• Logix Designer application, version 28 or earlier - 25	
Logix Designer application, version 29 or later - 16	

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

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 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.			
The controllers now require the label to exist before:Downloading if working offline.Accepting edits if working online.				
1 🐼 Label_1	1 major fault since last cleared. Recent Faults: 1/4/1998 3:32:57 AM (Type 04) Program Fault (can be trapped by a fault routine) (Code 42) JMP to a label that did not exist or was deleted. Task: Main Task Program: MainProgram Routine: structural_changes Location: Rung 0			

Mitigation

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

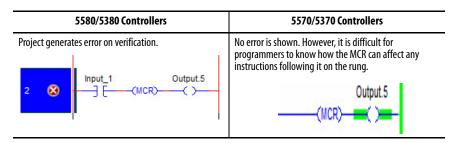
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	No
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

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

MCR Placement

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.



Mitigation

N/A

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

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.

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

5580/5380 Controllers									5570/5370	Controlle	ers		
Data Typ	oe Size - 32 bytes						Data Type	e Size - 24 bytes					
	'S:	Type Descripti	acking in L8	Datz	n Type Size: 3	22 bytes	F S E E E E			packing in L7		Type Size: 24	E
Word	Elements	5580/5380 cor Data Type	80/5380 controllers - 64-Bit Boundary Word Ele					Elements	5570/5370 co Data Type	0 controllers - 32 Bit Boundary Mapping Table (8 bits each column			
0	My_DINT	DINT	MAP	MAP	MAP	MAP	0	My_DINT	DINT	MAP	MAP	MAP	MAP
•			-		-		-						
-	Padding Bytes		PAD	PAD	PAD	PAD	1	Large_Value	LINT	MAP	MAP	MAP	MAP
1	Padding Bytes Large_Value	LINT	PAD MAP	PAD MAP	PAD MAP	PAD MAP	1 2	Large_Value	LINT	MAP MAP	MAP MAP	MAP MAP	MAP MAP
1 2	<i>,</i>	LINT		-	_			Large_Value Big_Value	LINT DINT				_
1 2 3	<i>,</i>	LINT DINT	MAP	MAP	MAP	МАР	2			MAP	MAP	MAP	MAP
1 2 3 4	Large_Value		MAP MAP	MAP MAP	MAP MAP	MAP MAP	2	Big_Value Float_Value Small_Value	DINT REAL INT, SINT,	MAP MAP	MAP MAP	MAP MAP	MAP MAP
1 2 3 4 5 6	Large_Value Big_Value	DINT	MAP MAP MAP	MAP MAP MAP	MAP MAP MAP	MAP MAP MAP	2 3 4	Big_Value Float_Value	DINT REAL	MAP MAP MAP	MAP MAP MAP	MAP MAP MAP	MAP MAP MAP

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

Mitigation

See <u>Produce and Consume Tags on page 96</u>, 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 97.

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:

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

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

Subscript Expressions

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 ⁽¹⁾
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	No

 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.

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
Compute Dest Resultint -32768 € Expression TRN(32768.12345)	Compute Dest Resultint -22768 ← Expression TRN(32768.12345)
s:fs s:n n] [] [
s:fs s:z z] [] [(L)	Z
s:fs s:c c	ů
s.fs s.v v [[

Mitigation

N/A

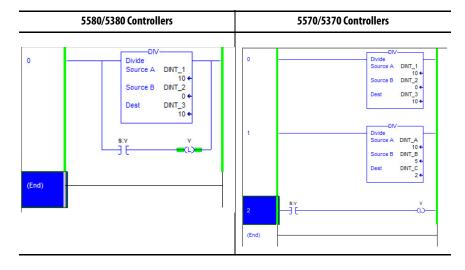
Math Status Flags are Valid Only in One Rung

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.



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.

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

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

AVE and STD Instruction Accuracy

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
Average File Array AR1 Dim. To Vary 0 Dest AR1(8) 1000000000 Control AVE_control Length 3 Position 2	AVE Average File Array AR1 Dim. To Vary 0 Dest AR1[8] -431655776 ← (ER) Control AVE_control Length 3 ← Position 2 ← (Type 04) Program Fault (Code 04) Anthmetic overflow. Result of an arithmetic instruction out of range. Task: Main Task Program: Main Task Program: Main Program Routine: Inst_Error faulting_changes Location: Rung 9

Mitigation

N/A

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

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
FAL Control control_1 Length 10 (DN) Position 0 (Mode ALL Dest AR2_INT -32768 (Expression TRN(32768.125)	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. File Arith/Logical Control_1 Length 10 (CN)- Position 0 (CN)- Position 0 (CN)- Dest AR2_INT[control_1-POS] Expression TRN(32768.125) 1/3/1998 7.47.09 PM (Type 04) Program Fault (Code 04) Arithmetic overflow. Result of an arithmetic instruction out of range. Task: Main Task Program: MainProgram Routine: Intel_Forg_Jauling_changes Location: Rung 4

Mitigation

N/A

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

Math Status Flags Not Permitted in Structured Text

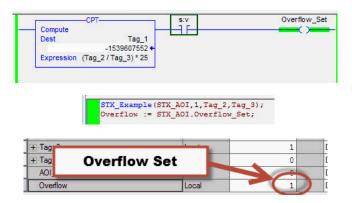
Math status flags are no longer permitted in ST. Use of math status flags in ST fails verification.

This implementation affects all math status producer/consumer instructions.

5580/5380 Controllers	5570/5370 Controllers
Tag_1:=(Tag_2/Tag_3)* 25; JELS:V)JARR.	<pre>Tag_1:=(Tag_2/Tag_3)* 25; IF(S:V)Then</pre>
Status_Flag := 1;	Status_Flag := 1;
Else	Else
Status_Flag:=0;	Status_Flag:=0;
End_If;	End_IF;
Verifying routine 'LET93' of program 'MainProgram'	
Error: Line 2: Math status flag can only be used within Ladder routines.	

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)	No
Structured Text (ST)	Yes
Function Blocks (FBD)	No
Sequential Function Chart (SFC)	Yes ⁽¹⁾

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.

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
S:V S:V S:V S:V S:V -(L)(L)(L)(L)	S:V S:V S:V S:V S:V -(L)(L)(L)(L)(L)(L)
5 minor faults since last cleared. Recent rauts: 1/19/2015 10:59:31 AM (Type 04) Program Fault (Code 04) Arithmetic overflow. Result of an arithmetic instruction out of range. Task: MainTask	3 minor faults since last cleared. Recent Faults: 1/3/1998 8:22:35 PM (Type 04) Program Fault (Code 04) Arithmetic overflow. Result of an arithmetic instruction out of range. Task: Main Task Program: MainProgram

Mitigation

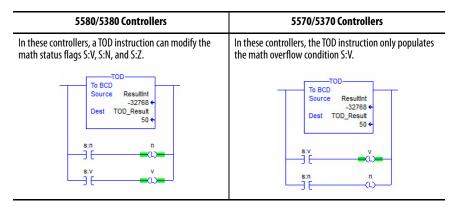
N/A

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

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.

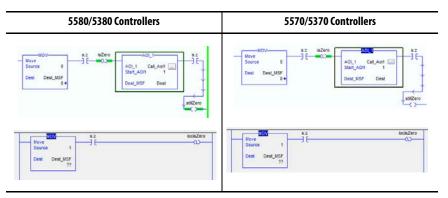


Mitigation

N/A

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.



Mitigation

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

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

Subroutines Do Not Affect Math Status Flags

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	
Work 0 3 4.5 are 4.5 are Stayce 0 3 5	- United Desk, MSP Desk Desk, MSP Let Desk, MSP	
Nove 1 Conception	How Source 1 Deal Deal, NS7 77	

Mitigation

N/A

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

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.
Compute Dest Res_INT Expression IntA + 10000000.0 s:c c F (1)	Compute Dest Res_INT 5759 + Expression IntA + 1000000.0

Mitigation

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

Store NAN in an Integer

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.
MOV- Source Res4 1.#QNAN ← Dest INT_18 0 ←	MOV- Source RL3 1.#QNAN ← Dest INT_18 -1 ←

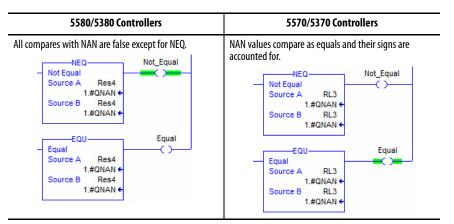
Mitigation

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

Compare NAN Values

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.



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.

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

Affected

Yes

Yes

Yes Yes⁽¹⁾

Language

Ladder Logic (RLL)

Structured Text (ST)

Function Blocks (FBD)

Sequential Function Chart (SFC)

Operand Changes

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.

This section describes the changes to operands.

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

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 -1 value whereas - infinity is stored as 0 in an integer.	
Writing infinity to an integer is the MAX signed value that is permitted.		
ADD Add Source A Inf_1 1.\$ ← Source B Inf_2 1.\$ ← Dest Add_Res_INT 32767 ←	Add Source A Inf_1 1.\$ Source B Inf_2 1.\$ Dest Add_Res_INT -1	

Mitigation

N/A

Copy/File Instructions

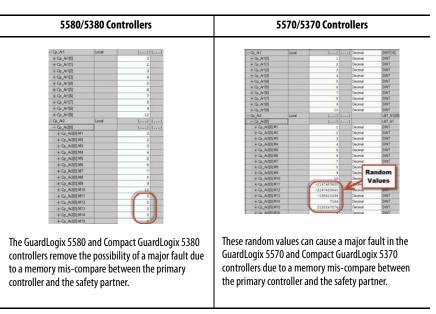
This section describes the changes to copy/file instructions that apply to the following:

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

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).



Mitigation

N/A

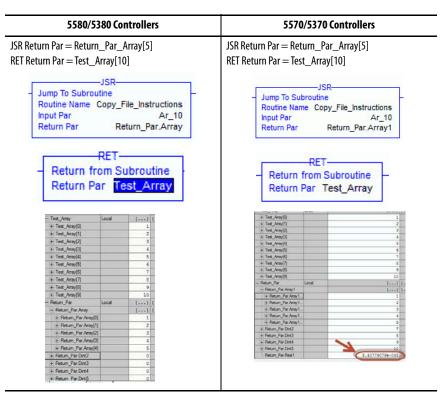
Language	Affected
Ladder Logic (RLL)	Yes
Structured Text (ST)	Yes
Function Blocks (FBD)	Yes
Sequential Function Chart (SFC)	Yes ⁽¹⁾

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.



Mitigation

N/A

JSR passing Atomic Data type into an Array or Structure

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.

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
JSR Jump To Subroutine Routine Name MySubRoutine Input Par MyAtomic	JSR – Jump To Subroutine Routine Name MySubRoutine Input Par MyAtomic
SBR- Subroutine Input Par MyArray	-SBR
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[2] = 100 MyArray[2] = 100 MyArray[3] = 100 MyArray[4] = 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. If the destination array is real array, real_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[2] = 100 MyArray[3] = 100 MyArray[6] = 100 MyArray[6] = 100 If MyArray = SINT structure After the copy MyArray[1] = 100 MyArray[1] = 100 MyArray[2] = 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 MyAtomic (DINT) = -1
If MyArray = SINT structure	If MyArray = SINT structure
After the copy	After the copy
MyArray[0] = -1	MyArray[0] = -1
MyArray[1] = -1	MyArray[1] = 100
MyArray[2] = -1	MyArray[2] = 100
MyArray[3] = -1	MyArray[3] = 100
MyArray[4] = 100	MyArray[4] = 100
MyArray[5] = 100	MyArray[5] = 100
MyArray[6] = 100	MyArray[6] = 100
My/may[0] = 100	If MyAtomic (DINT) = -1
If MyAtomic (DINT) = -1	If MyArray = Bool structure
If MyArray = Bool structure	
After the copy	After the copy
MyArray[0] = 1	MyArray[0] = 1
MyArray[1] = 1	MyArray[1] = 0
MyArray[2] = 1	MyArray[2] = 0
MyArray[3] = 1	MyArray[3] = 0
MyArray[4] = 1	MyArray[4] = 0
MyArray[5] = 1	MyArray[5] = 0
MyArray[6] = 1	MyArray[6] = 0
MyArray[7] = 1	MyArray[7] = 0
MyArray[8] = 1	MyArray[8] = 0
MyArray[9] = 1	MyArray[9] = 0
MyArray[10] = 1	MyArray[10] = 0
MyArray[11] = 1	MyArray[11] = 0
MyArray[12] = 1	MyArray[12] = 0
MyArray[13] = 1	MyArray[13] = 0
·····	
MyArray[31] = 1	MyArray[31] = 0

Mitigation

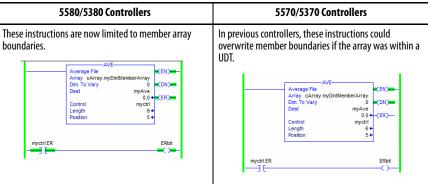
N/A

Instructions That Operate On Arrays

Language	Affected	instructions attempt to access j bit and abort the operation.
Ladder Logic (RLL)	Yes	
Structured Text (ST)	No	AVE, BSL, BSR, DDT, FBC, I

Instruction actions are limited to member array boundaries. If any of these past the end of a member array, they set the ER

FFL, FFU, LFL, LFU, SQL, SRT, and STD now respect boundaries when reading.



Mitigation

N/A

GSV/SSV Instructions

Function Blocks (FBD)

Sequential Function Chart (SFC)

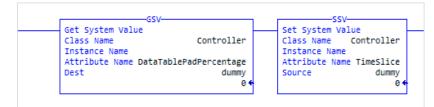
No

No

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:

- <u>Controller Status Display and Indicators on page 141</u>
- Controller Web Pages on page 143

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 <u>1756-UM543</u>.

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.

IMPORTANT The 5570 controllers do not provide controller web pages because they do not have a built-in Ethernet port.

To access the diagnostic web pages, follow these steps.

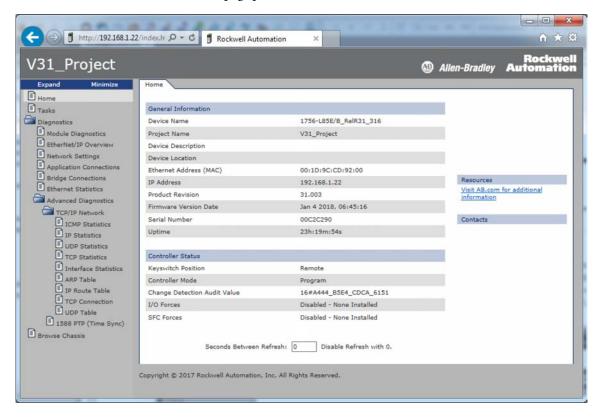
- 1. Open your web browser.
- 2. In the Address field, type the IP address of the controller and press Enter.

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.

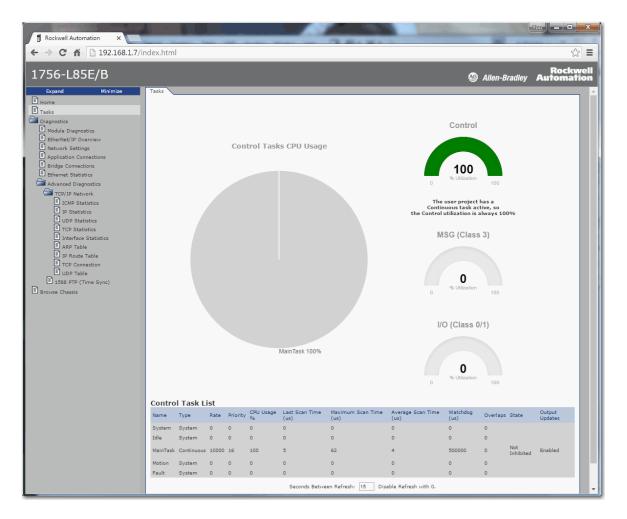
Home Web Page

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

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1756-L85E/B			 	Rockwell Automation
Expand Minimize Home Tasks Diagnostics Module Diagnostics EtherNet/IP Overview Network Settings Application Connections Bridge Connections Bridge Connections Ethernet Statistics Advanced Diagnostics C/J/IP Network ICMP Statistics IDP Statistics IDP Statistics TOP Statistics Interface Statistics Interface Statistics IP Route Table TCP Connection	Module Diagnostics EtherNet/IP Overview Module Resource Utilization (All Ports) I/O Comms Utilization (Actual) I/O Comms Utilization (Actual) I/O Comms Utilization (All Ports) Active Total Active Messaging Active I/O Maximum Total Observed	0.1 % 0.1 % 4 1 3 4 Seconds Between Refresh	Ethernet Statistics	
UDP Table 1588 PTP (Time Sync) Browse Chassis				

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)

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5_application		Allen-Bradi	ey Automat
Expand Minimize			
ome	ICMP Statistics		
isks	In messages		1
agnostics	In errors In destination unreachable		0
Module Diagnostics	In destination unreachable In time exceeded		1
EtherNet/IP Overview			0
Network Settings	In parameter problems In source guenches		0
Network Settings	In source quenches In redirects		0
Application Connections	In redirects		0
Bridge Connections	In echo responses		0
Ethernet Statistics	In timestamps		0
Advanced Diagnostics	In timestamp responses		0
TCP/IP Network	In address masks		0
ICMP Statistics	In address mask responses		0
IP Statistics	Out messages		5
UDP Statistics	Out errors		0
ODP Statistics	Out destination unreachable		1
TCP Statistics	Out time exceeded		0
Interface Statistics	Out parameter problems		0
ARP Table	Out source guenches		0
IP Route Table	Out redirects		0
TCP Connection	Out echos		0
UDP Table	Out echo responses		0
1588 PTP (Time Sync)	Out timestamps		0
owse Chassis	Out timestamp responses		0
owse Chassis	Out address masks		0
	Out address mask responses		0
		Seconds Between Refresh: 15 Disable Refresh with 0.	

Browse Chassis Web Page

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

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L85_application				🚇 Allen-Bradley	Rockwell Automation
Expand Minimize	Browse Ch			_	
Tasks	Slot 00	Module	Rev		
Browse Chassis	>> 🖞 01	<u>1756-L85E/B</u>	28.013		
	1 02	1756-IF6I/A AAAAAA	1.012		
	1 03	1756-OF6VI/A XXXXXX	1.012		
	1 04	1756-IB16D/A DCIN DIAG	2,004		
] 05	1756-OB16D/A DCOUT DIAG	2.003		
	1 06	1756-EN2TR/C 217021900	10.007		
	07				
	08	<u>1756-CN2R/B</u>	20.020		
	9 09	1756-CN2R/B	20.020		
	Copyright ©	2015 Rockwell Automation, Inc. All Rights	Reserved.		

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L85_application			🚇 Allen-Bradley	Rockwell Automation
Expand Minimize Home Tasks Diagnostics	Browse Chassis Module Information Module Information: Slot 2			
Browse Chassis	Product Name Vendor Product Type	1756-IF6I/A AAAAAA 1 10		
	Product Code Module Revision	1 1.012		
	Serial Number Module Status	002E8299 Minor recoverable fault		
	Copyright © 2015 Rockwell Automation, In	nc. All Rights Reserved.		

Notes:

Diagnostics and Status Indicators with CompactLogix Systems

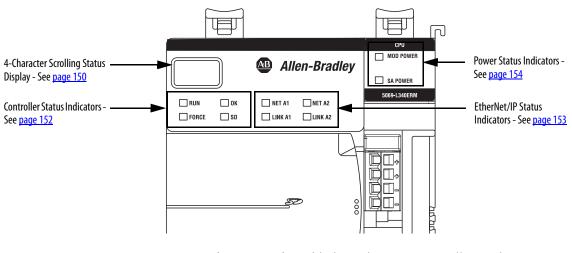
This chapter features these controllers, and where applicable, the controllers are known as:

Controller Family	Includes these controllers
5380 controllers	CompactLogix [™] 5380 and Compact GuardLogix [®] 5380 controllers
5370 controllers	CompactLogix 5370 and Compact GuardLogix 5370 controllers

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:

- <u>Controller Status Display and Indicators on page 150</u>
- <u>Controller Web Pages on page 155</u>

Controller Status Display and Indicators

The 5380 controllers provide the following:

- <u>4-Character Display</u>
- <u>Controller Status Indicators</u>
- EtherNet/IP Status Indicators
- <u>Power Status Indicators</u>

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.

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.
SavingDo 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 21 - General Status Messages

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 Ax 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 Ax 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 21 - General Status Messages (continued)

Table 21 - 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 <u>http://www.rockwellautomation.com/support/</u> 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 <u>http://www.rockwellautomation.com/support/</u> 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 22 describes the MOD Power indicator on a 5380 controller.

Table 22 - 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 23 describes the SA Power indicator on a 5380 controller.

Table 23 - 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.

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.

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.

	SIL2_Test			Allen-Bradley Autom
	Expand Minimize	Home General Information		_
	Diagnostics	Device Name	5069-L3100ERMS2/A_RelR31_724	
	Module Diagnostics	Project Name	SIL2_Test	
	Application Connections	Device Description		
	Bridge Connections	Device Location		
	Ring Statistics	Product Revision	31.011	
	Ethernet Port A1/A2	Firmware Version Date	Mar 8 2018, 04:49:46	Resources
	Diagnostic Overview	Serial Number	6099AA87	Visit AB.com for additional
DLR Mode	Network Settings Ethernet Statistics	Uptime	00h:03m:26s	information
	Advanced Diagnostics	Port A1/A2 Ethernet Address (MAC)	F4:54:33:98:20:86	Contacts
	ICMP Statistics	Port A1/A2 IP Address	192.168.1.11	
	UDP Statistics	Controller Status		
	TCP Statistics	Keyswitch Position	Remote	
	TCP Connection	Controller Mode	Program	
	UDP Table	Change Detection Audit Value	16#E588_9D12_32C8_5788	
	Ethernet Port A1/A2	I/O Forces	Disabled - None Installed	
	Interface Statistics ARP Table IP Route Table	SFC Forces	Disabled - None Installed	
	ISBB PTP (Time Sync) Browse Chassis	Seconds Between	Refresh: 0 Disable Refresh with 0.	

SIL2_Test			Allen-Bradley Autom
Expand Minimize	Home		
Home Tasks	General Information		
Diagnostics	Device Name	5069-L3100ERM52/A RelR31_724	
Module Diagnostics	Project Name	Sil2_Test	
Application Connections	Device Description	olle_Test	
Bridge Connections	Device Location		
Ripe Clatitics	Product Revision	31.011	
Ethernet Port A1	Firmware Version Date	Mar 8 2018, 04:49:46	
Diagnostic Overview	Serial Number	6099AA87	
Network Settings	Uptime	00334467	Resources Visit AB.com for additional
Ethernet Statistics	Optime	Call and the Call of C	Visit Ab.com for additional information
Ethernet Port A2	Port A1 Ethernet Address (MAC)	F4:54:33:98:20:86	
Diagnostic Overview	Port A1 Ethernet Address (MAC) Port A1 IP Address		Contacts
Network Settings		192.168.1.11 F4:54:33:98:20:87	
Ethernet Statistics	Port A2 Ethernet Address (MAC) Port A2 IP Address		
Advanced Diagnostics	Port A2 IP Address	192.168.2.12	
TCP/IP Network	Controller Status		
IP Statistics	Keyswitch Position	Remote	
UDP Statistics			
TCP Statistics	Controller Mode	Program	
TCP Connection	Change Detection Audit Value	16#AEE7_7600_D871_47C9	
DODP Table	1/O Forces	Disabled - None Installed	
Ethernet Port A1	SFC Forces	Disabled - None Installed	
Interface Statistics			
ARP Table	Seconds Betwee	en Refresh: 0 Disable Refresh with 0.	
IP Route Table			
Ethernet Port A2	Copyright @ 2017 Rockwell Automation, Inc. Al	Rights Reserved.	
Interface Statistics ARP Table	sopp pro graver reserves restanting berry arres res		

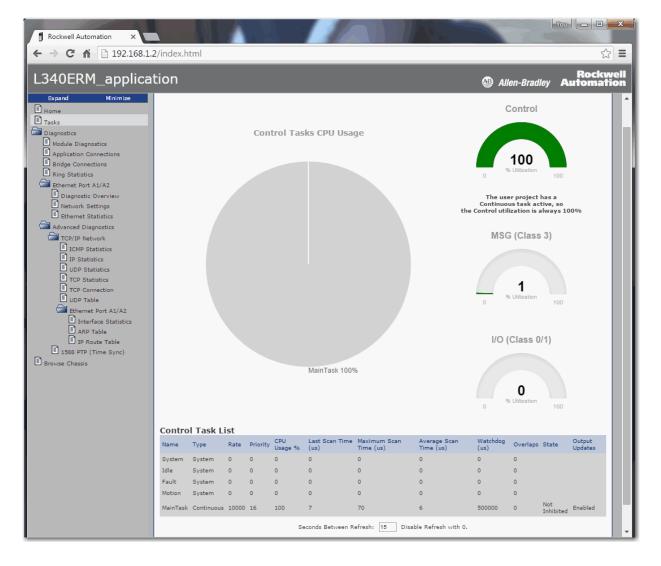
Dual-IP Mode

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

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L340ERM_applica	tion			🚇 Allen-Bradley	Rockwell Automation
Expand Minimize	Module Diagnostics Application Connecti	ons 🔪 Bridge Connections 🔍 Ring St	atistics		
Tasks	Module Resource Utilization (All Ports) I/O Comms Utilization (Actual)	0.5 %			
Module Diagnostics	I/O Comms Utilization (Theoretical)	0.5 %			
Bridge Connections	CIP Connection Statistics (All Ports)				
Ring Statistics	Active Total	6			
	Active Messaging	1			
Diagnostic Overview Network Settings	Active I/O	5			
Ethernet Statistics	Maximum Total Observed	7			
Advanced Diagnostics		Seconds Between Refresh: 15	Disable Refresh with 0.		
TCP/IP Network					
ICMP Statistics					
	Copyright © 2015 Rockwell Automation, Inc.	All Rights Reserved.			
UDP Statistics TCP Statistics					
TCP Connection					
UDP Table					
Ethernet Port A1/A2					
Interface Statistics					
ARP Table					
IP Route Table					
1588 PTP (Time Sync)					
Browse Chassis					

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

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Expand Minimize	Diagnostic Overview Network Settin	ngs Ethernet Statistics		
Home Fasks	TCP Connections (EtherNet/IP Port)		HMI/MSG Connected (EtherNet/IP Port	\ \
Tasks Diagnostics	Active	2	Sent Packets Per Second	3
Module Diagnostics	Maximum Observed	2	Received Packets Per Second	3
Application Connections	Guaranteed	5	Sent Bytes Per Second	1500
Bridge Connections	Maximum Allowed	512	Received Bytes Per Second	598
Ring Statistics	Total Pool Size	512	Sent Packet Count	9197
Ethernet Port A1/A2	_		Received Packet Count	9197
Diagnostic Overview	HMI/MSG Unconnected (EtherNet/IP P	ort)		
Network Settings	Sent Packets Per Second	0	I/O and Prod/Cons Packets Per Second	(EtherNet/IP Port)
Ethernet Statistics	Received Packets Per Second	0	Total	428
Advanced Diagnostics	Sent Packet Count	122	Sent	214
TCP/IP Network	Received Packet Count	122	Received	214
IP Statistics				
UDP Statistics			I/O and Prod/Cons Packet Counts (Eth	erNet/IP Port)
TCP Statistics			Total	963537
TCP Connection			Sent	481772
UDP Table			Received	481765
Ethernet Port A1/A2			Rejected	0
 Interface Statistics ARP Table 			Missed	0
IP Route Table			Multicast Producers (EtherNet/IP Port)	
1588 PTP (Time Sync)			Active	0
Browse Chassis			Maximum Observed	0
			Maximum Supported	32
			Base Address	239.192.1.32

Linear/DLR Mode

- → C ⋒ 🗋 192.168.	1.2/index.html				
_340ERM_applic	ation			🚇 Allen-Bradley	Rock Automa
Expand Minimize	Diagnostic Overview Network Settin	gs Ethernet Statistics			
D Home Tasks	TCP Connections (EtherNet/IP Port)		HMI/MSG Connected (EtherNet/IP I		
	Active	0	Sent Packets Per Second	Port)	
Diagnostics	Active Maximum Observed	1	Received Packets Per Second	0	
Application Connections	Maximum Observed	1	Sent Bytes Per Second	0	
Bridge Connections		496		0	
Ring Statistics	Maximum Allowed Total Pool Size	496 512	Received Bytes Per Second Sent Packet Count	0	
Ethernet Port A1	Total Pool Size	512		0	
Diagnostic Overview	HMI/MSG Unconnected (EtherNet/IP Po	+)	Received Packet Count	0	
Network Settings	Sent Packets Per Second	0	I/O and Prod/Cons Packets Per Sec	and (Ethertick/ID Dert)	
Ethernet Statistics	Received Packets Per Second	0	Total	0	
Ethernet Port A2	Sent Packet Count	9	Sent	0	
Diagnostic Overview	Received Packet Count	9	Received	0	
Network Settings	Received Packet Count	,	Received	0	
Ethernet Statistics			I/O and Prod/Cons Packet Counts (EtherNet/IP Port)	
Advanced Diagnostics			Total	0	
TCP/IP Network			Sent	0	
ICMP Statistics IP Statistics			Bereived	0	
UDP Statistics			Rejected	0	
TCP Statistics			Missed	0	
TCP Connection			1125124		
UDP Table			Multicast Producers (EtherNet/IP Po	ort)	
Ethernet Port A1			Active	0	
Interface Statistics			Maximum Observed	0	
ARP Table			Maximum Supported	32	
IP Route Table			Base Address	239,192.1	.32
Ethernet Port A2					
Interface Statistics		Seconds Between Refre	sh: 15 Disable Refresh with 0,		
ARP Table		Seconds Between Kerre	ish: 15 Disable Kerresh with 0.		

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)

LS40ERM_application @ Allen-Bradley Auto	☆ E ockwell mation
LS40ERM_application @ Allen-Bradley Auto	ockwell mation
Toppondic Minimize Wrame In messages Diagnontic In messages Diagnontic In destination unreachable In messages In messages Module Diagnotics In messages Diagnotics In devise masks In messages Out messages Diagnotics Out devises mask responses Dup Patables Out devise quenches Dup Patable Out envise Dup Patable Out envise quenches Dup Patable Out devise masks	1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
Seconds Between Refresh: 15 Disable Refresh with 0. Seconds Between Refresh: 15 Disable Refresh with 0. Copyright © 2015 Rockwell Automation, Inc. All Rights Reserved.	

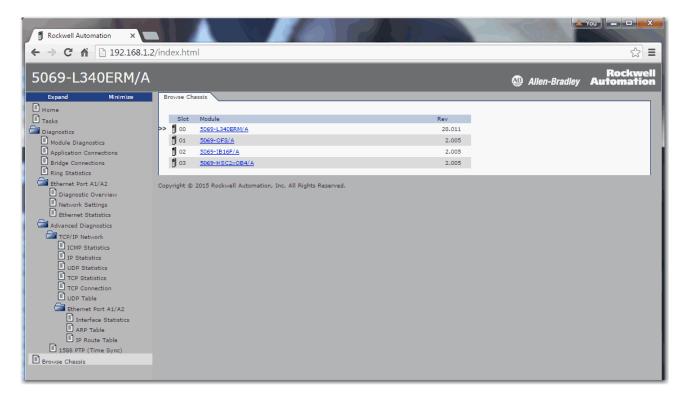
Linear/DLR Mode

L340ERM_applica	ition		🚇 Allen-Bradley	Rockv Automat
Expand Minimize				
Home	ICMP Statistics			
Tasks	In messages			1
Tasks	In errors			0
Diagnostics	In destination unreachable			1
Module Diagnostics	In time exceeded			0
Application Connections	In parameter problems			0
Bridge Connections	In source quenches			0
Ring Statistics	In redirects			0
Ethernet Port A1	In echos			0
Diagnostic Overview	In echo responses			0
	In timestamps			0
Network Settings	In timestamp responses			0
Ethernet Statistics	In address masks			0
Ethernet Port A2	In address mask responses			0
Diagnostic Overview	Out messages			3
Network Settings	Out errors			0
Ethernet Statistics	Out destination unreachable			1
Advanced Diagnostics	Out time exceeded			0
	Out parameter problems			0
TCP/IP Network	Out source quenches			0
ICMP Statistics	Out redirects			0
IP Statistics	Out echos			0
UDP Statistics	Out echo responses			0
TCP Statistics	Out timestamps			0
TCP Connection	Out timestamp responses			0
UDP Table	Out address masks			0
Ethernet Port A1	Out address mask responses			0
		Seconds Between Refresh: 15 Disable Refresh with 0.		
Interface Statistics				
ARP Table				
IP Route Table	Copyright © 2015 Rockwell Automation, Inc	All Platts Pasanuad		
Ethernet Port A2	copyright @ 2010 Nockwell Automation, Inc	c. An highlic heserveux		
Interface Statistics				
ARP Table				
IP Route Table				

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.



Rockwell Automation ×		A CAR	1	
← → C A □ 192.168.1.3 5069-L340ERM/A	z/index.ntmi		🚇 Allen-Bradley	☆ ≡ Rockwell Automation
Expand Minimize Home Tasks	Module Information: Slot 0	ckplane Statistics Connection Manager Statistics		
Module Diagnostics Application Connections Bridge Connections	Product Name Vendor Product Type Product Code	5069-L340ERM/A 1 14 194		
 Ring Statistics Ethernet Port A1/A2 Diagnostic Overview 	Module Revision Serial Number Module Status	194 28.011 60794F5D Idle		
 Network Settings Ethernet Statistics Advanced Diagnostics 	Copyright © 2015 Rockwell Automation, Inc. All			
TCP/IP Network ICMP Statistics IP Statistics UDP Statistics TCP Statistics TCP Connection UDP Table	Copyrigin © 2013 Rockviel Automation, Inc. All	Nyns Neserveo.		
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Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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