Allen-Bradley

CompactLogix Controllers

Catalog Numbers 1769-L31, 1769-L32C, 1769-L32E, 1769-L35CR, 1769-L35E

Firmware Revision 16

User Manual

Rockwell Automation

Important User Information

Solid state equipment operates differently than electromechanical equipment. To learn how solid state equipment differs from hard-wired electromechanical devices, consult Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1, available from your local Rockwell Automation sales office or online at http://www.ab.com/literature. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to: personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.
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.

Introduction

This release of this document contains new and updated information. To find new and updated information, look for change bars, as shown next to this paragraph.

Updated Information

The document contains these changes.

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Dynamic Memory Allocation in CompactLogix Controllers

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Introduction

Use this manual to become familiar with the CompactLogix controller and its features. This manual corresponds to controller firmware revision 16.

This manual describes the necessary tasks to install, configure, program, and operate a CompactLogix system. In some cases, this manual includes references to additional documentation that provides the more comprehensive details.

Additional Information

These documents address Logix5000 products.

Catalog Number	Title	Publication Number
1769-L31, 1769-L32E, 1769-L35CR, and 1769-L35E	Logix5000 Controllers Quick Start	1756-QS001
1769-L31, 1769-L32C, 1769-L32E, 1769-L35CR, and 1769-L35E	Logix5000 Controllers Common Procedures Programming Manual	1756-PM001
	SFC and ST Programming Languages Programming Manual	1756-PM003
	Logix5000 Controllers System Reference	1756-QR107
	Logix5000 Controllers General Instruction Set Reference Manual	1756-RM003
	Logix5000 Controllers Process Control/Drives Instruction Set Reference Manual	1756-RM006
	Logix5000 Controllers PhaseManager User Manual	LOGIX-UM001
1769-L32E and 1769-L35E	EtherNet/IP Communication Modules in Logix5000 Control Systems User Manual	ENET-UM001
1769-L32C and 1769-L35CR	ControlNet Communication Modules in Logix5000 Control Systems User Manual	CNET-UM001

To view or download these publications, go to:

http://literature.rockwellautomation.com

To obtain a hard copy, contact your Rockwell Automation distributor or sales representative.

Notes:

1769 CompactLogix Controllers Overview

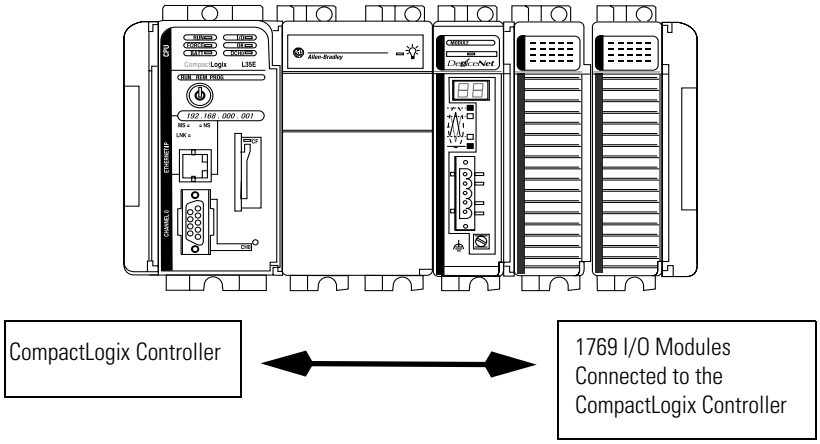
Introduction

This chapter introduces the 1769 CompactLogix controllers. These controllers offer state-of-the-art control, communications, and I/O elements in a distributed control package.

About the CompactLogix Controllers

The CompactLogix controller offers state-of-the-art control, communications, and I/O elements in a distributed control package.

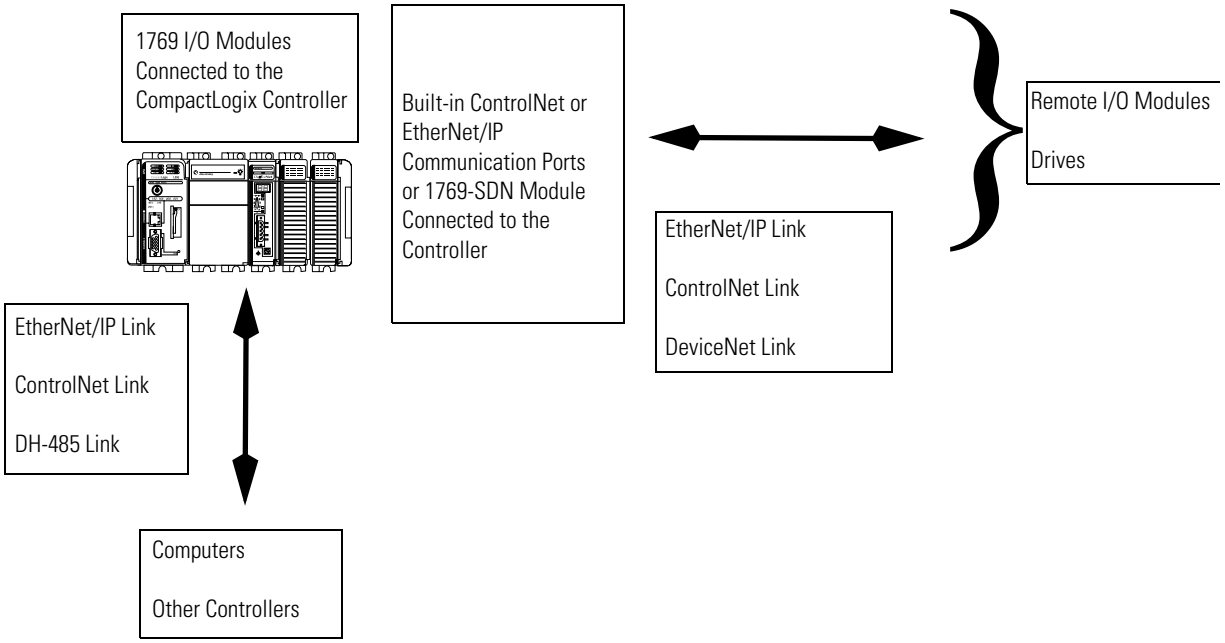
CompactLogix Controller and 1769 I/O Modules



For a more flexible system, use:

- multiple controllers in a single chassis.
- multiple controllers joined across networks.
- I/O in multiple platforms that is distributed in many locations and connected over multiple I/O links.

CompactLogix System Overview



The CompactLogix controller, part of the Logix family of controllers, provides a small, powerful, cost-effective system consisting of:

- RSLogix 5000 programming software.
- built-in communication ports for EtherNet/IP (1769-L32E and 1769-L35E only) and ControlNet (1769-L32C and 1769-L35CR only) networks.
- a 1769-SDN communication interface module providing I/O control and remote device configuration over DeviceNet.
- a built-in serial port on every CompactLogix controller.
- Compact I/O modules providing a compact, DIN-rail or panel-mounted I/O system.

CompactLogix Controller Combinations

Controller	Available Memory	Communication Options	Number of Tasks Supported	Number of Local I/O Modules Supported
1769-L35CR	1.5 MB	1 port ControlNet - supports redundant media 1 port RS-232 serial (system or user protocols)	8	30
1769-L35E		1 port EtherNet/IP 1 port RS-232 serial (system or user protocols)		
1769-L32C	750 KB	1 port ControlNet 1 port RS-232 serial (system or user protocols)	6	16
1769-L32E		1 port EtherNet/IP 1 port RS-232 serial (system or user protocols)		
1769-L31	512 KB	1 port RS-232 serial (system or user protocols) 1 port RS-232 serial (system protocol only)	4	

Design a CompactLogix System

When designing a CompactLogix system, determine the network configuration and the placement of components in each location. To design your CompactLogix system, you must select:

- I/O devices.
- a communication network.
- controllers.
- power supplies.
- software.

Additional Resources

For more information, consult these publications:

- CompactLogix Selection Guide, publication 1769-SG001.
- Logix5000 Controller Design Considerations Reference Manual, publication 1756-RM094.

Install Hardware

To install a CompactLogix controller, perform these procedures:

1. Set the node address, but only for 1769-L32C and 1769-L35CR controllers.
2. Connect the battery. See the chapter Maintain the Battery.
3. Install a 1784-CF64 CompactFlash card for nonvolatile memory. See the chapter Maintain Nonvolatile Memory.
4. Assemble the system.
5. Mount the system.
6. Establish a serial connection to the controller. See the chapter Connect to the Controller Via the Serial Port.
7. For 1769-L32E and 1769-L35E controllers only, assign an IP address.
8. Make additional network connections. See the section Communicate Over Networks.
9. Install the EDS files.
10. Load the controller firmware.

Additional Resources

For more information, consult these publications:

- 1769-L31 CompactLogix Controller Installation Instructions, publication 1769-IN069
- 1769-L32C, -L35CR CompactLogix Controllers Installation Instructions, publication 1769-IN070
- 1769-L32E, -L35E CompactLogix Controllers Installation Instructions, publication 1769-IN020

Connect to the Controller Via the Serial Port

Introduction

This chapter describes how to connect to the controller via the serial port so you can configure the controller and upload or download a project to the controller.

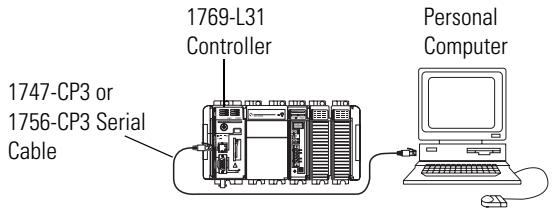
For the CompactLogix controller to operate on a serial network, you need:

- a workstation with a serial port.
- RSLinx software to configure the serial communication driver.
- RSLogix5000 programming software to configure the serial port of the controller.

Connect to the Controller Via the Serial Port

Channel 0 on the CompactLogix controllers is fully isolated and does not need a separate isolation device. Channel 1 on the 1769-L31 is not an isolated serial port.

Serial Connection to Controller

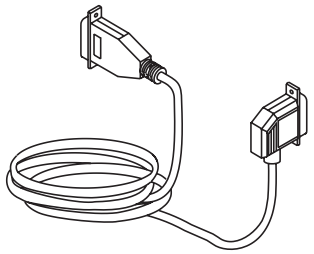


If you connect channel 1 of the 1769-L31 controller to a modem or an ASCII device, consider installing an isolator between the controller and modem or ASCII device. An isolator is also recommended when connecting the controller directly to a programming workstation. One possible isolator is the 1761-NET-AIC interface converter.

For more information on installing an isolator, see Configure an Isolator on page 32.

To connect a serial cable, perform this procedure.

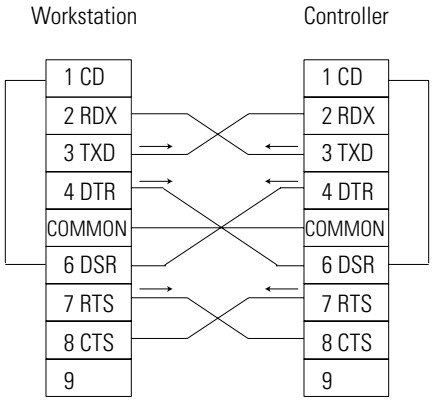
1. Obtain a 1747-CP3 or 1756-CP3 serial cable.



TIP If you make your own serial cable, complete this procedure.

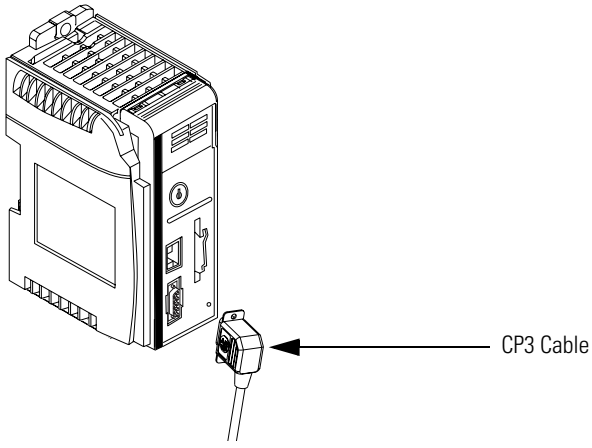
A. Limit the length to 15.2 m (50 ft).

B. Wire the connectors.



C. Attach the shield to both connectors.

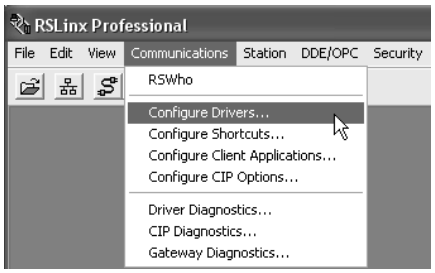
2. Connect the cable to your controller and workstation.



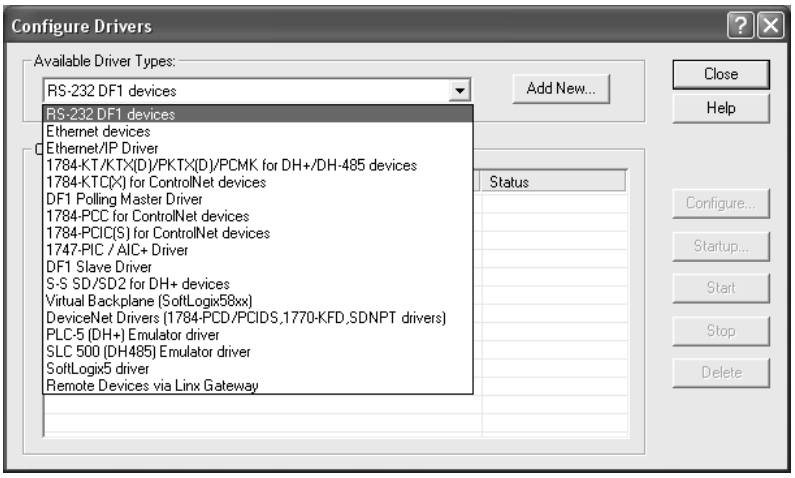
Configure the Serial Driver

Use RSLinx software to configure the RS-232 DF1 Device driver for serial communications. To configure the driver, perform this procedure.

1. From the Communications pull-down menu, choose Configure Drivers.



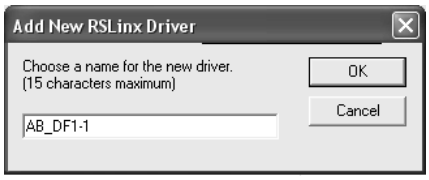
The Configure Drivers dialog appears.



2. From the Available Driver Types pull-down menu, choose the RS-232 DF1 Device driver.

3. Click Add New to add the driver.

   The Add New RSLinx Driver dialog appears.



4. Specify the driver name and click OK.

The Configure RS-232 DF1 Devices dialog appears.

5. Specify the serial port settings.
   a. From the Comm Port pull-down menu, choose the serial port on the workstation to which the cable is connected.
   b. From the Device pull-down menu, choose Logix 5550-Serial Port.
   c. Click Auto-Configure.

6. Verify that the Auto-Configuration was successful.

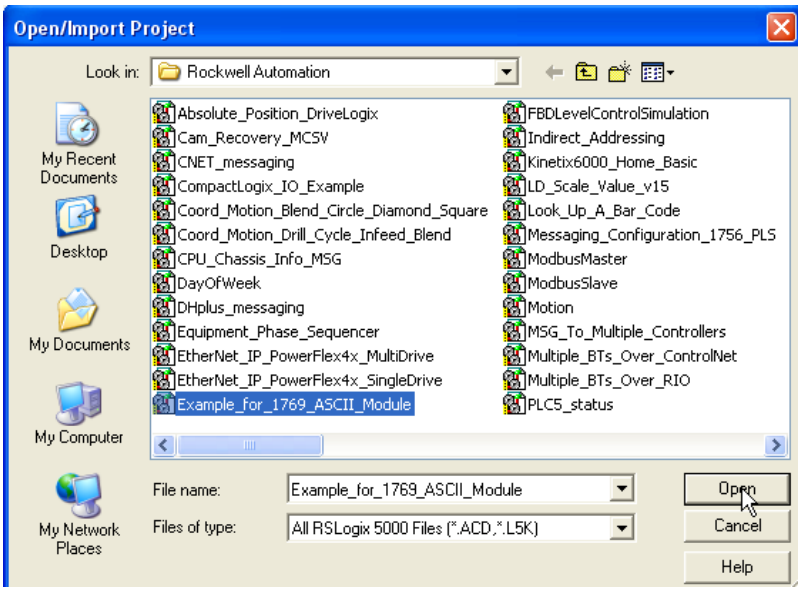
If	Then
Yes	Click OK.
No	Go to step 5 and verify that you selected the correct communications port.

7. Click Close.

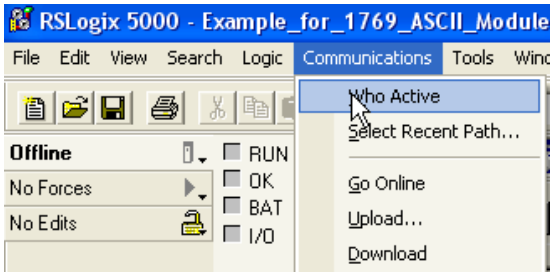
Select the Controller Path

To select the controller path, perform this procedure.

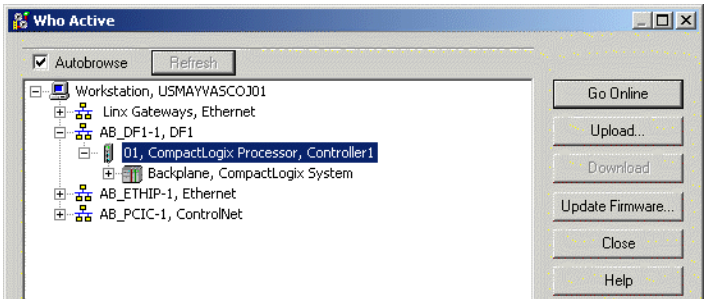
1. In RSLogix 5000 programming software, open a project for the controller.



2. From the Communications pull-down menu, choose Who Active.



The Who Active dialog appears.



3. Expand the communication driver to the level of the controller.

4. Select the controller.

Controller Options

Once you have selected a controller, you have several options.

To	Choose
Monitor the project in the controller	Go Online
Transfer a copy of the project from the controller to RSLogix 5000 software	Upload
Transfer the open project to the controller	Download

Additional Resources

For additional information, consult these publications:

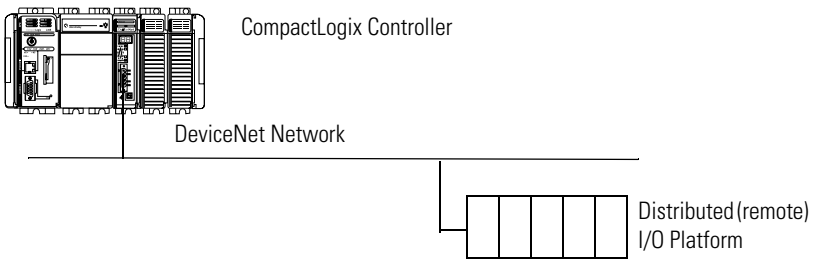
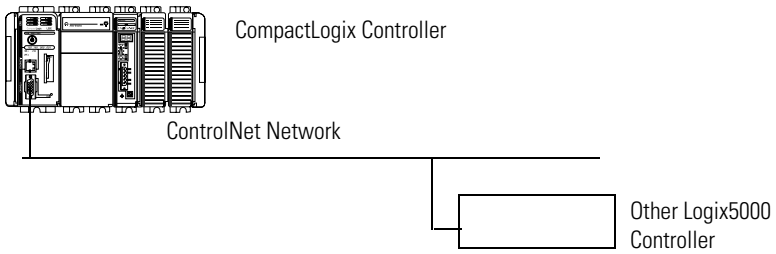
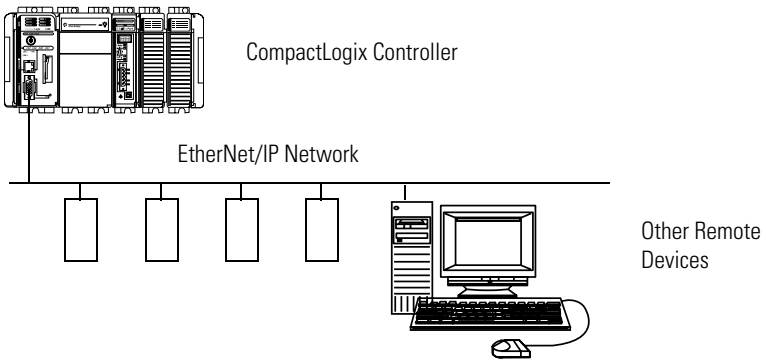
- EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001
- ControlNet Modules in Logix5000 Control System User Manual, publication CNET-UM001
- DeviceNet Modules in Logix5000 Control System User Manual, publication DNET-UM004

Communicate Over Networks

Introduction

This chapter explains how CompactLogix controllers support additional networks to enable various functions.

CompactLogix Controller Network Support

Function	Example
Control distributed (remote) I/O. • EtherNet/IP • ControlNet • DeviceNet	
Produce/consume (interlock) data between controllers. • EtherNet/IP • ControlNet	
Send and receive messages to and from other devices. This includes access to the controller via RSLogix 5000 programming software. • EtherNet/IP • ControlNet • DeviceNet (to devices only) • serial • DH-485	

EtherNet/IP Network Communication

The EtherNet/IP network offers a full suite of control, configuration and data collection services by layering the Common Industrial Protocol (CIP) over the standard Internet protocols, such as TCP/IP and UDP. This combination of well-accepted standards provides the capability required to both support information data exchange and control applications.

The EtherNet/IP network also uses commercial, off-the-shelf Ethernet components and physical media, providing you with a cost-effective plant-floor solution.

For EtherNet/IP communications, you can use these CompactLogix controllers with a built-in EtherNet/IP communication port:

- 1769-L32E CompactLogix controller
- 1769-L35E CompactLogix controller

You can use several software products with a 1769 CompactLogix controller on an EtherNet/IP network.

EtherNet/IP Network Software Combinations

Software	Functions	Requirement
RSLogix 5000 programming software	• Configure the CompactLogix project • Define EtherNet/IP communications	Yes
BOOTP/DHCP utility with RSLogix 5000 software	Assign IP addresses to devices on an EtherNet/IP network	No
RSNetWorx software for an EtherNet/IP network	Configure EtherNet/IP devices by IP addresses and/or host names	No

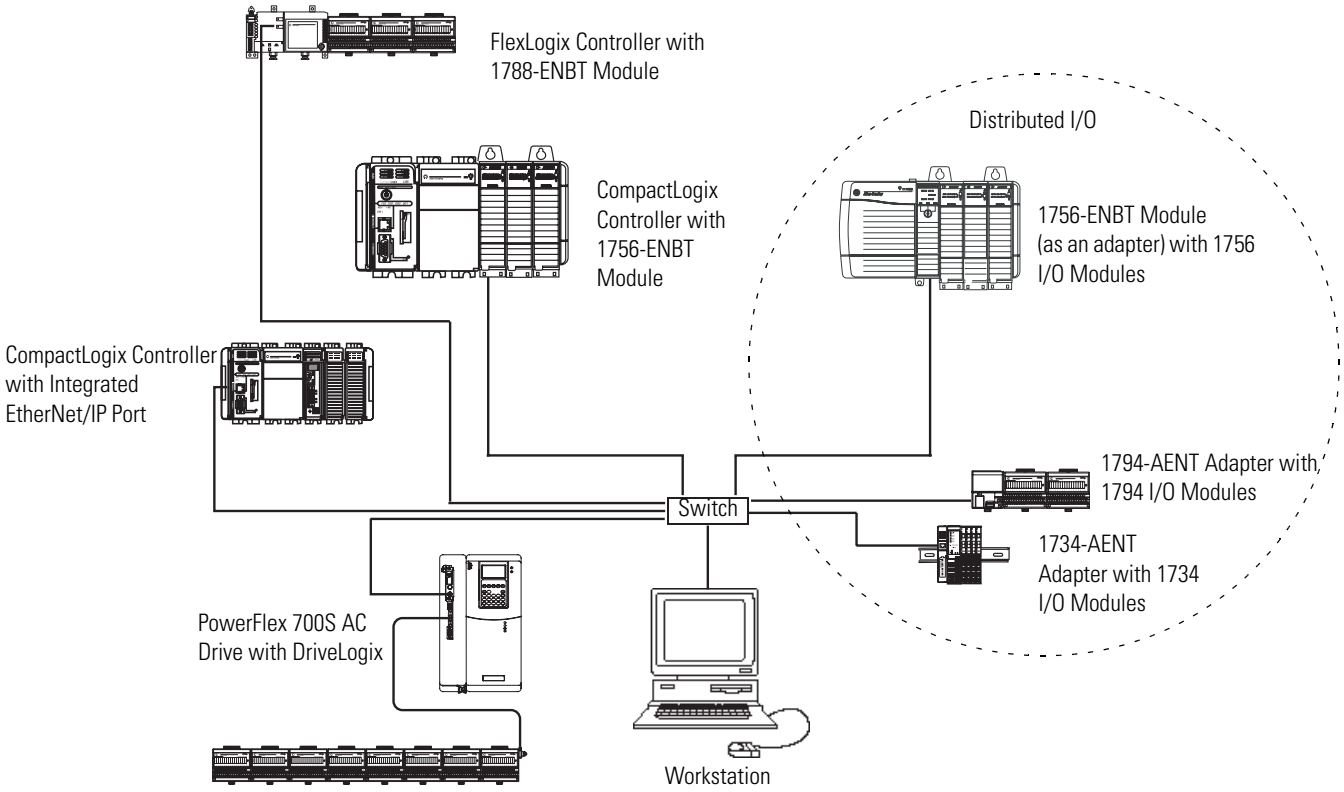
The EtherNet/IP communication modules:

- support messaging, produced/consumed tags, HMI, and distributed I/O.
- encapsulate messages within standard TCP/UDP/IP protocol.
- share a common application layer with ControlNet and DeviceNet.
- interface via RJ45, category 5, unshielded, twisted-pair cable.
- support half/full-duplex 10 Mbps or 100 Mbps operation.
- support standard switches.
- require no network scheduling.
- require no routing tables.

In this example:

- the controllers produce and consume tags amongst themselves.
- the controllers initiate MSG instructions that send and receive data or configure devices.
- the personal computer uploads or downloads projects to the controllers.
- the personal computer configures devices on an EtherNet/IP network.

CompactLogix EtherNet/IP Overview



Connections Over an EtherNet/IP Network

You indirectly determine the number of connections the controller uses by configuring the controller to communicate with other devices in the system. Connections are allocations of resources that provide more reliable communications between devices than unconnected messages.

All EtherNet/IP connections are unscheduled. An unscheduled connection is a message transfer between controllers that is triggered by the requested packet interval (RPI) or the program, such as a MSG instruction. Unscheduled messaging lets you send and receive data when needed.

The 1769-L32E and 1769-L35E controllers support 100 connections. However, the built-in EtherNet/IP port only supports 32 CIP connections over an EtherNet/IP network. With these controllers, the number of end-node connections they effectively support depends on a connection's RPI.

Requested Packet Interval	Max EtherNet/IP Port Communication Connections
2 ms	2
4 ms	5
8 ms	10
16 ms	18
32 ms+	25+

You can use all 32 communication connections on the built-in EtherNet/IP port. However, we recommend that you leave some connections available for tasks such as going online and non-I/O purposes.

Additional Resources

For more information, consult these publications:

- EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001
- EtherNet/IP Web Server Module User Manual, publication ENET-UM527
- EtherNet/IP Performance Application Guide, publication ENET-AP001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

ControlNet Network Communication

ControlNet is a real-time control network that provides high-speed transport of both time-critical I/O and interlocking data and messaging data, including uploading and downloading of programming and configuration data on a single physical-media link. The ControlNet network's highly-efficient data transfer capability significantly enhances I/O performance and peer-to-peer communication in any system or application.

The ControlNet network is highly deterministic and repeatable and remains unaffected as devices are connected or disconnected from the network. This robust quality results in dependable, synchronized, and coordinated real-time performance.

The ControlNet network often functions as:

- the default network for the CompactLogix platform.
- a substitute/replacement for the remote I/O (RIO) network because the ControlNet network adeptly handles large numbers of I/O points.
- a backbone to multiple distributed DeviceNet networks.
- a peer interlocking network.

For ControlNet communications, you can use these CompactLogix controllers with a built-in ControlNet communication port:

- 1769-L32C CompactLogix controller
- 1769-L35CR CompactLogix controller

You can use these software products with a 1769 CompactLogix controller on a ControlNet network.

ControlNet Network Software Combinations

Software	Functions	Requirement
RSLogix 5000 programming software	• Configure the CompactLogix project • Define EtherNet/IP communications	Yes
RSNetWorx software for ControlNet	• Configure the ControlNet network • Define the NUT (network update time) • Schedule the ControlNet network	

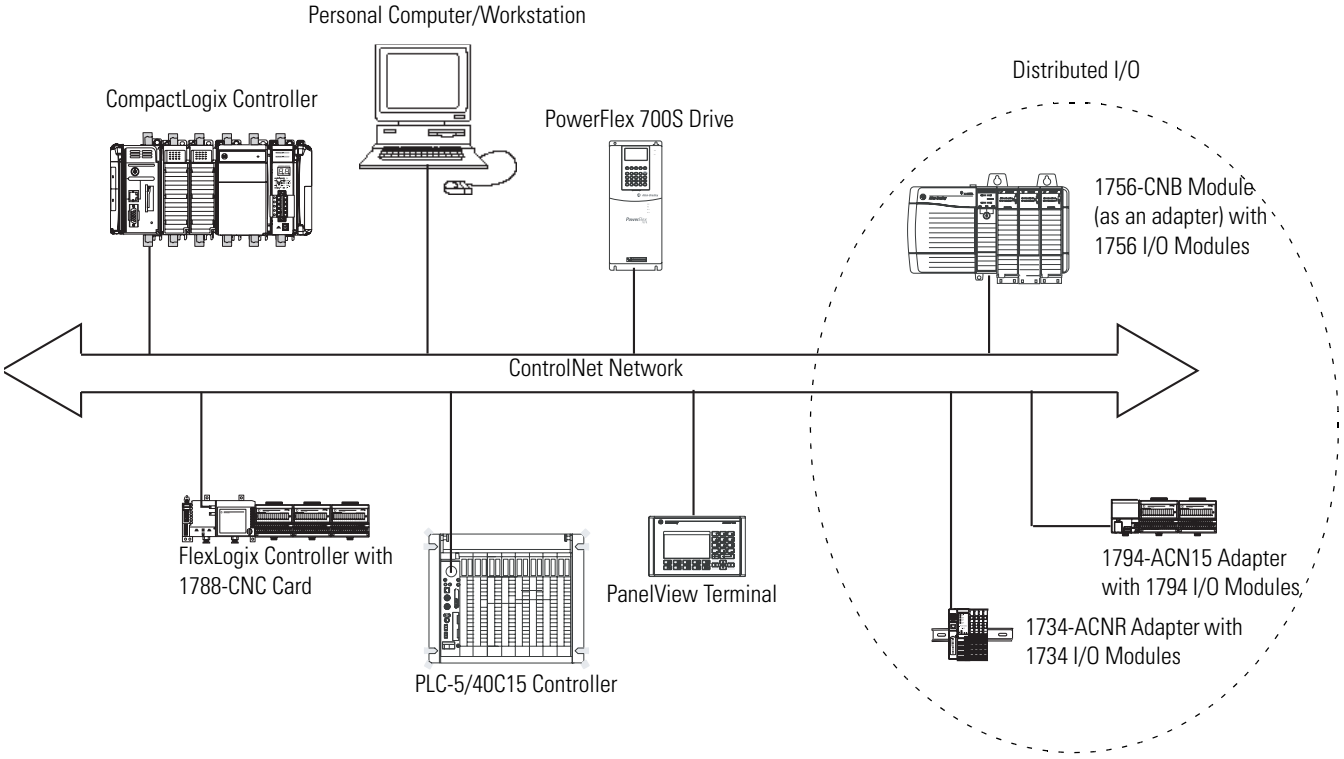
The ControlNet communications modules:

- support messaging, produced/consumed tags and distributed I/O.
- share a common application layer with DeviceNet and EtherNet/IP networks.
- require no routing tables.
- support the use of coax and fiber repeaters for isolation and increased distance.

In this example:

- the controllers produce and consume tags amongst themselves.
- the controllers initiate MSG instructions that send and receive data or configure devices.
- the personal computer uploads or downloads projects to the controllers.
- the personal computer configures devices on ControlNet, and configures the network itself.

CompactLogix ControlNet Overview



Connections Over ControlNet

You indirectly determine the number of connections the controller uses by configuring the controller to communicate with other devices in the system. Connections are allocations of resources that provide more reliable communications between devices compared to unconnected messages.

ControlNet Connection Methods

Connection Method	Description
Scheduled	A scheduled connection is unique to ControlNet communications. A scheduled connection lets you send and receive data repeatedly at a set interval, which is the requested packet interval (RPI). For example, a connection to an I/O module is a scheduled connection because you repeatedly receive data from the module at a specified interval. Other scheduled connections include connections to: • communication devices. • produced/consumed tags. On a ControlNet network, you must use RSNetWorx for ControlNet to enable all scheduled connections and establish a network update time (NUT). Scheduling a connection reserves network bandwidth to specifically handle the connection.
Unscheduled	An unscheduled connection is a message transfer between nodes that is triggered by ladder logic or the program (such as a MSG instruction). Unscheduled messaging lets you send and receive data when needed. Unscheduled messages use the remainder of network bandwidth after scheduled connections are allocated.

The 1769-L32C and 1769-L35CR controllers support 100 connections. However, the built-in ControlNet port only supports 32 communication connections. With these controllers, the number of end-node connections they effectively support depends on the connection's NUT and RPI.

NUT	RPI	Supported ControlNet Communication Connections(1)
2 ms	2 ms	0...1
3 ms	3 ms	1...2
5 ms	5 ms	3...4
10 ms	10 ms	6...9
14 ms	14 ms	10...12
5 ms	20 ms	12...16
4 ms	64 ms	31

(1) For each NUT/RPI combination, the number of connections supported is listed in a range. The lower number is the number of connections we recommend you make to maintain reasonable ControlNet port CPU utilization rates. The higher number is the maximum number of connections possible for that NUT/RPI combination.

You can use all 32 communication connections on the built-in ControlNet port. However, we recommend that you leave some connections available for tasks such as going online and unscheduled network traffic.

Additional Resources

For additional information, consult these publications:

- Control Net Modules in Logix5000 Control Systems User Manual, publication CNET-UM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

DeviceNet Communications

The DeviceNet network uses the Common Industrial Protocol (CIP) to provide the control, configuration, and data collection capabilities for industrial devices. The DeviceNet network uses the proven Controller Area Network (CAN) technology, which lowers installation costs and decreases installation time and costly downtime.

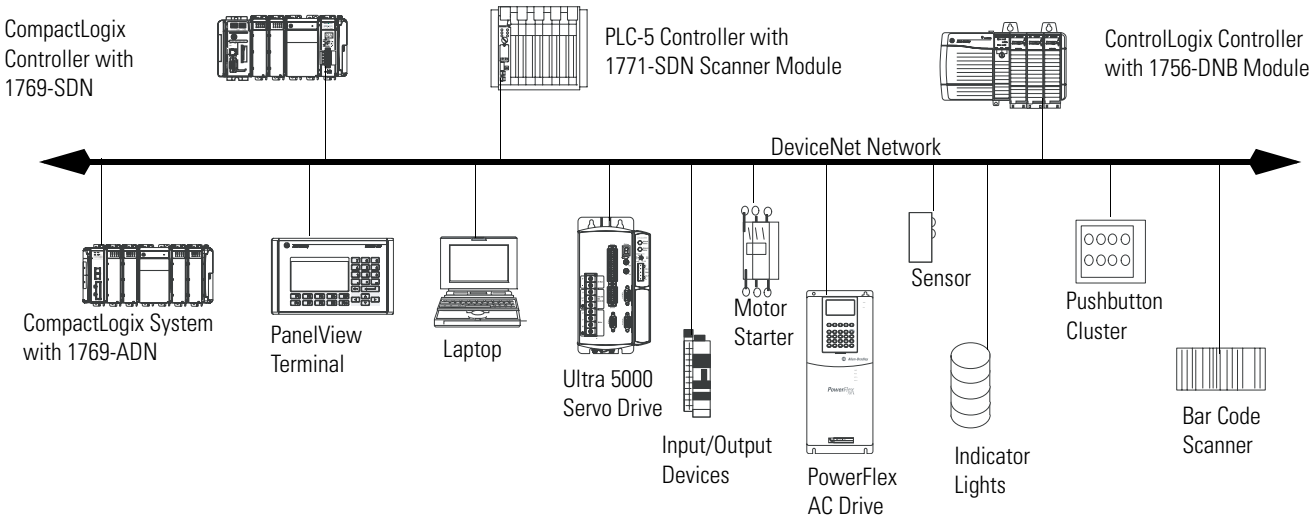
A DeviceNet network provides access to the intelligence present in your devices by letting you connect devices directly to plant-floor controllers without having to hard wire each device into an I/O module.

CompactLogix DeviceNet Communications Interfaces

If your application	Select
• Communicates with other DeviceNet devices • Uses the controller as a master or slave on DeviceNet • Uses a controller ControlNet, Ethernet or serial port for other communications	1769-SDN DeviceNet scanner module
• Accesses remote Compact I/O over a DeviceNet network • Sends remote I/O data for as many as 30 modules back to scanner or controller	1769-ADN DeviceNet adapter module[1]

(1) This table specifically describes using the 1769-ADN module to access remote Compact I/O over DeviceNet. However, CompactLogix controllers can access other Allen-Bradley remote I/O over DeviceNet. In those cases, you must select the appropriate interface. For example, if accessing remote POINT I/O modules, you must select the 1734-ADN.

CompactLogix DeviceNet Overview



You can use these software products with a 1769 CompactLogix controller on a DeviceNet network.

CompactLogix DeviceNet Software Combinations

Software	Functions	Requirement
RSLogix 5000 programming software	• Configure the CompactLogix project • Define EtherNet/IP communications	Yes
RSNetWorx software for DeviceNet devices	• Configure DeviceNet devices • Define the scan list for DeviceNet devices	

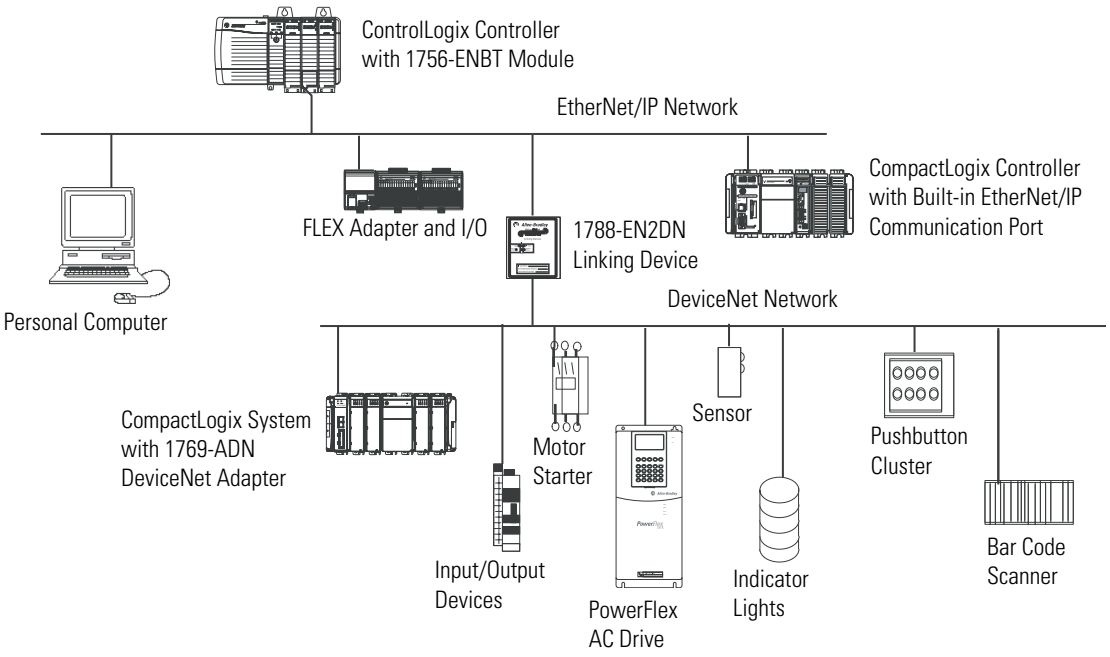
The DeviceNet communications module:

- supports messaging to devices, not controller to controller.
- shares a common application layer with ControlNet and EtherNet/IP.
- offers diagnostics for improved data collection and fault detection.
- requires less wiring than traditional, hardwired systems.

You can use a linking device as a:

- gateway to connect information.
- control-level network to device-level network for programming, configuration, control or data collection.
- router/bridge to connect the EtherNet/IP or ControlNet network to the DeviceNet network.

CompactLogix Linking Device Overview



Additional Resources

For additional information, consult these publications:

- DeviceNet Modules in Logix5000 Control Systems User Manual, publication DNET-UM004
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

Serial Communications

CompactLogix controllers have a built-in RS-232 port.

- 1769-L32C, -L32E, -L35CR, and -L35E CompactLogix controllers have one built-in RS-232 port. By default, that port is channel 0 on these controllers.
- The 1769-L31 CompactLogix controller has two RS-232 ports. One port only allows DF1 protocol only. The second port accepts DF1 and ASCII protocol.

IMPORTANT Limit the length of serial (RS-232) cables to 15.2 m (50 ft).

You can configure the serial port of the controller for several modes.

CompactLogix Serial Port Configuration

Mode	Functions
DF1 Point-to-Point	Communicate between the controller and one other DF1-protocol-compatible device. This is the default system mode. Default parameters are: • Baud Rate: 19,200 • Data Bits: 8 • Parity: None • Stop Bits: 1 • Control Line: No Handshake • RTS send Delay: 0 • RTS Off Delay: 0 This mode is typically used to program the controller through its serial port.
DF1 Master	Control polling and message transmission between the master and slave nodes. • The master/slave network includes one controller configured as the master node and as many as 254 slave nodes. Link slave nodes using modems or line drivers. • A master/slave network can have node numbers from 0...254. Each node must have a unique node address. Also, at least 2 nodes must exist to define your link as a network (1 master and 1 slave station are the two nodes).
DF1 Slave	Use a controller as a slave station in a master/slave serial communication network. • When there are multiple slave stations on the network, link slave stations using modems or line drivers to the master. When you have a single slave station on the network, you do not need a modem to connect the slave station to the master. You can configure the control parameters for no handshaking. You can connect 2...255 nodes to a single link. In DF1 slave mode, a controller uses DF1 half-duplex protocol. • One node is designated as the master and it controls who has access to the link. All the other nodes are slave stations and must wait for permission from the master before transmitting.
DF1 Radio Modem	• Compatible with SLC500 and MicroLogix1500 controllers. • This mode supports master and slave, and store and forward modes.
User (channel 0 only)	Communicate with ASCII devices. This requires your program to use ASCII instructions to transmit data to and from ASCII device.
DH-485	• Communicate with other DH-485 devices. • This multi-master, token-passing network allows programming and peer-to-peer messaging.

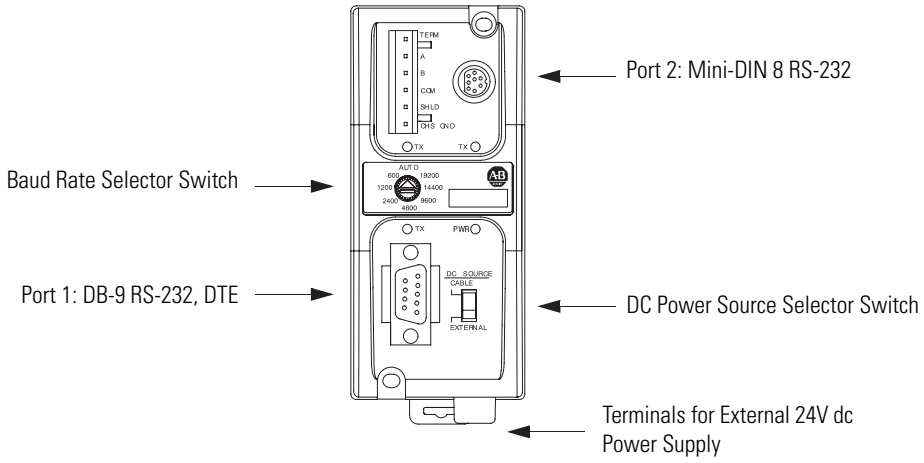
Configure an Isolator

Channel 0 on the CompactLogix controllers is fully isolated and does not need a separate isolation device. Channel 1 on the 1769-L31 controller is not an isolated serial port. To configure an isolator, perform this procedure.

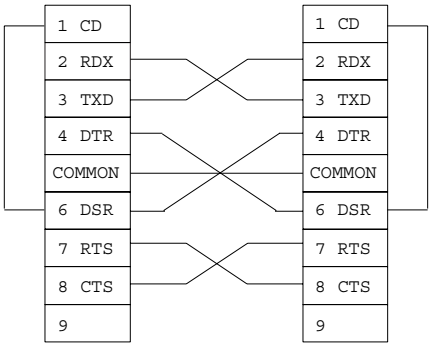
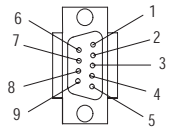
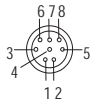
1. Determine whether you need an isolator.

   If you connect channel 1 of the 1769-L31 controller to a modem or an ASCII device, consider installing an isolator between the controller and modem or ASCII device. An isolator is also recommended when connecting the controller directly to a programming workstation.

   One possible isolator is the 1761-NET-AIC interface converter.



2. Select the appropriate cable.

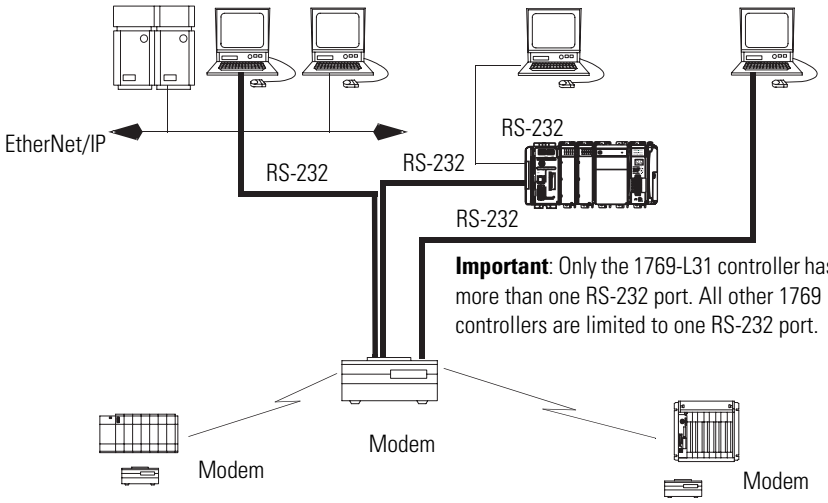
Are you using an isolator?	Then use this cable
No	The 1756-CP3 cable attaches the controller directly to the controller.  If you make your own cable, it must be shielded, and the shields must be tied to the metal shell (that surrounds the pins) on both ends of the cable. You can also use a 1747-CP3 cable from the SLC product family. This cable has a taller right-angle connector housing than that of the 1756-CP3 cable.
Yes	The 1761-CBL-AP00 cable (right-angle connector to controller) or the 1761-CBL-PM02 cable (straight connector to the controller) attaches the controller to port 2 on the 1761-NET-AIC isolator. The mini-DIN connector is not commercially available, so you cannot make this cable.  DB-9 Right-angle or Straight Cable End  8-pin, Mini-DIN Cable End **Pin** / **DB-9 End** / **Mini-DIN End** 1 / DCD / DCD 2 / RxD / RxD 3 / TxD / TxD 4 / DTR / DTR 5 / Ground / Ground 6 / DSR / DSR 7 / RTS / RTS 8 / CTS / CTS 9 / NA / NA

3. Connect the appropriate cable to the serial port.

Communicate with DF1 Devices

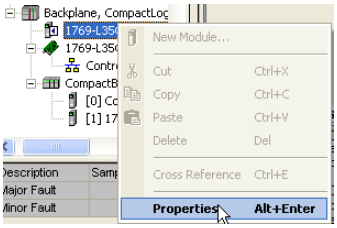
You can configure the controller as a master or slave on a serial communication network. Use serial communications when:

- the system contains three or more stations.
- communications occur regularly and require leased-line, radio, or power-line modems.

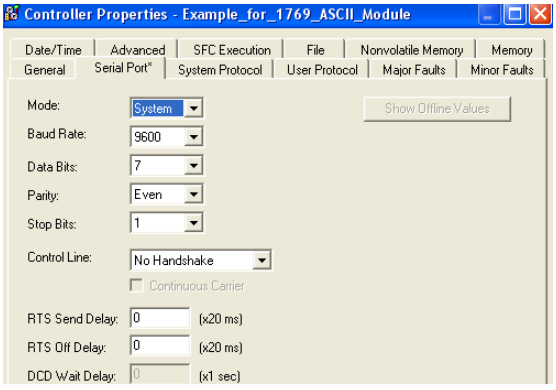


To configure the controller for DF1 communications, perform this procedure.

1. In RSLogix 5000 programming software, right-click your controller and select Properties.



The Controller Properties dialog appears.

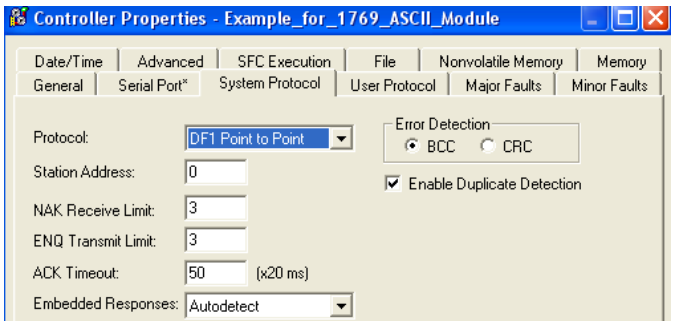


2. Click the Serial Port tab.

3. From the Mode pull-down menu, choose System.

4. Specify communication settings.

5. Click the System Protocol tab.



6. From the Protocol pull-down menu, choose a DF1 protocol.

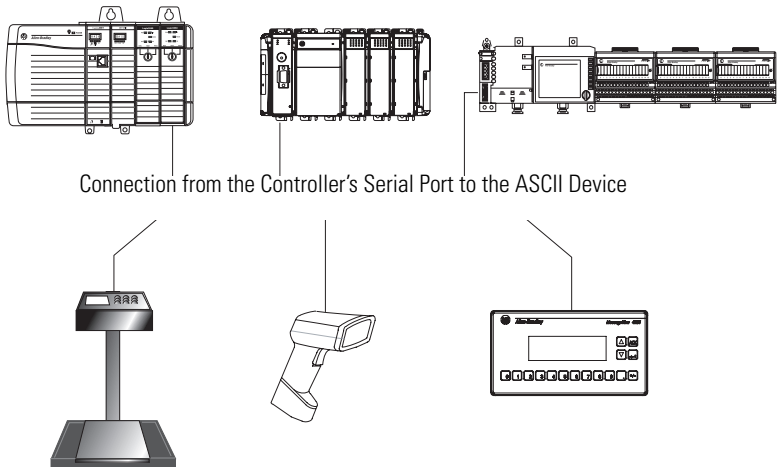
7. Specify DF1 settings.

Communicate with ASCII Devices

You can use the serial port to interface with ASCII devices when the controller is configured for user mode. For example, you can use the serial port to:

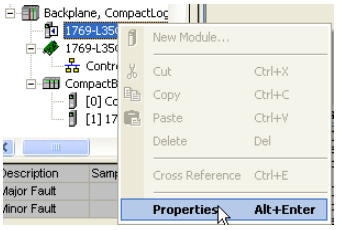
- read ASCII characters from a weigh scale module or bar code reader.
- send and receive messages from an ASCII triggered device, such as a MessageView terminal.

ASCII Device Serial Communications

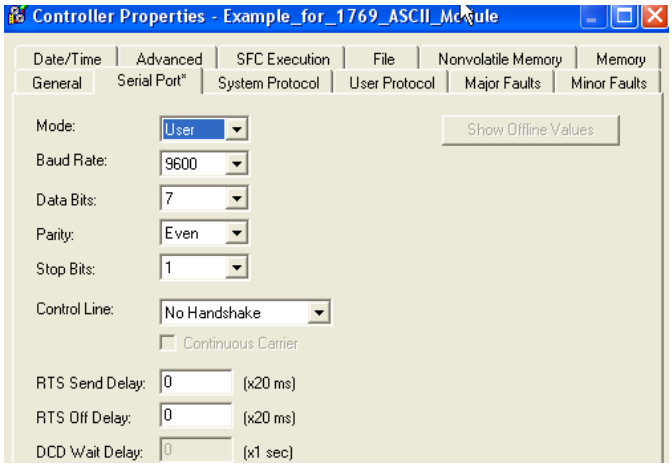


To configure the controller for ASCII communications, perform this procedure.

1. In RSLogix 5000 programming software, right-click your controller and select Properties.



The Controller Properties dialog appears.

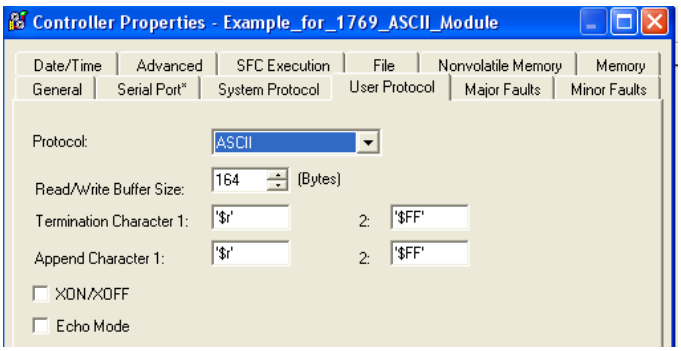


2. Click the Serial Port tab.

3. From the Mode pull-down menu, choose User.

4. Specify communication settings.

5. Click the User Protocol tab.



6. From the Protocol pull-down menu, choose ASCII.

7. Specify ASCII settings.

The controller supports several instructions to manipulate ASCII characters. The instructions are available in ladder diagram (LD) and structured text (ST).

Read and Write ASCII Characters

Instruction Code	Description
ABL	Determine when the buffer contains termination characters
ACB	Count the characters in the buffer
ACL	Clear the buffer
	Clear out ASCII Serial Port instructions that are currently executing or are in the queue
AHL	Obtain the status of the serial port control lines
	Turn on or off the DTR signal
	Turn on or off the RTS signal
ARD	Read a fixed number of characters
ARL	Read a varying number of characters, up to and including the first set of termination characters
AWA	Send characters and automatically append one or two additional characters to mark the end of the data
AWT	Send characters

Create and Modify Strings of ASCII Characters

Instruction Code	Description
CONCAT	Add characters to the end of a string
DELETE	Delete characters from a string
FIND	Determine the starting character of a substring
INSERT	Insert characters into a string
MID	Extract characters from a string

Convert Data to or from ASCII Characters

Instruction Code	Description
STOD	Convert the ASCII representation of an integer value to a SINT, INT, DINT, or REAL value
STOR	Convert the ASCII representation of a floating-point value to a REAL value
DTOS	Convert a SINT, INT, DINT, or REAL value to a string of ASCII characters
RTOS	Convert a REAL value to a string of ASCII characters
UPPER	Convert the letters in a string of ASCII characters to upper case
LOWER	Convert the letters in a string of ASCII characters to lower case

Modbus Support

To use Logix5000 controllers on Modbus, connect the controllers through the serial port and execute specific ladder logic routines.

A sample controller project is available with RSLogix 5000 Enterprise programming software. To view sample projects, see Sample Controller Projects on pg. 70.

Additional Resources

For more information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers General Instructions Reference Manual, publication 1756-RM003
- SCADA System Application Guide, publication AG-UM008
- Logix5000 Controllers as Masters or Slaves on Modbus Application Solution, publication CIG-AP129

DH-485 Network Communications

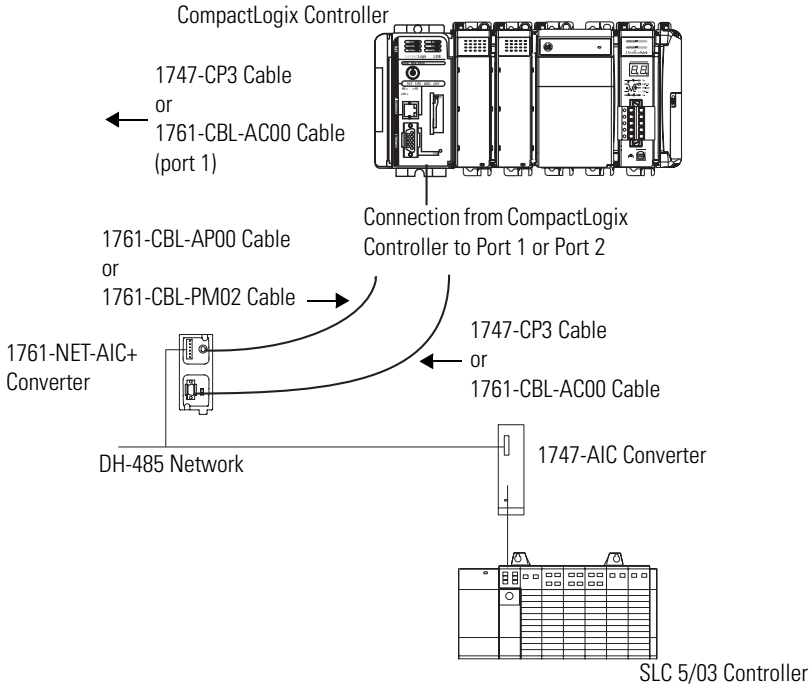
For DH-485 communication, use the controller's serial port.

However, with a CompactLogix controller, we recommend that you use NetLinx networks, such as EtherNet/IP, ControlNet, or DeviceNet, because excessive traffic on a DH-485 network may make it impractical to connect to a controller with RSLogix 5000 programming software.

IMPORTANT If your application uses connections to DH-485 networks, select built-in serial ports.

The DH-485 protocol uses RS-485 half-duplex as its physical interface. RS-485 is a definition of electrical characteristics, not a protocol. You can configure the CompactLogix controller's RS-232 port to act as a DH-485 interface. By using a 1761-NET-AIC converter and the appropriate RS-232 cable (1756-CP3 or 1747-CP3), a CompactLogix controller can send and receive data on a DH-485 network.

CompactLogix DH-485 Communications Overview



On the DH-485 network, the CompactLogix controller can send and receive messages to and from other controllers.

IMPORTANT A DH-485 network consists of multiple cable segments. Limit the total length of all the segments to 1219 m (4000 ft).

For the controller to operate on a DH-485 network, you need a 1761-NET-AIC interface converter for each controller you want to put on the DH-485 network.

You can have two controllers for each 1761-NET-AIC converter, but you need a different cable for each controller.

To establish DH-485 communication, perform this procedure.

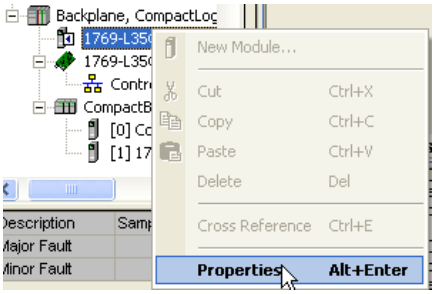
1. Connect the serial port of the controller to either port 1 or port 2 of the 1761-NET-AIC converter.

2. Use the RS-485 port to connect the converter to the DH-485 network.

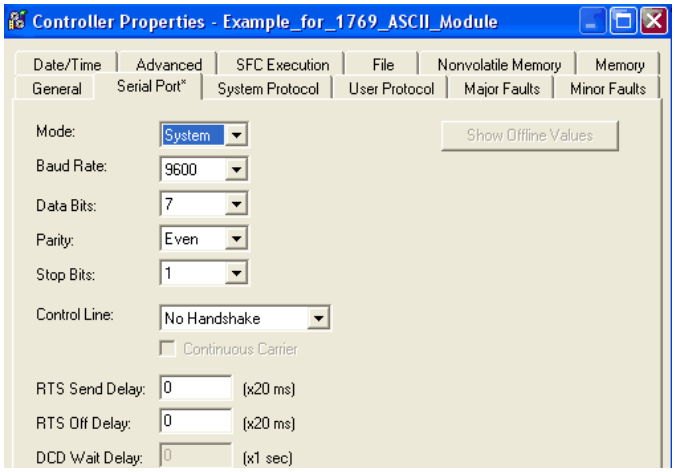
   The cable you use to connect the controller depends on the port you use on the 1761-NET-AIC converter.

Connection	Required Cable
Port 1 DB-9 RS-232, DTE connection	1747-CP3 or 1761-CBL-AC00
Port 2 mini-DIN 8 RS-232 connection	1761-CBL-AP00 or 1761-CBL-PM02

3. In RSLogix 5000 programming software, right-click on your controller and choose Properties.



The Controller Properties dialog appears.



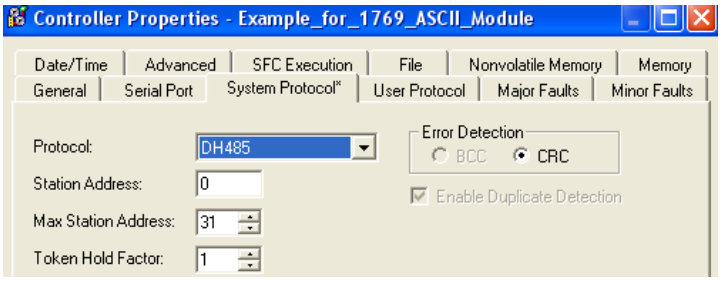
4. Click the Serial Port tab.

5. From the Mode pull-down menu, choose System.

6. Specify communication settings.

IMPORTANT The baud rate specifies the communication rate for the DH-485 port. All devices on the same DH-485 network must be configured for the same baud rate. Select 9600 or 19200 KB.

7. Click the System Protocol tab.



8. From the Protocol pull-down menu, choose DH485.

9. Specify DH-485 settings.

10. From the Protocol pull-down menu, choose DF1 Radio.

System Protocol Specifications

Characteristic	Description
Station Address	Specifies the node address of the controller on the DH-485 network. Select a number 1...31 decimal, inclusive. To optimize network performance, assign node addresses in sequential order. Initiators, such as personal computers, should be assigned the lowest address numbers to minimize the time required to initialize the network.
Token Hold Factor	Number of transmissions plus retries that a node holding a token can send onto the data link each time it receives the token. Enter a value between 1...4. The default is 1.
Maximum Station Address	Specifies the maximum node address of all the devices on the DH-485 network. Select a number 1...31 decimal, inclusive. To optimize network performance, make sure: • the maximum node address is the highest node number being used on the network. • that all the devices on the same DH-485 network have the same maximum node address.

Additional Resources

For additional information, consult Data Highway/Data Highway Plus/Data Highway II/Data Highway-485 Cable Installation Manual, publication 1770-6.2.2.

Manage Controller Communications

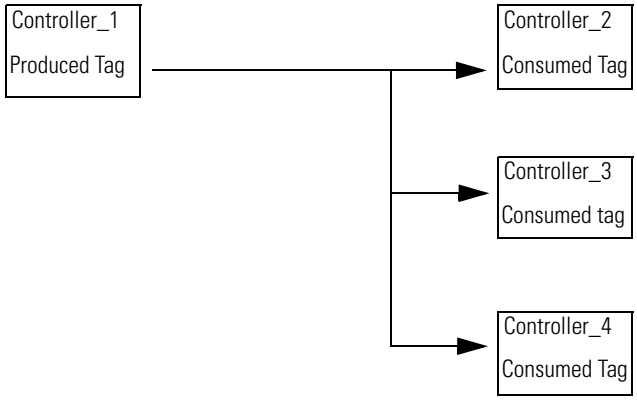
Introduction

This chapter explains how to manage controller communications.

Produce and Consume Data

The controller supports the ability to produce (broadcast) and consume (receive) system-shared tags over ControlNet or EtherNet/IP networks. Produced and consumed tags each require connections. Over ControlNet, produced and consumed tags are scheduled connections.

Controller Communications Overview



Tag Type	Description
Produced	A produced tag allows other controllers to consume the tag, which means that a controller can receive the tag data from another controller. The producing controller uses one connection for the produced tag and another for each consumer. The controller's communication device uses one connection for each consumer. As you increase the number of controllers that can consume a produced tag, you also reduce the number of connections the controller and communication device have available for other operations, like communications and I/O.
Consumed	Each consumed tag requires one connection for the controller that is consuming the tag. The controller's communication device uses one connection for each consumer.

For two controllers to share produced or consumed tags, both controllers must be attached to the same control network, such as a ControlNet or Ethernet/IP network. You cannot bridge produced and consumed tags over two networks.

The number of available connections limits the total number of tags that can be produced or consumed. If the controller uses all of its connections for I/O and communication devices, no connections are left for produced and consumed tags.

Send and Receive Messages

Messages transfer data to other devices, such as controllers or operator interfaces. Messages use unscheduled connections to send or receive data. Connected messages can leave the connection open (cache) or close the connection when the message is done transmitting.

Message Transmission

Message Type	Communication Method	Connected Message	Can the message be cached?
CIP data table read or write	NA	Yes	Yes
PLC-2, PLC-3, PLC-5, or SLC (all types)	CIP	No	No
	CIP with Source ID	No	No
	DH+	Yes	Yes
CIP generic	NA	Optional (1)	Yes(2)
Block-transfer read or write	NA	NA	Yes

(1) You can connect CIP generic messages. However, for most applications we recommend you leave CIP generic messages unconnected.

(2) Consider caching only if the target module requires a connection.

Connected messages are unscheduled connections on both ControlNet and EtherNet/IP networks.

Each message uses one connection, regardless of how many devices are in the message path. You can program the target of a MSG instruction to optimize message transfer time.

Determine Whether to Cache Message Connections

When you configure a MSG instruction, you can cache or not cache the connection.

Caching Messages

Message Execution	Function
Repeatedly	Cache the connection. This keeps the connection open and optimizes execution time. Opening a connection each time the message executes increases execution time.
Infrequently	Do not cache the connection. This closes the connection upon completion of the message, freeing up that connection for other uses.

Connections

A Logix5000 system uses a connection to establish a communication link between two devices. Connections can be:

- a controller to local I/O modules or local communication modules.
- a controller to remote I/O or remote communication modules.
- a controller to remote I/O (rack-optimized) modules.
- produced and consumed tags.
- messages.
- controller access by RSLogix 5000 programming software.
- controller access by RSLinx software for HMI or other applications.

The limit of connections may ultimately reside in the communication module you use for the connection. If a message path routes through a communication module, the connection related to the message also counts towards the connection limit of that communication module.

Connections Overview

Device	Supported Connections
CompactLogix controller (1769-L31)	100
Built-in ControlNet communication port (1769-L32C and 1769-L35CR controllers only)	
Built-in EtherNet/IP communication port (1769-L32E and 1769-L35E controllers only)	

Calculate Total Connections

You can calculate the total number of local and remote connections the controller uses.

Local Connections Calculation

Local Connection Type	Device Quantity	Connections per Device	Total Connections
Local I/O module (always a direct connection)		1	
Built-in ControlNet communication port (1769-L32C and 1769-L35CR controllers only)		0	
Built-in EtherNet/IP communication port (1769-L32E and 1769-L35E controllers only)		0	
1769-SDN DeviceNet scanner module		2	
		Total	

The number of remote connections a communication module supports determines how many connections the controller can access through that module.

Remote Connections Calculation

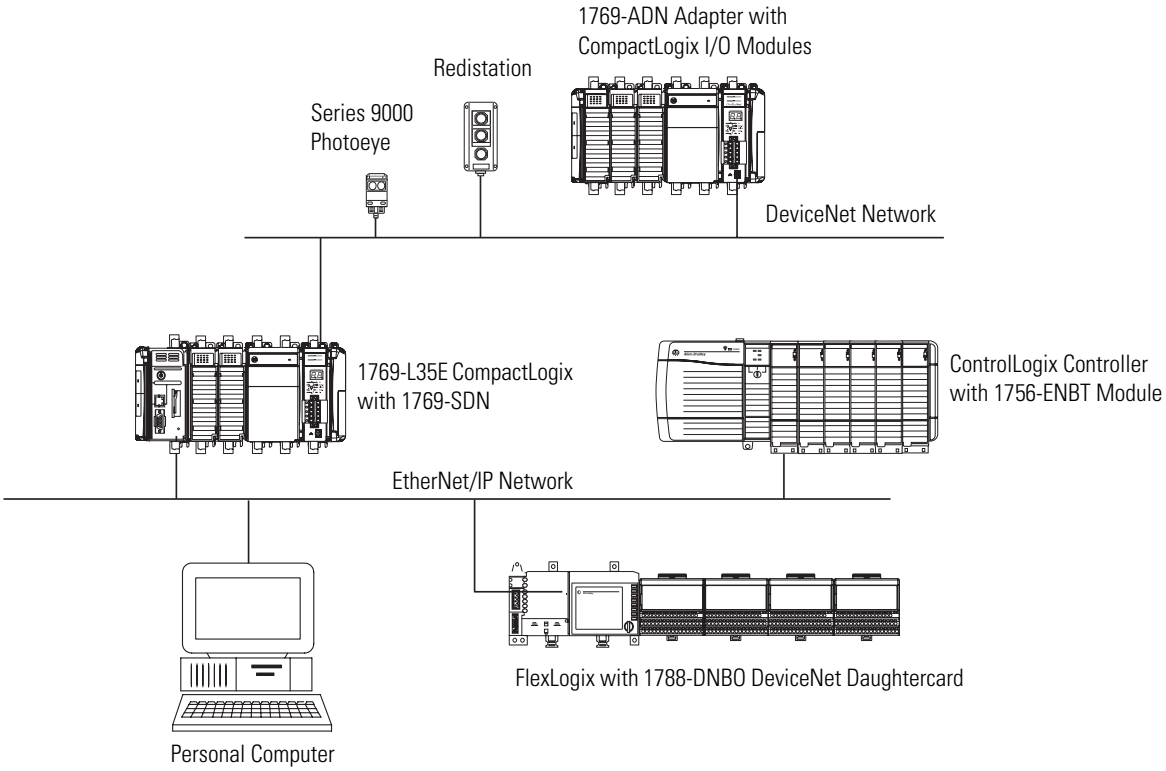
Remote Connection Type	Device Quantity	Connections per Device	Total Connections
Remote ControlNet communication module			
• I/O configured as direct connection (none)		0 or	
• I/O configured as rack-optimized connection		1	
Remote I/O module over ControlNet (direct connection)		1	
Remote EtherNet/IP communication module			
• I/O configured as direct connection (none)		0 or	
• I/O configured as rack-optimized connection		1	
Remote I/O module over a EtherNet/IP network (direct connection)		1	
Remote device over a DeviceNet network (accounted for in rack-optimized connection for local 1769-SDN module)		0	
Other remote communication adapter (POINT and FLEX adapters, for example)		1	
Produced tag		1	
Each consumer		1	
Consumed tag		1	
Message (depending on type)		1	
Block-transfer message		1	
		Total	

Connections Example

In this example system the 1769-L35E CompactLogix controller:

- controls local digital I/O modules in the same chassis.
- controls remote I/O devices on a DeviceNet network.
- sends and receives messages to/from a ControlLogix controller on an EtherNet/IP network.
- produces one tag that the 1794 FlexLogix controller consumes.
- is programmed via RSLogix 5000 programming software.

Example - CompactLogix System Connections



Example - CompactLogix Connection Types

Connection Type	Device Quantity	Connections per Device	Total Connections
Controller to local I/O modules (rack-optimized)	2	1	2
Controller to 1769-SDN scanner module	1	2	2
Controller to built-in EtherNet/IP communication port (rack-optimized)	1	0	0
Controller to RSLogix 5000 programming software	1	1	1
Message to ControlLogix controller	2	1	2
Produced tag consumed by FlexLogix controller	2	1	2
		Total	9

Additional Resources

For additional information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094
- Logix5000 Controllers General Instructions Reference Manual, publication 1756-RM003

Place, Configure, and Monitor I/O

Introduction

This chapter explains how to place, configure, and monitor CompactLogix I/O modules.

Select I/O Modules

When choosing 1769 I/O modules, select:

- specialty I/O modules when appropriate.

  Some modules have field-side diagnostics, electronic fusing, or individually-isolated inputs and outputs.

- a 1492 wiring system for each I/O module as an alternative to the terminal block that comes with the module.

- 1492 PanelConnect modules and cables if you are connecting input modules to sensors.

Additional Resources

For additional information, consult Compact I/O Selection Guide, publication 1769-SG002.

Validate I/O Layout

After you have selected your I/O modules, you need to validate the system you want to design. Before you begin to place your I/O modules, consider that:

- as you add modules, the minimum backplane RPI increases.
- the I/O modules must be distributed such that the current consumed from the left or right side of the power supply never exceeds 2.0 A at 5V dc or 1.0 A at 24V dc.

Estimate Request Packet Interval

The request packet interval (RPI) defines the frequency at which the controller sends and receives all I/O data on the backplane. There is one RPI for the entire 1769 backplane.

Type of Module	Request Packet Interval
Digital and analog (any mix)	• 1...4 modules can be scanned in 1 ms. • 5...16 modules can be scanned in 1.5 ms. • 17...30 modules can be scanned in 2 ms. • Some input modules have a fixed 8 ms filter, so selecting a greater RPI has no effect.
Specialty	• Full-sized 1769-SDN modules add 1.5 ms per module. • 1769-HSC modules add 0.5 ms per module.

You can always select an RPI that is slower than these. The RPI shows how quickly modules can be scanned, not how quickly an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

Calculate System Power Consumption

To validate your proposed system, calculate the total 5V dc current and 24V dc to be consumed.

I/O Module Power Consumption Calculation Table

Catalog Number	Number of Modules	Module Current Requirements		Calculated Current = (Number of Modules) x (Module Current Requirements)	
		at 5V dc (in mA)	at 24V dc (in mA)	at 5V dc (in mA)	at 24V dc (in mA)
1769-L31		330	40		
1769-L32C		650	40		
1769-L32E		660	90		
1769-L35CR		680	40		
1769-L35E		660	90		
			Total Current Required(1):		

(1) This number must not exceed the power supply current capacity.

Power Supply Current Capacity

Specification	Power Supply and Capacity			
	1769-PA2	1769-PB2	1769-PA4	1769-PB4
Output Bus Current Capacity 0...55 °C (32...131 °F)	2 A at 5V dc and 0.8 A at 24V dc		4 A at 5V dc and 2 A at 24V dc	
24V dc User Power Capacity 0...55 °C (32...131 °F)	250 mA (maximum)	NA		

Validate Placement of I/O Modules

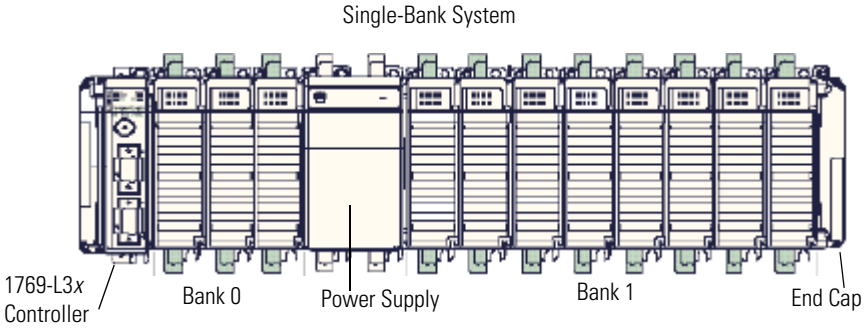
The controller you use determines how many local I/O modules you can configure.

Controller I/O Support

Controller	Supported Local I/O Modules	I/O Banks
1769-L35CR	30	3
1769-L35E	30	3
1769-L32C, 1769-L32E and 1769-L31	16	3

To validate the proposed placement of I/O modules in your CompactLogix system, perform this procedure.

1. Verify that your 1769-L3*x* controller resides on the leftmost side of the bank.



2. Verify that you have placed no more than three I/O modules between your controller and power supply (bank 0).

   Placing more than three I/O modules in bank 0 would exceed the distance rating of four and invalidate your system.

3. Validate the number of I/O modules your power supply can support.

   In a single-bank system, make sure you have not placed more than eight I/O modules between the power supply and end cap (bank 1).

IMPORTANT In a single-bank system, the power supply can support up to eight I/O modules as long as the modules' power consumption does not exceed the power supply's capacity.

So, in a single-bank system, you may not have more than eleven total I/O modules, three to the left of your power supply and eight to the right.

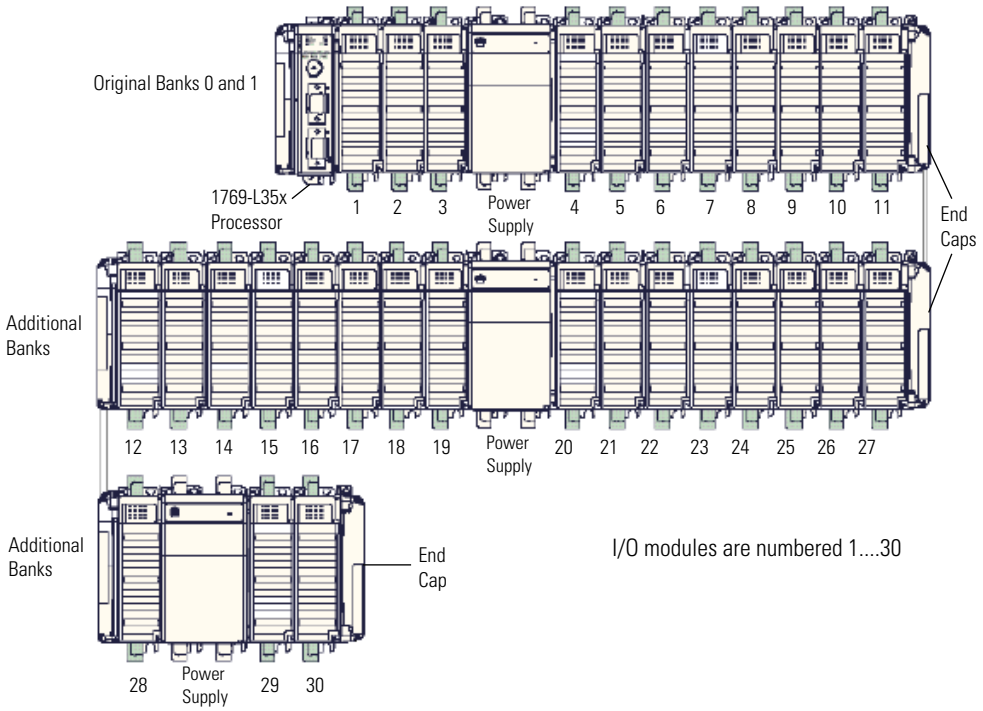
If your system requires additional I/O modules, you must add an additional bank.

In a multi-bank system, make sure that your additional bank(s) do not have more than eight I/O modules on either side of the additional power supply.

IMPORTANT In a multi-bank system, you may place up to eight I/O modules on either side of the additional power supply so long as the power consumed by these modules does not exceed the power supply's capacity.

In this example, the I/O modules 12...30 could be arranged in any way so long as the power supplies' capacity was not exceeded. In other words, the first additional bank could contain fewer than sixteen I/O modules This is just one possible arrangement.

Example of Multi-Bank System



4. Verify that all banks have end caps.

IMPORTANT If you place and configure more I/O modules and I/O banks than your controller can support, your system may run well for a period of time. Nothing alerts you to the fact that you have exceeded your controller's capacity.

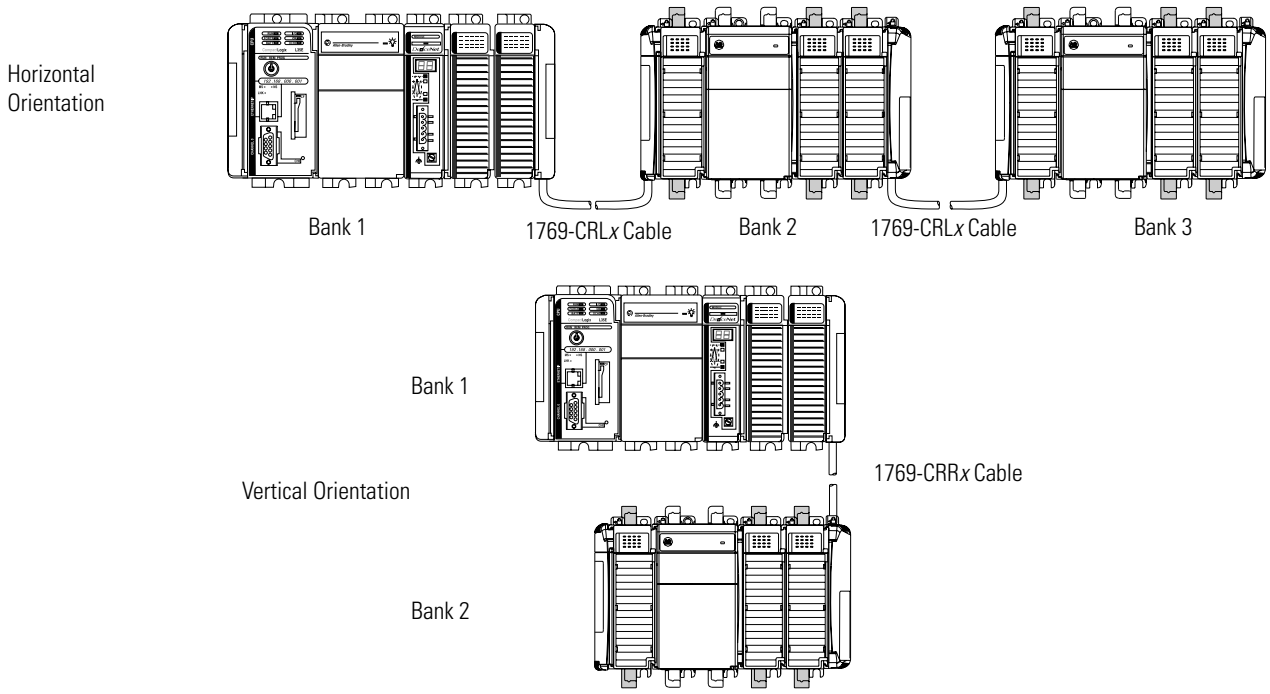
However, by exceeding your controller's I/O capacity, you put your system at risk of intermittent faults, the most common being Major Fault Type 03 (I/O Fault) Code 23.

Place Local I/O Modules

Use the 1769-CRR1/-CRR3 or 1769-CRL1/-CRL3 expansion cable to connect banks of I/O modules.

Each I/O module also has a power supply distance rating, the number of modules from the power supply. The distance rating is printed on each module's label. Each module must be located within its distance rating.

Controller I/O Placement



ATTENTION

The CompactLogix system does not support Removal and Insertion Under Power (RIUP). While the CompactLogix system is under power:

- any break in the connection between the power supply and the controller (for example, removing the power supply, controller, or an I/O module) may subject the logic circuitry to transient conditions above the normal design thresholds and may result in damage to system components or unexpected behavior.
- removing an end cap or an I/O module faults the controller and may also result in damage to system components.

The CompactLogix controller also supports distributed (remote) I/O via these networks:

- EtherNet/IP
- ControlNet
- DeviceNet

Additional Resources

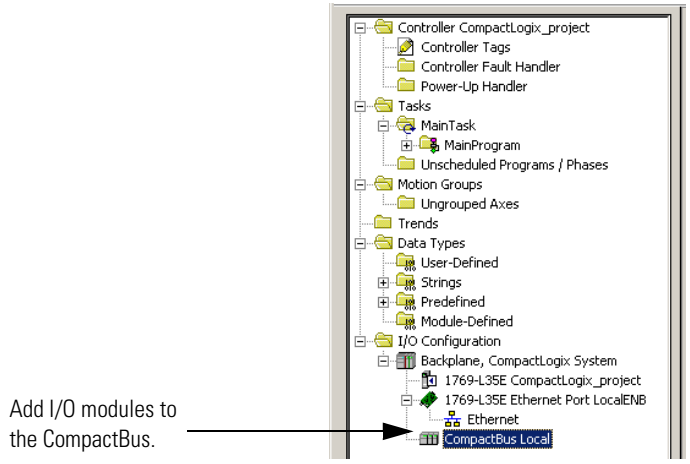
For additional information, consult these publications:

- Compact Analog I/O Modules User Manual, publication 1769-UM002
- Compact I/O 1769-IR6 RTD/Resistance Input Module User Manual, publication 1769-UM005
- Compact I/O 1769-IT6 Thermocouple/mV Input Module User Manual, publication 1769-UM004

Configure I/O

To communicate with an I/O module in your system, add the module to the I/O Configuration folder of the controller.

I/O Module Configuration



When you add a module, you also define a specific configuration for the module. While the configuration options vary from module to module, there are some common options that you typically configure

I/O Configuration Options

Configuration Option	Description
Requested packet interval (RPI)	The RPI specifies the interval at which data updates over a connection. For example, an input module sends data to a controller at the RPI that you assign to the module. • Typically, you configure an RPI in milliseconds (ms). The range is 0.2 ms...750 ms. • If a ControlNet network connects the devices, the RPI reserves a slot in the stream of data flowing across the ControlNet network. The timing of this slot may not coincide with the exact value of the RPI, but the control system guarantees that the data transfers at least as often as the RPI.
Change of state (COS)	Digital I/O modules use COS to determine when to send data to the controller. If a COS does not occur within the RPI timeframe, the module multicasts data at the RPI. Because the RPI and COS functions are asynchronous to the logic scan, it is possible for an input to change state during program scan execution. If this is a concern, buffer input data so your logic has a stable copy of data during its scan. Use the Synchronous Copy (CPS) instruction to copy the input data from your input tags to another structure and use the data from that structure.
Communication format	Many I/O modules support different formats. The communication format that you choose also determines: • data structure of tags. • connections. • network usage. • ownership. • returning of diagnostic information.
Electronic keying	When you configure a module, you specify the slot number for the module. However, it is possible to purposely or accidentally place a different module in that slot. Electronic keying lets you protect your system against the accidental placement of the wrong module in a slot. The chosen keying option determines how closely any module in a slot must match the configuration for that slot before the controller opens a connection to the module. There are different keying options depending on your application needs.

I/O Connections

A Logix5000 system uses connections to transmit I/O data.

Logix5000 I/O Connections

Connection	Description
Direct	A direct connection is a real-time, data-transfer link between the controller and an I/O module. The controller maintains and monitors the connection between the controller and the I/O module. Any break in the connection, such as a module fault or the removal of a module while under power, causes the controller to set fault status bits in the data area associated with the module. Typically, analog I/O modules, diagnostic I/O modules, and specialty modules require direct connections.
Rack-optimized	For digital I/O modules, you can select rack-optimized communication. A rack-optimized connection consolidates connection usage between the controller and all the digital I/O modules on a rack (or DIN rail). Rather than having individual, direct connections for each I/O module, there is one connection for the entire rack (or DIN rail).

Additional Resources

For additional information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

Configure Distributed I/O on an EtherNet/IP Network

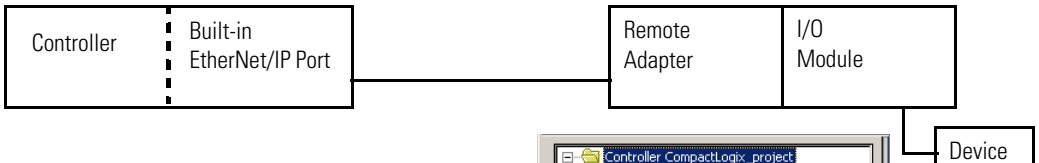
To communicate with distributed I/O modules over EtherNet/IP:

- choose a 1769-L32E or 1769-L35E CompactLogix controller with a built-in EtherNet/IP communication port.
- add an EtherNet/IP adapter, and I/O modules to the I/O Configuration folder of the controller.

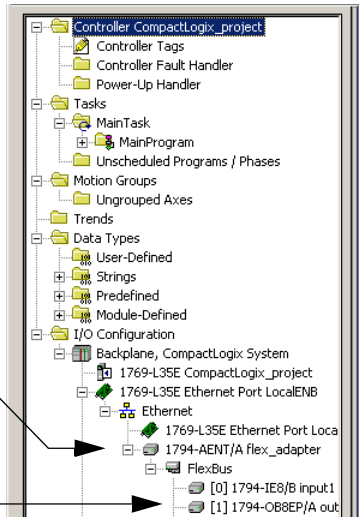
  Within the I/O Configuration folder, organize the modules into a hierarchy of tree/branch and parent/child.

EtherNet/IP Distributed I/O Configuration

For a typical distributed I/O network…



…you build the I/O configuration in this order.



1. Add the remote adapter for the distributed I/O chassis or DIN rail.
2. Add the distributed I/O modules.

Additional Resources

For more information, consult EtherNet/IP Communication Modules in Logix5000 Control Systems User Manual, publication ENET-UM001.

Configure Distributed I/O on a ControlNet Network

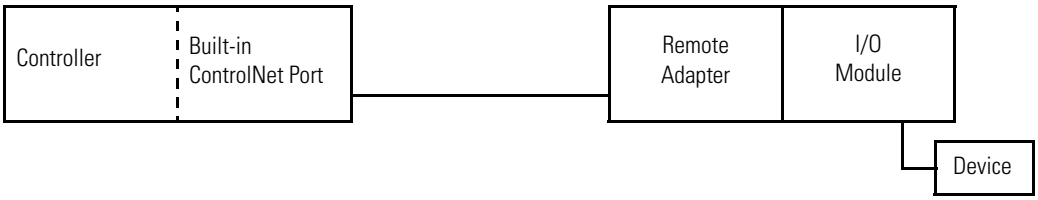
To communicate with distributed I/O modules over ControlNet:

- choose a 1769-L32C or 1769-L35CR CompactLogix controller with a built-in ControlNet communication port.
- add a ControlNet adapter, and I/O modules to the I/O Configuration folder of the controller.

  Within the I/O Configuration folder, organize the modules into a hierarchy of tree/branch and parent/child.

ControlNet Distributed I/O Configuration

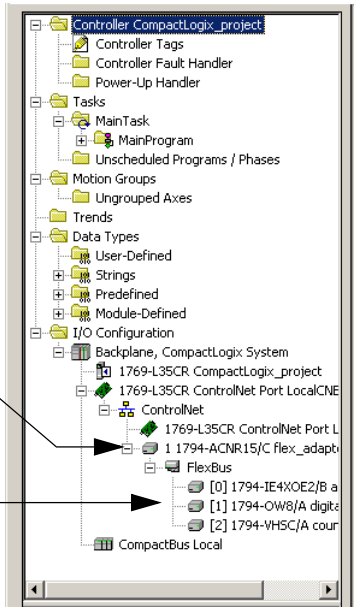
For a typical distributed I/O network…



…you build the I/O configuration in this order.

1. Add the remote adapter for the distributed I/O chassis or DIN rail.

2. Add the distributed I/O modules.



Additional Resources

For more information, consult ControlNet Communication Modules in Logix5000 Control Systems User Manual, publication CNET-UM001.

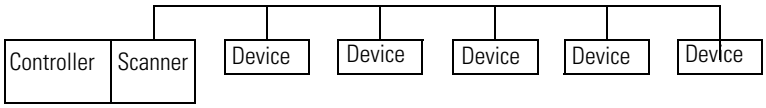
Configure Distributed I/O on a DeviceNet Network

To communicate with the I/O modules over a DeviceNet network, add the DeviceNet bridge to the I/O Configuration folder of the controller. RSNetWorx for DeviceNet software is used to define the scanlist within the DeviceNet scanner to communicate data between the devices and the controller through the scanner.

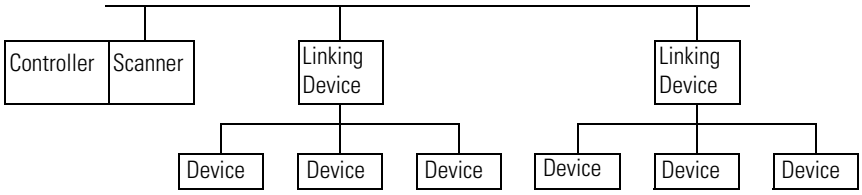
DeviceNet Distributed I/O Configuration

For a typical distributed I/O network…

Single Network

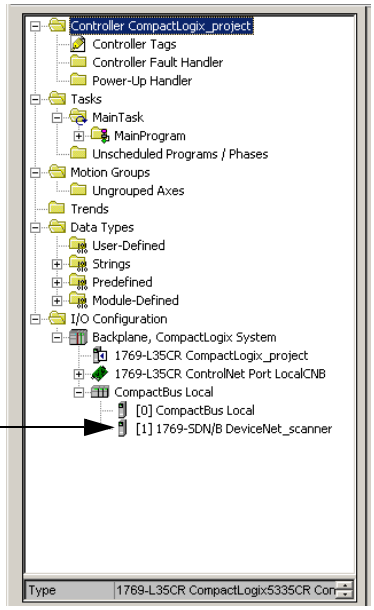


Several Smaller Distributed Networks (subnets)



…you build the I/O configuration in this order

Add the local scanner module.



Additional Resources

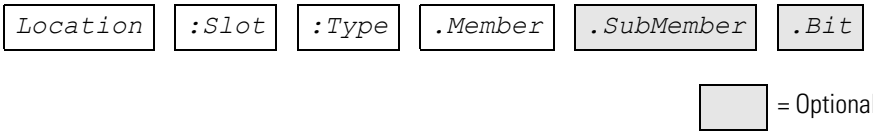
For more information, consult DeviceNet Communication Modules in Logix5000 Control Systems User Manual, publication DNET-UM004.

Address I/O Data

I/O information is presented as a set of tags.

- Each tag uses a structure of data, depending on the specific features of the I/O module.
- The name of the tags is based on the location of the I/O module in the system.

I/O Address Format

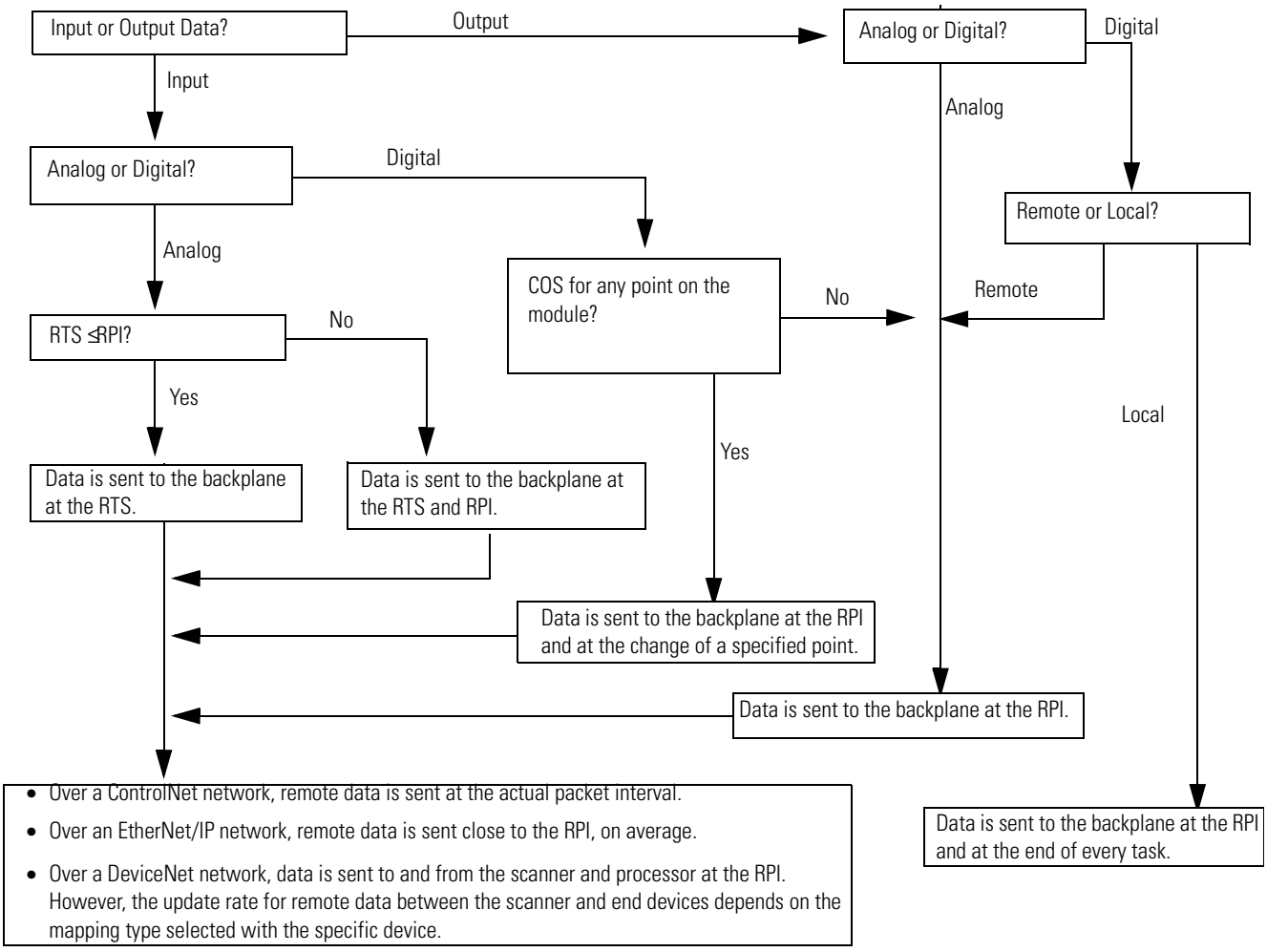


Where	Is
Location	Network location.
	Local = same chassis or DIN rail as the controller.
	Adapter_Name = identifies remote communication adapter or bridge module.
Slot	Slot number of I/O module in its chassis or DIN rail.
Type	Type of data.
	I = input.
	O = output.
	C = configuration.
	S = status.
Member	Specific data from the I/O module, depending on what type of data the module can store. • For a digital module, a data member usually stores the input or output bit values. • For an analog module, a channel member (CH#) usually stores the data for a channel.
SubMember	Specific data related to a member.
Bit	Specific point on a digital I/O module, depending on the size of the I/O module (0...31 for a 32-point module).

Determine When Data Is Updated

CompactLogix controllers update data asynchronously with the execution of logic. This flowchart illustrates when producers send data. Controllers, input modules and bridge modules are producers.

Updating of Data



TIP If you need to ensure that the I/O values being used during logic execution are from one moment in time, such as at the beginning of a ladder program, use the Synchronous Copy instruction (CPS) to buffer I/O data.

Additional Resources

For additional information, consult these publications:

- Logix5000 Controllers Common Procedures Programming Manual, publication 1756-PM001
- Logix5000 Controllers General Instruction Set Reference Manual, publication 1756-RM003

Monitor I/O Modules

With the CompactLogix controller, you can monitor I/O modules at different levels by:

- using the programming software to display fault data.

  Refer to Display Fault Data on page 62.

- programming logic to monitor fault data so you can take appropriate action

Additional Resources

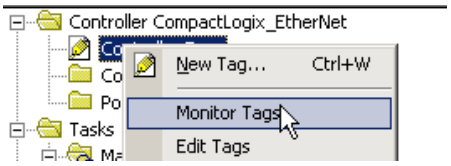
For examples of programming logic, refer to Logix5000 Controllers Common Procedures Programming Manual, publication 1756-PM001.

Display Fault Data

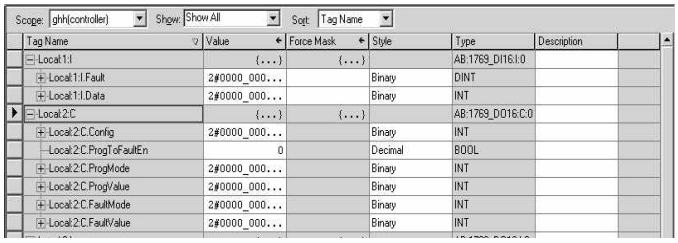
Fault data for certain types of module faults can be viewed through the programming software.

To display fault data, perform this procedure.

1. In RSLogix 5000 programming software, select Controller Tags in the Controller Organizer and right-click to select Monitor Tags.



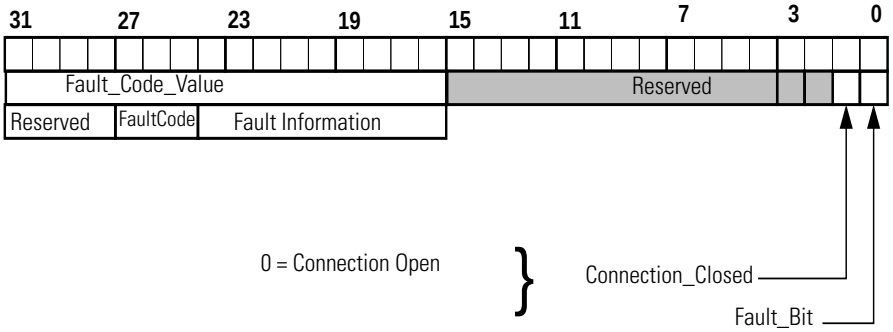
   The display style for the fault data defaults to decimal.



2. Change the display style to Hex to read the fault code.

If the module faults, but the connection to the controller remains open, the controller tags database displays the fault value 16#0E01_0001. The fault word uses this format.

Fault Word Format



Bit	Description
Fault_Bit	This bit indicates that at least one bit in the fault word is set (1). If all the bits in the fault word are cleared (0), this bit is cleared (0).
Connection_Closed	This bit indicates whether the connection to the module is open (0) or closed (1). If the connection is closed (1), the Fault_Bit is set (1).

End-cap Detection and Module Faults

If a module not adjacent to an end cap experiences a fault and the connection to the controller is not broken, only the module enters the fault state. If a module adjacent to an end cap experiences a fault, both the module and the controller transition to the fault state.

Reconfigure an I/O Module

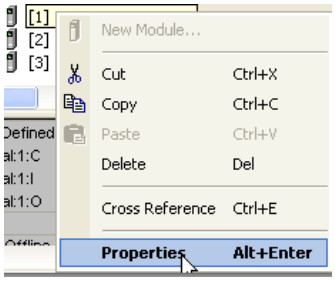
If an I/O module supports reconfiguration, you can reconfigure the module via:

- the Module Properties dialog in RSLogix 5000 software.
- a MSG instruction in program logic.

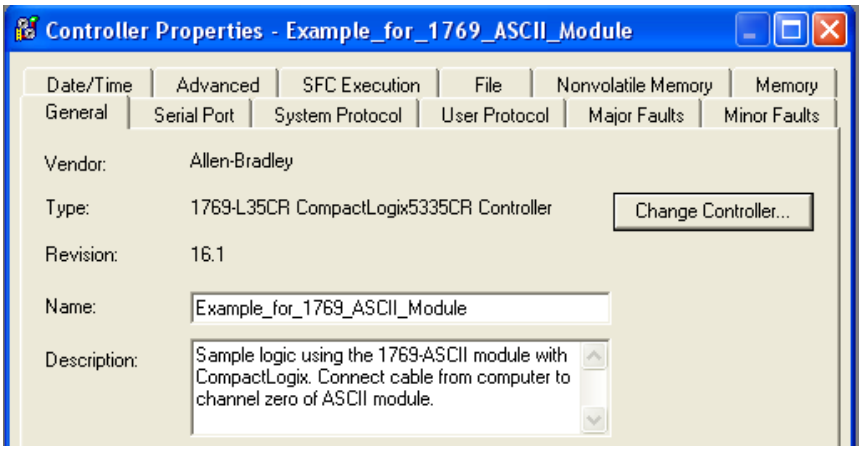
Reconfigure a Module via RSLogix 5000 Programming Software

To reconfigure an I/O module via RSLogix 5000 software, perform this procedure.

1. Highlight the module in the I/O Configuration tree and right-click to choose Properties.



The Controller Properties dialog appears.



2. Reconfigure the module.

Reconfigure a Module via a MSG Instruction

To reconfigure an I/O module, use a Module Reconfigure MSG instruction. During the reconfiguration:

- input modules continue to send input data to the controller.
- output modules continue to control their output devices.

A Module Reconfigure message requires the property Message Type and a selection of Module Reconfigure.

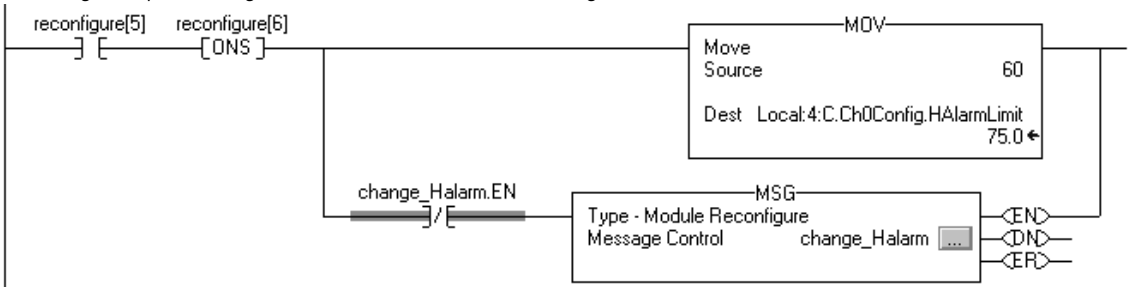
To reconfigure an I/O module, perform this procedure.

1. Set the required member of the configuration tag of the module to the new value.

2. Send a Module Reconfigure message to the module.

EXAMPLE

When reconfigure[5] is on, the MOV instruction sets the high alarm to 60 for the local module in slot 4. The Module Reconfigure message then sends the new alarm value to the module. The ONS instruction prevents the rung from sending multiple messages to the module while the reconfigure[5] is on.



Develop Applications

Introduction

This chapter explains how to develop applications.

Manage Tasks

With a Logix5000 controller, you can use multiple tasks to schedule and prioritize the execution of your programs based on specific criteria. This divides your controller's processing time among the different operations in your application. Remember that:

- the controller executes only one task at one time.
- one exception task can interrupt another and take control.
- in any given task, only one program executes at one time.

Additional Resources

For more information, consult these publications:

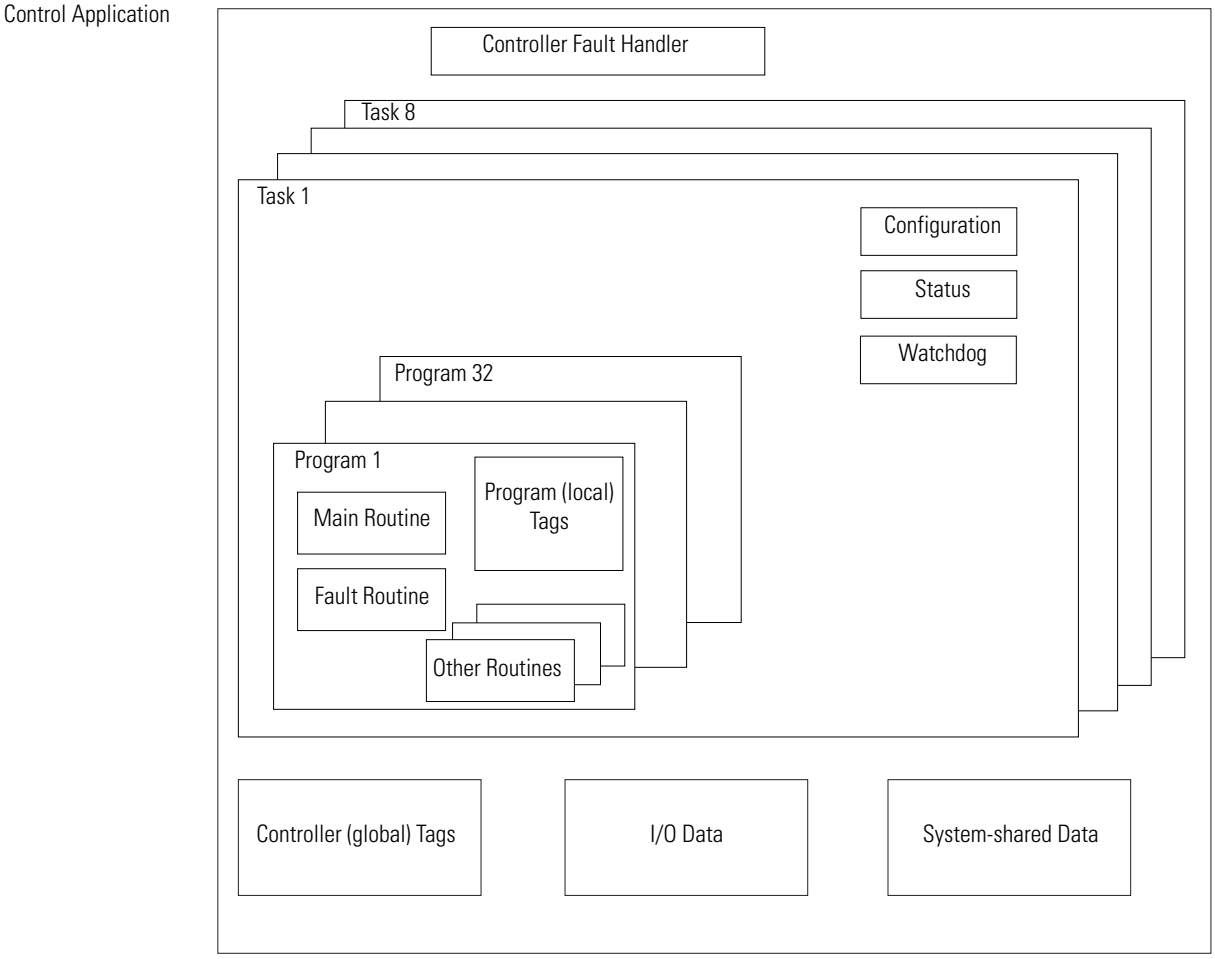
- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

Develop Programs

The controller's operating system is a preemptive multitasking system that is IEC 1131-3 compliant. This environment provides:

- tasks to configure controller execution.
- programs to group data and logic.
- routines to encapsulate executable code written in a single programming language.

Program Development



Define Tasks

Tasks provide scheduling and priority information for programs. You can configure tasks as continuous, periodic, or event tasks. Only one task can be continuous.

Task Support

Controller	Tasks Supported
1769-L35*x*	8
1769-L32*x*	6
1769-L31	4

A task can have as many as 100 separate programs, each with its own executable routines and program-scoped tags. Once a task is triggered (activated), all the programs assigned to the task execute in the order in which they are grouped. Programs can only appear once in the Controller Organizer and cannot be shared by multiple tasks.

Specify Task Priorities

Each task in the controller has a priority level. The operating system uses the priority level to determine which task to execute when multiple tasks are triggered. You can configure periodic tasks to execute from the lowest priority of 15 up to the highest priority of 1. A higher-priority task will interrupt any lower-priority task. The continuous task has the lowest priority and is always interrupted by a periodic task.

The CompactLogix controller uses a dedicated periodic task at priority 6 to process I/O data. This periodic task executes at the RPI you configure for the CompactBus, which can be as fast as once each millisecond. Its total execution time is as long as it takes to scan the configured I/O modules.

How you configure your tasks affects how the controller receives I/O data. Tasks at priorities 1...5 take precedence over the dedicated I/O task. Tasks in this priority range can impact I/O processing time. For example, if you use the following configuration:

- I/O RPI = 1 ms
- a task of priority = 1...5 that requires 500 µs to execute and is scheduled to run every millisecond

this configuration leaves the dedicated I/O task 500 µs to complete its job of scanning the configured I/O.

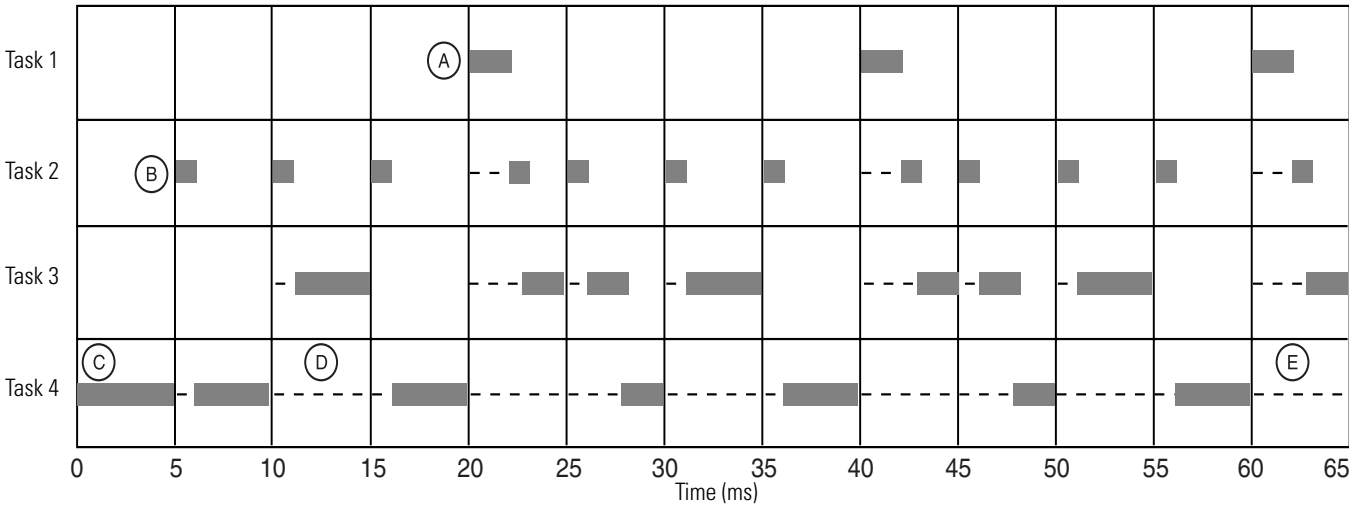
However, if you schedule two high priority tasks 1...5 to run every millisecond, and they both require 500 µs or more to execute, no CPU time would be left for the dedicated I/O task. Furthermore, if you have so much configured I/O that the execution time of the dedicated I/O task approaches 2 ms (or the combination of the high priority tasks and the dedicated I/O task approaches 2 ms) no CPU time is left for low priority tasks 7...15.

TIP

For example, if your program needs to react to inputs and control outputs at a set rate, configure a periodic task with a priority higher than 6 (1...5). This keeps the dedicated I/O task from affecting the periodic rate of your program. However, if your program contains a lot of math and data manipulation, place this logic in a task with priority lower than 6 (7...15), such as the continuous task, so that the dedicated I/O task is not adversely affected by your program.

Multiple Tasks Example

Task	Priority Level	Task Type	Example Execution Time	Worst-Case Completion Time
1	5	20 ms periodic task	2 ms	2 ms
2	7	Dedicated I/O task 5 ms selected RPI	1 ms	3 ms
3	10	10 ms periodic task	4 ms	8 ms
4	None (lowest)	Continuous task	25 ms	60 ms



Remember that:

- the highest priority task interrupts all lower priority tasks.
- the dedicated I/O task can be interrupted by tasks with priority levels 1...5.

  The dedicated I/O task interrupts tasks with priority levels 7...15. This task runs at the selected RPI rate scheduled for the CompactLogix system (2 ms in this example).
- the continuous task runs at the lowest priority and is interrupted by all other tasks.
- a lower priority task can be interrupted multiple times by a higher priority task.
- when the continuous task completes a full scan it restarts immediately, unless a higher priority task is running.

Define Programs

Each program contains:

- program tags.
- a main executable routine.
- other routines.
- an optional fault routine.

Each task can schedule as many as 100 programs.

The scheduled programs within a task execute to completion from first to last. Programs unattached to any task show up as unscheduled programs. You must specify (schedule) a program within a task before the controller can scan the program.

Define Routines

A routine is a set of logic instructions in a single programming language, such as ladder logic. Routines provide the executable code for the project in a controller. A routine is similar to a program file or subroutine in a PLC or SLC controller.

Each program has a main routine. This is the first routine to execute when the controller triggers the associated task and calls the associated program. Use logic, such as the Jump to Subroutine (JSR) instruction, to call other routines.

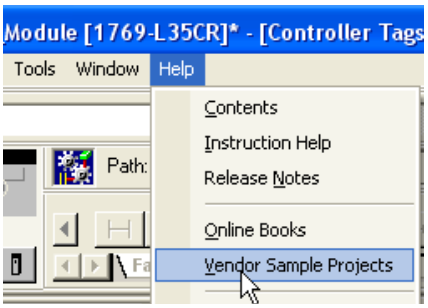
You can also specify an optional program fault routine. The controller executes this routine if it encounters an instruction-execution fault within any of the routines in the associated program.

Sample Controller Projects

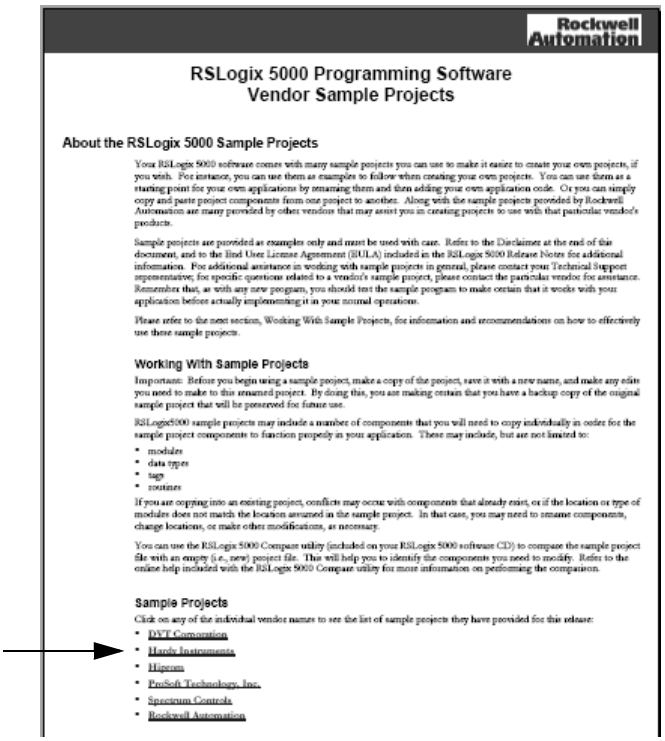
RSLogix 5000 Enterprise programming software includes sample projects that you can copy and then modify to fit your application.

To view a set of sample controller projects, perform this procedure.

1. From the Help pull-down menu, choose Vendor Sample Projects.



2. Scroll down to select a set of sample projects.



Additional Resources

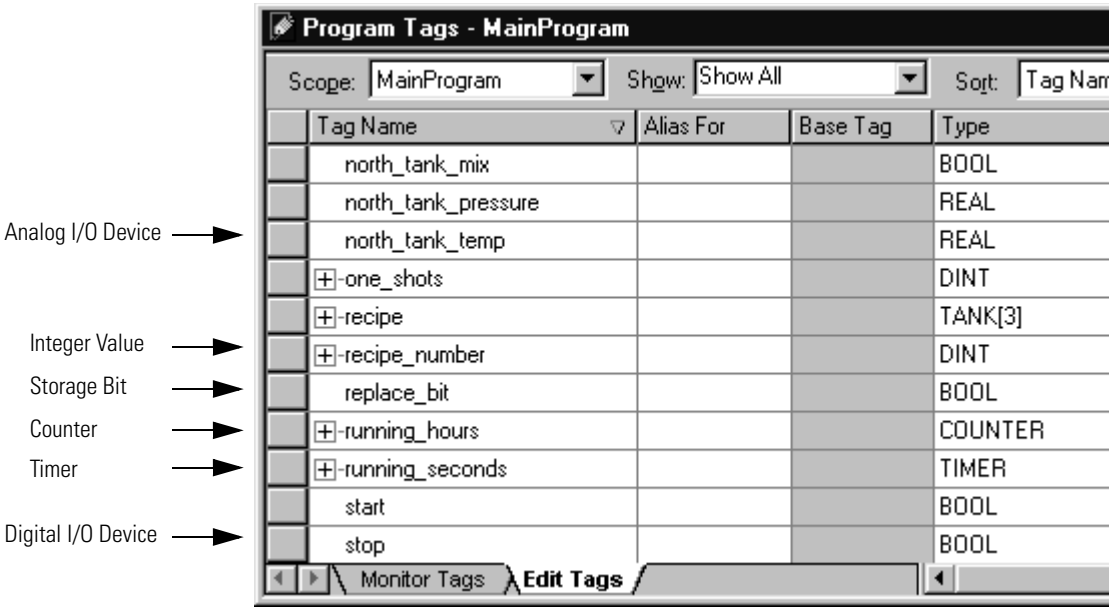
For more information, consult Logix5000 Controllers Common Procedures Manual, publication 1756-PM001.

Organize Tags

With a Logix5000 controller, you use a tag (alphanumeric name) to address data (variables). In Logix5000 controllers, there is no fixed, numeric format. The tag name itself identifies the data. This lets you:

- organize your data to mirror your machinery.
- document (through tag names) your application as you develop it.

Tag Organization



When you create a tag, assign these properties to the tag:

- Tag type
- Data type
- Scope

Additional Resources

For additional information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

Select a Programming Language

The CompactLogix controller supports these programming languages, both online and offline.

Programming Language Selection

Required Language	Program
Ladder diagram (LD)	Continuous or parallel execution of multiple operations (not sequenced)
	Boolean or bit-based operations
	Complex logical operations
	Message and communication processing
	Machine interlocking
	Operations that service or maintenance personnel may have to interpret in order to troubleshoot the machine or process
Function block diagram (FBD)	Continuous process and drive control
	Loop control
	Calculations in circuit flow
Sequential function chart (SFC)	High-level management of multiple operations
	Repetitive sequence of operations
	Batch process
	Motion control using structured text
	State machine operations
Structured text (ST)	Complex mathematical operations
	Specialized array or table loop processing
	ASCII string handling or protocol processing

Add-On Instructions

With version 16 of RSLogix 5000 programming software, you can design and configure sets of commonly used instructions to increase project consistency. Similar to the built-in instructions contained in Logix5000 controllers, these instructions you create are called Add-On Instructions. Add-On Instructions reuse common control algorithms. With them, you can:

- ease maintenance by animating logic for a single instance.
- protect intellectual property with locking instructions.
- reduce documentation development time.

You can use Add-On Instructions across multiple projects. You can define your instructions, obtain them from somebody else, or copy them from another project.

Once defined in a project, Add-On Instructions behave similarly to the built-in instructions in Logix5000 controllers. They appear on the instruction tool bar for easy access, as do internal RSLogix 5000 software instructions.

Save Time

With Add-On Instructions, you can combine your most commonly used logic into sets of reusable instructions. You save time when you create instructions for your projects and then share them with others. Add-On Instructions increase project consistency since commonly used algorithms all work in the same manner, regardless of who implements the project.

Use Standard Editors

You create Add-On Instructions by using one of three RSLogix 5000 software programming editors.

- Standard Ladder
- Function Block Diagram
- Structured Text

Once you have created instructions, you can use them in any RSLogix 5000 editor.

Export Add-On Instructions

You can export Add-On-Instructions to other projects as well as copy and paste them from one project to another. Give each instruction a

unique name so that you don't accidentally overwrite another instruction of the same name.

Use Context Views

Context views let you visualize an instruction's logic for a specific instant, simplifying online troubleshooting of your Add-On Instructions. Each instruction contains a revision, a change history, and an auto-generated help page.

Create Custom Help

When you create an instruction, you enter information for the description fields in software dialogs, information that becomes what is known as Custom Help. Custom Help makes it easier for users to get the help they need when implementing the instructions.

Apply Source Protection

As the creator of Add-On Instructions, you can limit users of your instruction(s) to read-only access, or you can bar access to the internal logic or local parameters used by the instruction(s). This source protection lets you prevent unwanted changes to your instruction(s) and protects your intellectual property.

Additional Resources

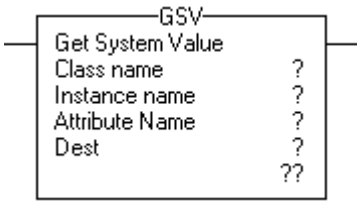
For additional information, consult Logix5000 Controllers Execution Time and Memory Use Reference Manual, publication 1756-RM087.

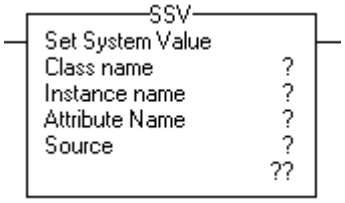
Additional Resources

For more information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Execution Time and Memory Use Reference Manual, publication 1756-RM087

Monitor Controller Status





The CompactLogix controller uses Get System Value (GSV) and Set System Value (SSV) instructions to get and set (change) controller data. The controller stores system data in objects. There is no status file, as in the PLC-5 processor.

The GSV instruction retrieves the specified information and places it in the destination. The SSV instruction sets the specified attribute with data from the source.

When you enter a GSV/SSV instruction, the programming software displays the:

- valid object classes.
- object names.
- attribute names.

For the GSV instruction, you can get values for all the available attributes. For the SSV instruction, the software displays only those attributes you are allowed to set.

In some cases, there will be more than one of the same type of object, so you might also have to specify the object name. For example, there can be several tasks in your application. Each task has its own TASK object that you access by the task name.

You can access these object classes:

- AXIS
- CONTROLLER
- CONTROLLERDEVICE
- CST
- DF1
- FAULTLOG
- MESSAGE
- MODULE
- MOTIONGROUP
- PROGRAM
- ROUTINE
- SERIALPORT
- TASK
- WALLCLOCKTIME

Additional Resources

For more information, consult these publicaitons:

- Logix5000 Controllers General Instructions Reference Manual, publication 1756-RM003
- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001

Monitor Connections

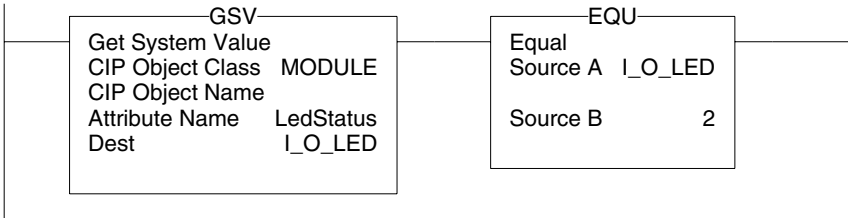
If communication with a device in the I/O configuration of the controller does not occur for 100 ms or 4 times the RPI, whichever is less, the communication times out, and the controller produces these warnings:

- The I/O LED on the front of the controller flashes green.
- A ⚠ displays over the I/O configuration folder and the device (s) that has timed out.
- A module fault code is produced, which you can access via:
  - the Module Properties dialog box for the module.
  - a GSV instruction.

Determine if Device Communication Has Timed Out

If communication times out with at least one device (module) in the I/O configuration of the controller, the I/O LED on the front of the controller flashes green.

- The GSV instruction gets the status of the I/O LED and stores it in the I_O_LED tag.
- If I_O_LED equals 2, the controller has lost communication with at least one device.



where:

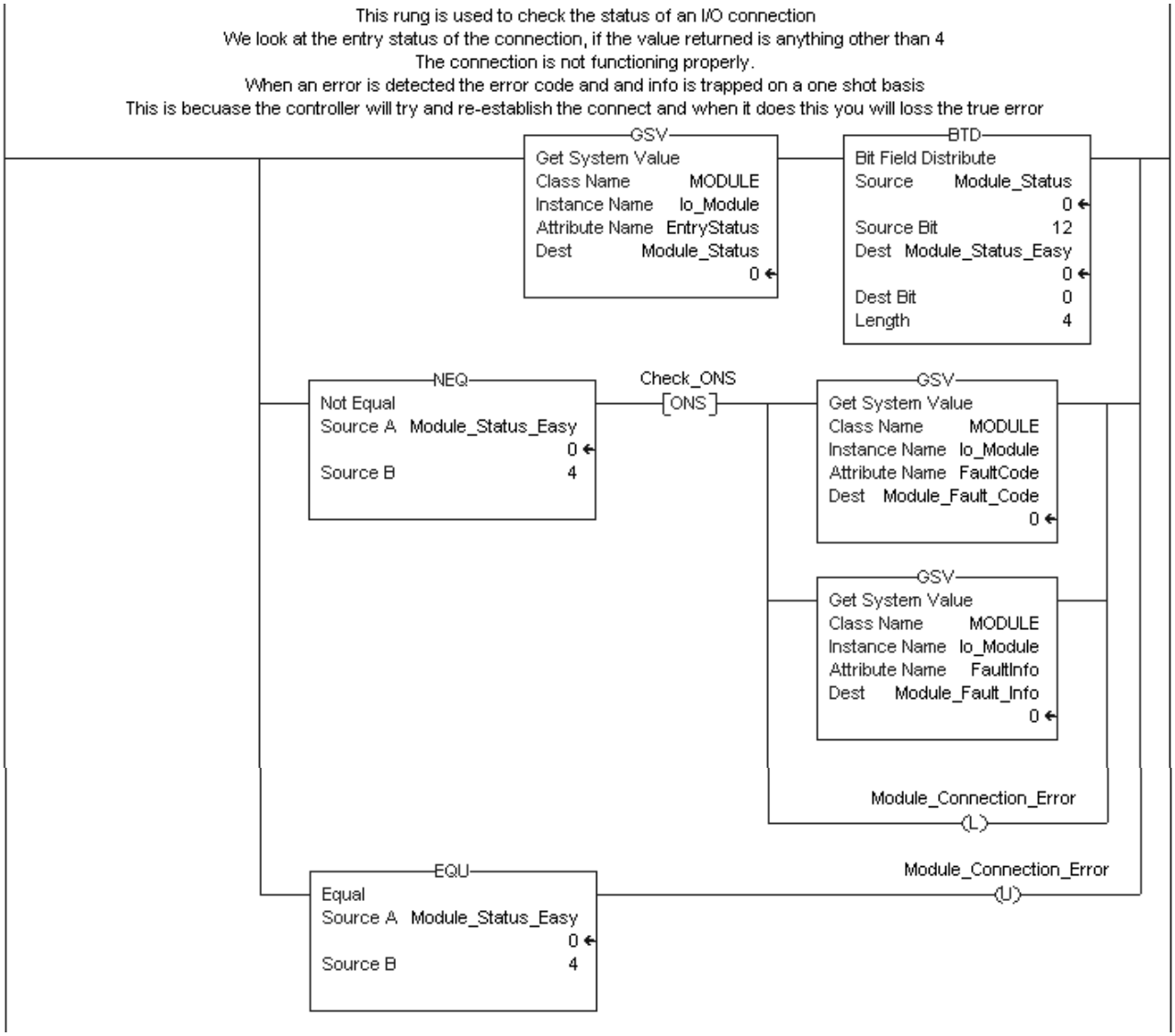
I_O_LED is a DINT tag that stores the status of the I/O LED on the front of the controller.

Determine if I/O Module Communication Has Timed Out

If communication times out with a device (module) in the I/O configuration of the controller, the controller produces a fault code for the module.

- The GSV instruction gets the fault code for IO_Module and stores it in the Module_Status tag.
- If Module_Status is any value other than 4, the controller is not communicating with the module.

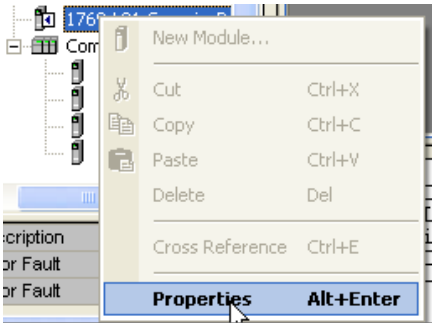
I/O Module Communication



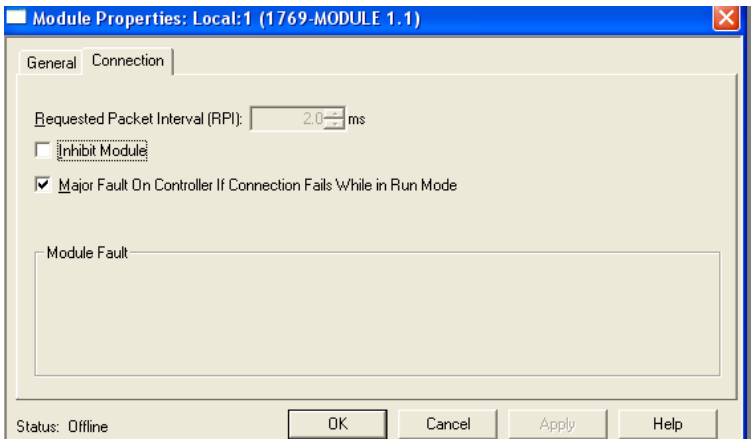
Interrupt the Execution of Logic and Execute the Fault Handler

To interrupt the execution of logic and execute the fault handler, perform this procedure.

1. In the Controller Organizer of RSLogix 5000 programming software, right-click the module and choose Properties.



The Module Properties dialog appears.



2. Click the Connection and check Major Fault On Controller If Connection Fails While in Run Mode check box.

3. Click OK.

4. Develop a routine for the Controller Fault Handler.

Additional Resources

For additional information, consult these publications:

- Logix5000 Controllers Common Procedures Manual, publication 1756-PM001
- Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094

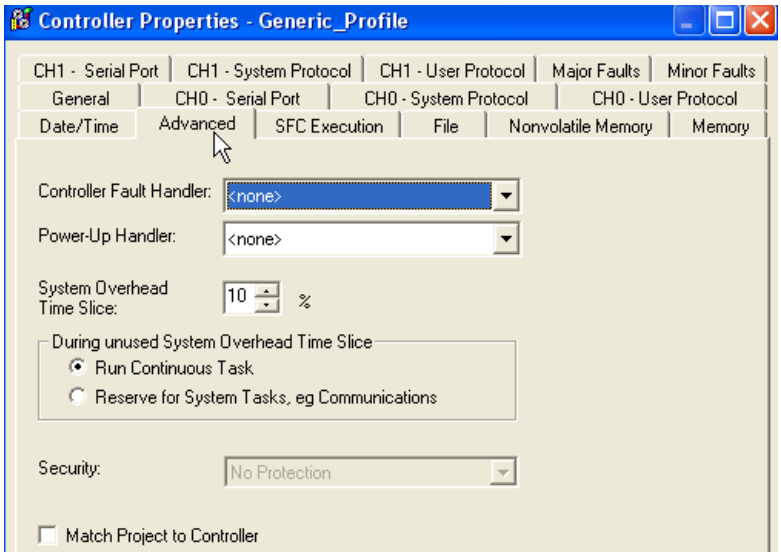
Select a System Overhead Time Slice Percentage

The Controller Properties dialog lets you specify a percentage for system overhead. This percentage specifies the ratio of controller time, excluding the time for periodic tasks, that is devoted to communication and background functions.

To select a system overhead percentage, perform this procedure.

1. In the Controller Organizer of RSLogix 5000 programming software, right-click on your controller and choose Properties.

   The Controller Properties dialog appears.



2. Click the Advanced tab.

3. From the System Overhead Time Slice menu, choose a percentage.

   System overhead time slice functions include:

   - communicating with programming and HMI devices, such as RSLogix 5000 software.
   - responding to messages.
   - sending messages.

   The controller performs system overhead functions for up to one millisecond at a time. If the controller completes the overhead

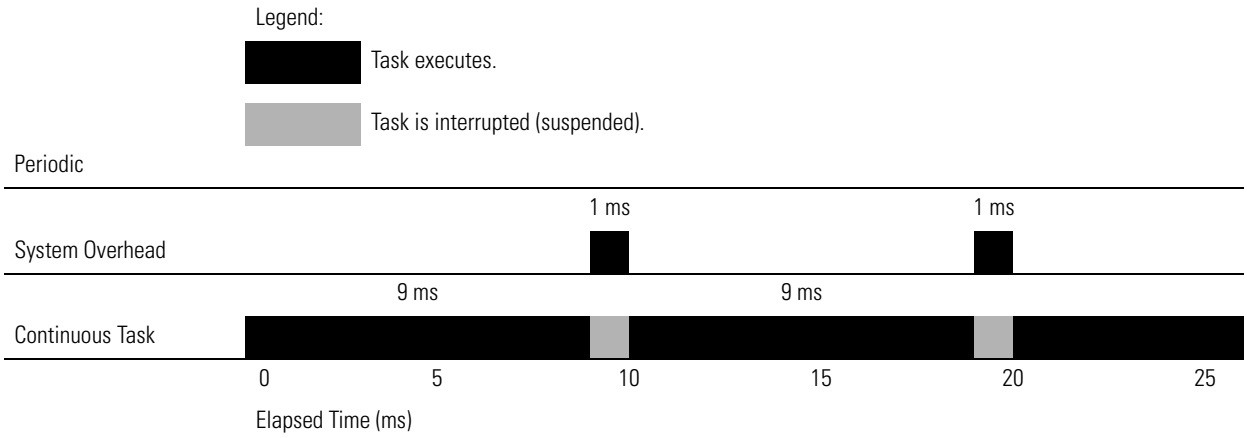
functions in less than one millisecond, it resumes the continuous task.

As the system overhead time slice percentage increases, time allocated to executing the continuous task decreases. If there are no communications for the controller to manage, the controller uses the communications time to execute the continuous task. While increasing the system overhead percentage does increase communications performance, it also increases the amount of time it takes to execute a continuous task, increasing overall scan time.

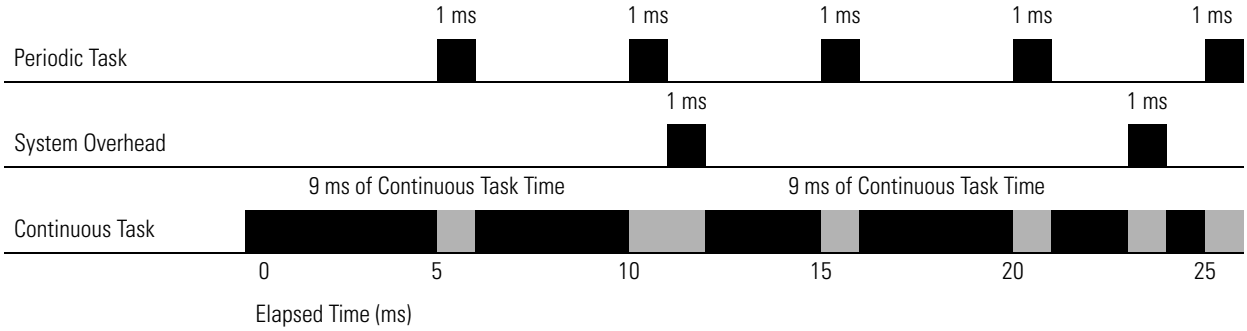
Ratio between Continuous Task and System Overhead Functions

Time Slice	Continuous Tasks	Max Overhead Function Time
10%	9 ms	1 ms
20%	4 ms	1 ms
33%	2 ms	1 ms
50%	1 ms	1 ms

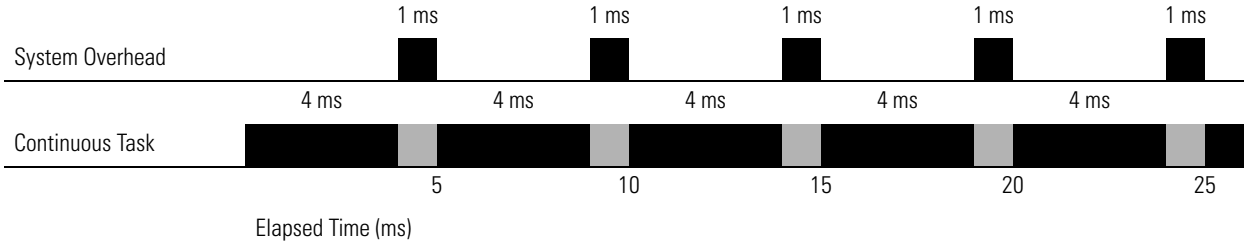
At a time slice of 10%, system overhead interrupts the continuous task every 9 ms of continuous task time.



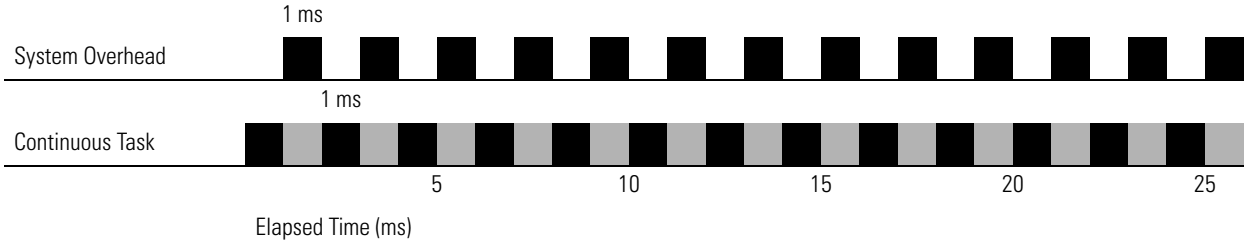
The interruption of a periodic task increases the elapsed time (clock time) between the execution of system overhead functions.



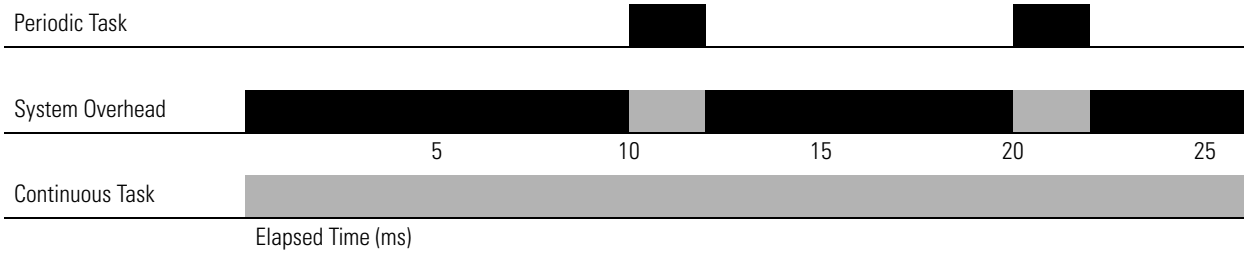
If you use the default time slice of 20%, the system overhead interrupts the continuous task every 4 ms.



If you increase the time slice to 50%, the system overhead interrupts the continuous task every 1 ms.



If the controller contains only a periodic task(s), the system overhead time slice value has no effect. System overhead runs whenever a periodic task is not running.



Configure PhaseManager

Introduction

This chapter explains how to configure PhaseManager.

The PhaseManager option of RSLogix 5000 programming software gives you a state model for your equipment.

Additional Resources

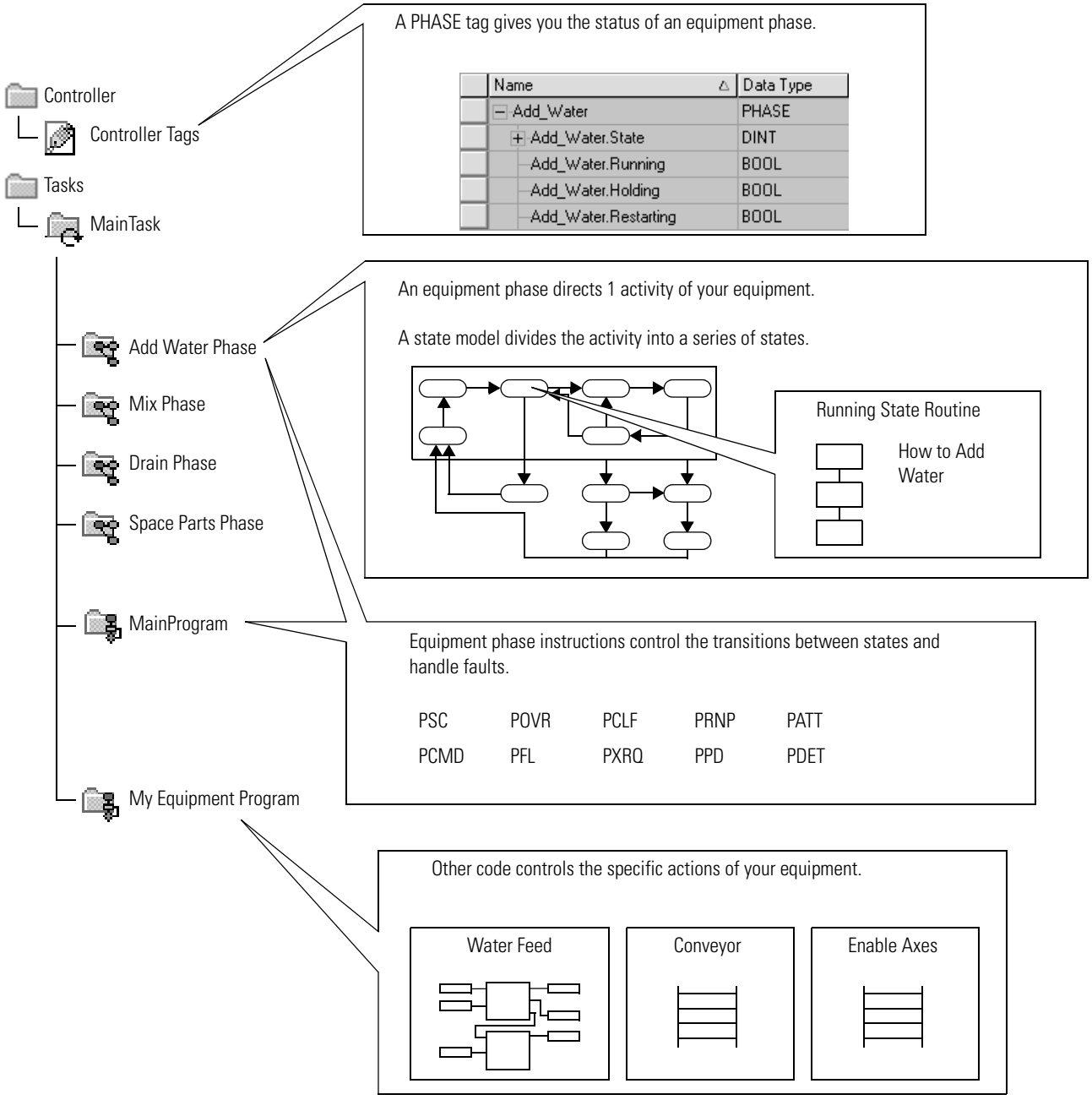
For additional information, consult PhaseManager User Manual, publication LOGIX-UM001.

About PhaseManager

PhaseManager lets you add equipment phases to your controller. An equipment phase helps you lay out your code in sections that are easier to write, find, follow, and change.

Term	Description
Equipment phase	• As with a program, an equipment phase is run in a task and is given a set of routines and tags. • Unlike a program, an equipment phase runs by a state model and lets you do one activity.
State model	A state model divides the operating cycle of your equipment into a series of states. Each state is an instant in the operation of the equipment. It's the actions or conditions of the equipment at a given time. The state model of an equipment phase is similar to the S88 and Pack*ML* state models.
State machine	An equipment phase includes an embedded state machine that: • calls the main routine (state routine) for an acting state. • manages the transitions between states with minimal coding. • makes sure that the equipment goes from state to state along an allowable path.
PHASE tag	When you add an equipment phase, RSLogix 5000 software makes a tag, using the PHASE data type.

PhaseManager Overview



About a State Model

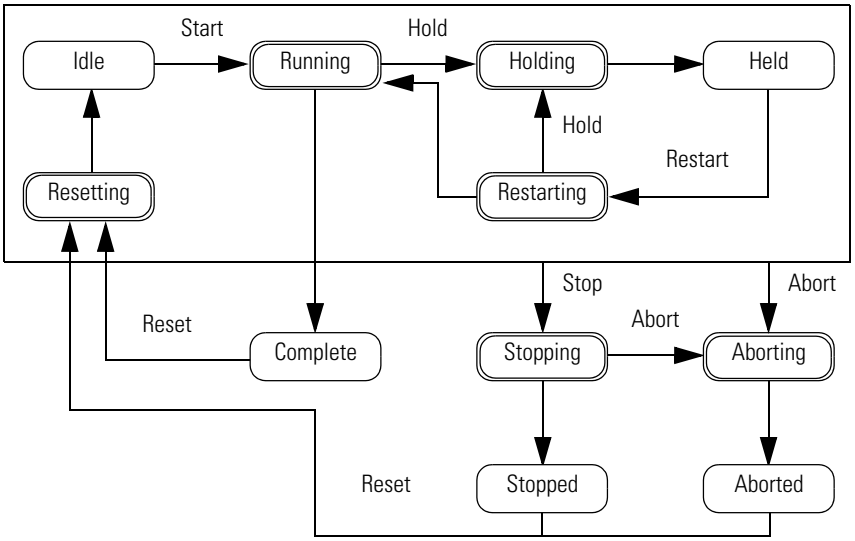
A state model divides the operating cycle of your equipment into a series of states. Each state is an instant in the operation of the equipment, an action or condition at a given time.

In a state model, you define what your equipment does under different conditions, such as run, hold, and stop. You don't need to use all the states for your equipment. Use only needed states.

Types of States

State	Description
Acting	Does something or several things for a certain time or until certain conditions are met. An acting state runs one time or repeatedly.
Waiting	Shows that certain conditions are met and the equipment is waiting for the signal to go to the next state.

PhaseManager States



Your equipment can go from any state in the box to the stopping or aborting state.

Acting

Acting states represent the things your equipment does at a given time.

Waiting

Waiting states represent the condition of your equipment when it is in between acting states.

With a state model, you define the behavior of your equipment and put it into a brief functional specification. In this way you show what happens and when it happens.

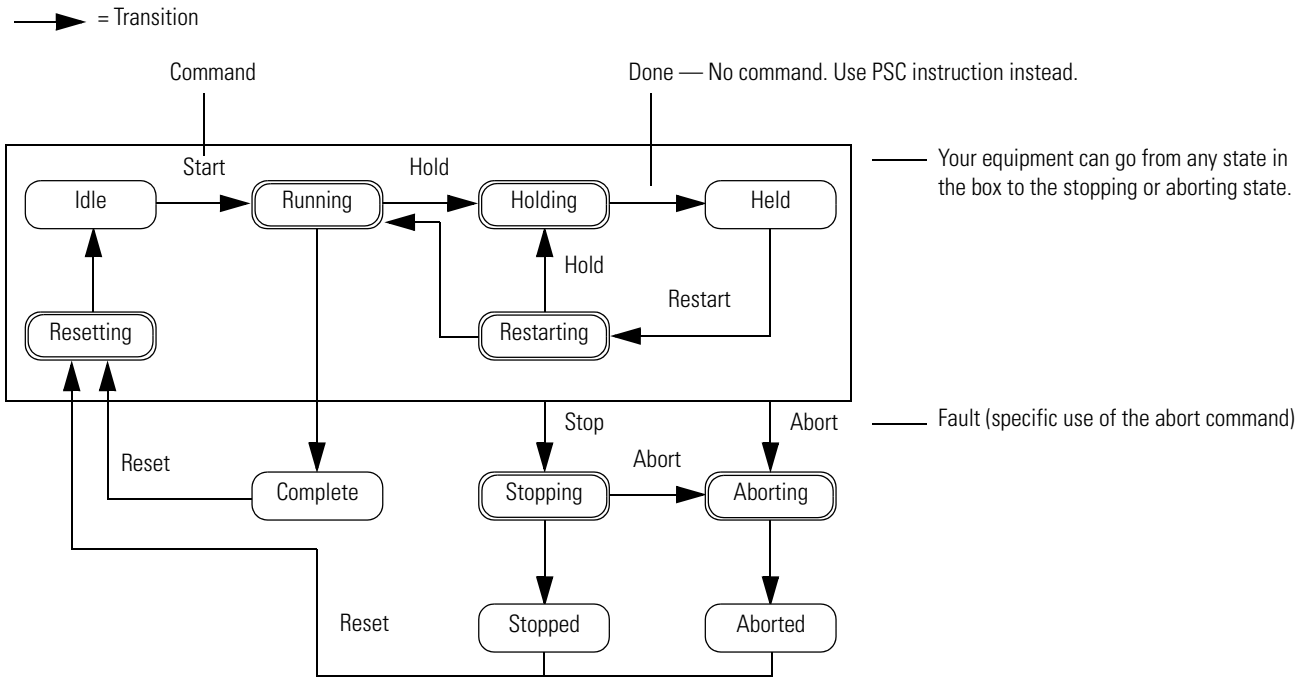
State	Question To Be Asked
Stopped	What happens when you turn on power?
Resetting	How does the equipment get ready to run?
Idle	How do you tell that the equipment is ready to run?
Running	What does the equipment do to make product?
Holding	How does the equipment temporarily stop making product without making scrap?
Held	How do you tell if the equipment is safely holding?
Restarting	How does the equipment resume production after holding?
Complete	How do you tell when the equipment has finished what it had to do?
Stopping	What happens during a normal shutdown?
Aborting	How does the equipment shut down if a fault or failure happens?
Aborted	How do you tell if the equipment is safely shut down?

Change Equipment States

The arrows in the state model show how your equipment can transition from one state to another.

- Each arrow is called a transition.
- A state model lets the equipment make only certain transitions. This transition restriction standardizes equipment behavior so that another piece of equipment using the same model will behave the same way.

PhaseManager Transitions Overview

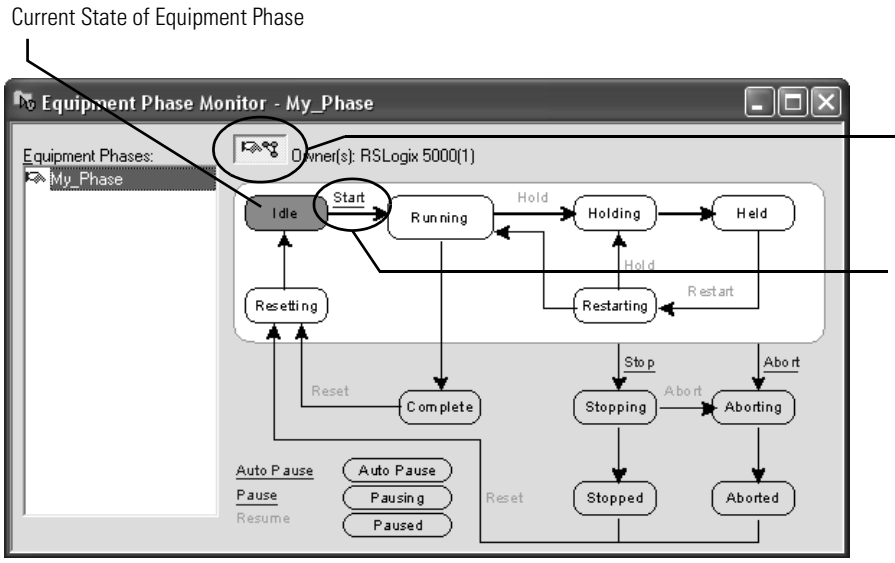


PhaseManager Transition Types

Transition Type	Description
Command	A command tells the equipment to start doing something or do something different. For example the operator pushes the start button to start production and the stop button to halt production. PhaseManager uses these commands: • Reset • Start • Stop • Hold • Restart • Abort
Done	Equipment goes to a waiting state when it has completed a task. You don't have to command equipment to stop. Instead, set up your code to signal when a task is complete.
Fault	A fault tells you that something unusual has occurred. Set up your code to find and take action for faults. Suppose you want your equipment to shut down as fast as possible in case of a certain fault. In that case, set up your code to look for that fault and give the abort command if it finds it.

Manually Change States

With RSLogix 5000 software, you can monitor and command an equipment phase. To manually change states, perform this procedure.



Compare PhaseManager to Other State Models

You can compare PhaseManager's state models to other common state models.

State Model Comparisons

S88	Pack*ML*	PhaseManager
Idle	Starting ⇒Ready	Resetting ⇒Idle
Running ⇒Complete	Producing	Running ⇒Complete
Pausing ⇒Paused	Standby	Subroutines and/or breakpoints
Holding ⇒Held	Holding ⇒Held	Holding ⇒Held
Restarting	None	Restarting
Stopping ⇒Stopped	Stopping ⇒Stopped	Stopping ⇒Stopped
Aborting ⇒Aborted	Aborting ⇒Aborted	Aborting ⇒Aborted

Minimum System Requirements

To develop PhaseManager programs, you need:

- a CompactLogix controller with firmware revision 16.0 or later.
- a communication path to the controller.
- RSLogix 5000 programming software, version 15.0 or later.

To enable PhaseManager support, you need the full or professional editions of RSLogix 5000 software or the optional PhaseManager add-on (9324-RLDPMENE) to your RSLogix 5000 software package.

Equipment Phase Instructions

With CompactLogix controllers, you can issue many ladder diagram (LD) and structured text (ST) instructions to begin various equipment phases.

Instruction Code	Instruction
PSC	Signal a phase that the state routine is complete so go to the next state
PCMD	Change the state or substate of a phase
PFL	Signal a failure for a phase
PCLF	Clear the failure code of a phase
PXRQ	Initiate communication with RSBizWare Batch software
PRNP	Clear the NewInputParameters bit of a phase
PPD	Set up breakpoints within the logic of a phase
PATT	Take ownership of a phase to either: • prevent another program or RSBizWare Batch software from commanding a phase or • make sure another program or RSBizWare Batch software does not already own a phase
PDET	Relinquish ownership of a phase
POVR	Override a command

Notes:

Maintain Nonvolatile Memory

Introduction

This chapter explains how to maintain nonvolatile memory.

CompactLogix controllers support the 1784-CF64 CompactFlash card for nonvolatile memory. If the controller loses power and lacks sufficient battery capacity, it loses the project in user memory. Nonvolatile memory lets you keep a copy of your project on the controller. The controller does not need power to keep this copy.

You can load the copy from nonvolatile memory to user memory of the controller:

- every time power is applied.
- whenever there is no project in the controller and it turns on.
- any time via RSLogix 5000 programming software.

IMPORTANT

Nonvolatile memory stores the contents of the user memory when you store the project.

- Changes made after you store the project are not reflected in nonvolatile memory.
- If you change the project but do not store those changes, you overwrite them when you load the project from nonvolatile memory. If this occurs, you have to upload or download the project to go online.

If you want to store changes such as online edits, tag values, or a ControlNet network schedule, store the project again after you make the changes.

Prevent a Major Fault During a Load

If the major and minor revision of the project in nonvolatile memory does not match the major and minor revision of the controller, a major fault may occur during a load.

If the controller	Then
Does not use a CompactFlash card	Make sure that the major and minor revision of the project in nonvolatile memory matches the major and minor revision of the controller. The nonvolatile memory of the controller stores only the project, not the firmware for the controller.
Uses a CompactFlash card	The CompactFlash card stores the firmware for projects at revision 12.0 or earlier. Depending on the current revision of the controller, you may be able to use the CompactFlash card to update the firmware of the controller and load the project.

ATTENTION

Do not remove the CompactFlash card while the controller is reading from or writing to the card, as indicated by a flashing green CF LED. Doing so could corrupt the data on the card or in the controller, as well as corrupt the latest firmware in the controller.

Use a CompactFlash Reader

All CompactLogix controllers support the FAT16 file system used with the CompactFlash card.

Typically, you do not have to manage the files on a CompactFlash card. The card automatically loads the most recently stored project. For additional flexibility, the file system also lets you:

- manually change which project loads from the CompactFlash card.
- manually change the load parameters for a project.

A sample controller project that reads and writes from a CompactFlash card is available with RSLogix 5000 Enterprise programming software. To display a list of sample projects from a CompactFlash card, see Sample Controller Projects on pg. 70.

Additional Resources

For more information, consult Logix5000 Controllers Common Procedures Manual, publication 1756-PM001.

Maintain the Battery

Introduction

This chapter explains how to maintain your battery.

CompactLogix controllers support the 1769-BA battery.

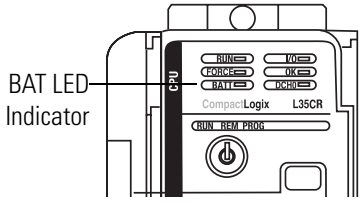
ATTENTION

The 1769-BA battery is the only battery you can use with the CompactLogix controllers. The 1747-BA battery is not compatible with the CompactLogix controllers and may cause problems.

Check If the Battery Is Low

The battery indicator (BAT) warns when the battery is low. Once the controller is powered down, the battery retains controller memory as long as the BAT indicator remains on. Temperature dictates how long the BAT indicator remains on.

Battery LED Indicator



BAT Indicator Duration

Temperature	Duration
60 °C (140 °F)	8 days
25 °C (77 °F)	25 days

Estimate 1769-BA Battery Life

Certain conditions affect typical battery life.

Battery Life Estimations

Time On/Off	At 25 °C (77 °F)	At 40 °C (104 °F)	At 60 °C (140 °F)
Always on	14 months	12 months	9 months
On 8 hours per day 5 days per week	18 months	15 months	12 months
On 16 hours per day 5 days per week	26 months	22 months	16 months
Always On	There is almost no drain on the battery when the controller is always on.		

Store Batteries

ATTENTION

Follow these general rules to store your batteries.

- Store batteries in a cool, dry environment. We recommend 25 °C (77 ° °F) with 40…60% relative humidity.
- You may store batteries for up to 30 days between -45…85 °C (-49...185 °F), such as during transportation.
- To avoid leakage or other hazards, do not store batteries above 60 °C (140 °F) for more than 30 days.

Additional Resources

For more information, consult Guidelines for Handling Lithium Batteries, publication AG 5-4, which comes with your battery.

CompactLogix Controllers Specifications

Introduction

This appendix provides the specifications for CompactLogix controllers.

1769-L31 CompactLogix Controller

These are the 1769-L31 CompactLogix controller specifications.

Attribute	Value	
Communication ports	**CH0 - RS-232** RS-232 DF1, DH-485, DF1 Radio Modem,DF1 Radio Modem, ASCII Fully isolated 38.4 KB/s max	**CH1 - RS-232** RS-232 DF1, DH-485, DF1 Radio Modem nonisolated 38.4 KB/s max
User memory	512 KB	
Nonvolatile memory	1784-CF64 CompactFlash	
Maximum number of I/O modules	16 I/O modules	
Maximum number of I/O banks	3 banks	
Backplane current	330 mA @ 5V dc 40 mA @ 24V dc	
Power dissipation	2.61 W	
Power supply distance rating	4 (Controller must be within 4 slot positions of power supply.)	
Battery	1769-BA	
Weight, Approx.	0.30 kg (0.66 lb)	
Programming cable	1747-CP3 or 1756-CP3	
Panel mounting screw torque (using M4 or #8 screws)	10...16 in-lb (1.1...1.8 Nm)	
Enclosure type rating	None (open style)	

Attribute	Value
Wiring category	2 on communication ports[1]
Isolation voltage (continuous-voltage withstand rating)	30V dc continuous Tested to withstand 710V dc for 60 s
North american temperature code	T4
Temperature, operating IEC 60068-2-1 (test Ad, operating cold) IEC 60068-2-2 (test Bd, operating dry heat) IEC 60068-2-14 (test Nb, operating thermal shock)	0...60 °C (32...140 °F)
Temperature, storage IEC 60068-2-1 (test Ab, unpackaged nonoperating cold) IEC 60068-2-2 (test Bb, unpackaged nonoperating dry heat) IEC 60068-2-14 (test Na, unpackaged nonoperating thermal shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (test Db, unpackaged nonoperating damp heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (test Fc, operating)	Operating: 5 g @ 10-500Hz
Shock IEC 60068-2-27 (test Ea, unpackaged shock) DIN mount Panel mount	 Operating: 20 g; nonoperating: 30 g Operating: 30 g; nonoperating: 40 g
Emissions	CISPR 11: group 1, class A
ESD immunity (IEC61000-4-2)	4 kV contact discharges, 8 kV air discharges
Radiated RF immunity (IEC61000-4-3)	10V/M with 1 kHz sine-wave 80%AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100%AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100%AM @ 1890 MHz
EFT/B immunity (IEC 61000-4-4)	±2 kV @ 5 kHz on communication ports
Surge transient immunity (IEC61000-4-5)	Channel 0: ±2 kV line-earth (CM) on shielded ports Channel 1: ±1 kV line-earth (CM) on shielded ports
Conducted RF immunity (IEC61000-4-6)	10Vrms with 1 kHz sine-wave 80% AM from 150 kHz @ 80 MHz

[1] Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

1769-L32C and 1769-L35CR CompactLogix Controllers

These are the specifications for the 1769-L32c and 1769-L35CR CompactLogix controllers.

Attribute	Value	
	1769-L32C	**1769-L35CR**
Communication ports	RS-232, NAP, ControlNet channel A	RS-232, NAP, ControlNet channels A and B
User memory	750 KB	1.5 MB
Nonvolatile memory	1784-CF64 CompactFlash	
Maximum number of I/O modules	16 I/O modules	30 I/O modules
Maximum number of I/O banks	3 banks	3 banks
Backplane current(1)	650 mA @ 5V dc 40 mA @ 24V dc	680 mA @ 5V dc 40 mA @ 24V dc
Power dissipation	4.21 W	4.36 W
Power supply distance rating	4 (The controller must be within four slot positions of the power supply.)	
Replacement battery	1769-BA	
Weight, Approx.	0.32 kg (0.70 lb)	
Programming cable	1747-CP3 or 1756-CP3	
Panel mounting screw torque (using M4 or #8 screws)	10...16 in-lb (1.1...1.8 Nm)	
Wiring Connectors Category	 1 BNC connector 1 NAP (1786-CP cable) 2 – On communication ports(2)	 2 BNC connectors for redundant media operation 1 NAP (1786-CP cable) 2 – On communication ports(2)
Isolation voltage (continuous-voltage withstand rating)	30V dc Tested to withstand 710V dc for 60 seconds	
Environmental conditions		
Temperature, operating	IEC 60068-2-1 (test Ad, operating cold), IEC 60068-2-2 (test Bd, operating dry heat), IEC 60068-2-14 (test Nb, operating thermal shock): 0...60 °C (32...140 °F)	
Temperature, storage	IEC 60068-2-1 (test Ab, unpackaged nonoperating cold), IEC 60068-2-2 (test Bb, unpackaged nonoperating dry heat), IEC 60068-2-14 (test Na, unpackaged nonoperating thermal shock): -40...85 °C (-40...185 °F)	
Relative humidity	IEC 60068-2-30 (test Db, unpackaged nonoperating damp heat): 5...95% noncondensing	
Vibration	IEC 60068-2-6 (test Fc, operating): 5g @ 10-500Hz	

Attribute	Value	
	1769-L32C	1769-L35CR
Shock, operating	IEC 60068-2-27 (test Ea, unpackaged shock): DIN mount - operating: 20 g Panel mount - operating: 30 g	
Shock, nonoperating	IEC 60068-2-27 (test Ea, unpackaged shock): DIN mount - nonoperating: 30 g Panel mount - nonoperating: 40 g	
Emissions	CISPR 11: Group 1, class A	
ESD immunity	IEC 61000-4-2: 4 kV contact discharges 8 kV air discharges	
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80%AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100%AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100%AM @ 1890 MHz	
EFT/B immunity	IEC 61000-4-4: ±2 kV @ 5 kHz on communications ports	
Surge transient immunity	IEC 61000-4-5: ±2 kV line-earth (CM) on communications ports	
Conducted RF immunity	IEC 61000-4-6: 10Vrms with 1 kHz sine-wave 80%AM from 150 kHz...80 MHz	
Enclosure type rating	None (open-style)	

(1) This specification is also known as Power Consumption.

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

1769-L32E and 1769-L35E CompactLogix Controllers

These are the specifications for the 1769-L32E and 1769-L35E CompactLogix controllers.

Attribute	Value	
	1769-L32E	1769-L35E
Communication ports	**CH0 - RS-232** RS-232 DF1 38.4 KB/s maximum1	**EtherNet/IP** RJ-45 or 10BaseT EtherNet/IP 0/100 MB/sec
User memory	750 KB	1.5 MB
Nonvolatile memory	1784-CF64 CompactFlash	
Maximum number of I/O modules	16 I/O modules	30 I/O modules
Maximum number of I/O banks	3 banks	3 banks
Backplane current	660 mA @ 5V dc 90 mA @ 24V dc	660 mA @ 5V dc 90 mA @ 24V dc

Attribute	Value	
	1769-L32E	**1769-L35E**
Power dissipation	4.74 W	4.74 W
Power supply distance rating	4 (Controller must be within 4 slot positions of power supply.)	
Battery	1769-BA	
Weight	0.32 kg (0.70 lb.)	0.32 kg (0.70 lb.)
Programming cable	1747-CP3 or 1756-CP3	
Panel mounting screw torque (using M4 or #8 screws)	10...16 in-lb (1.1...1.8 Nm)	
Enclosure type rating	None (open style)	
Wiring category	2 on communication ports[1]	
Isolation voltage (continuous-voltage withstand rating)	30V dc continuous Tested to withstand 710V dc for 60 sec	
Temperature, operating IEC 60068-2-1 (test Ad, operating cold) IEC 60068-2-2 (test Bd, operating dry heat) IEC 60068-2-14 (test Nb, operating thermal shock)	0...60 °C (32...140 °F)	
Temperature, storage IEC 60068-2-1 (test Ab, unpackaged nonoperating cold) IEC 60068-2-2 (test Bb, unpackaged nonoperating dry heat) IEC 60068-2-14 (test Na, unpackaged nonoperating thermal shock)	-40...85 °C (-40...185 °F)	
Relative humidity IEC 60068-2-30 (test Db, unpackaged nonoperating damp heat)	5...95% noncondensing	
Vibration IEC 60068-2-6 (test Fc, operating)	Operating: 5 g @ 10...500Hz	
Shock IEC 60068-2-27 (test Ea, unpackaged shock) DIN mount Panel mount	 Operating: 20 g; nonoperating: 30 g Operating: 30 g; nonoperating: 40 g	
Emissions	CISPR 11: group 1, class A	
ESD immunity (IEC61000-4-2)	4 kV contact discharges, 8 kV air discharges	
Radiated RF immunity (IEC61000-4-3)	10V/M with 1 kHz sine-wave 80%AM from 80...2000 MHz 10V/M with 200 Hz 50% Pulse 100%AM @ 900 MHz 10V/M with 200 Hz 50% Pulse 100%AM @ 1890 MHz	
EFT/B immunity (IEC 61000-4-4)	±2 kV @ 5 kHz on communication ports	
Surge transient immunity (IEC61000-4-5)	±2 kV line-earth (CM) on shielded ports	
Conducted RF immunity (IEC61000-4-6)	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz	

[1] Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Real-Time Clock Accuracy

These are the real-time clock accuracy specifications for CompactLogix controllers.

Ambient °C (°F)	Accuracy
0 °C (32 °F)	54...-56 s/month
25 °C (77 °F)	9...-124 s/month
40 °C (104 °F)	-84...-234 s/month
55 °C (131 °F)	-228...-394 s/month
60 °C (140 °F)	-287...-459 s/month

Notes:

LED Indicators

Introduction

This appendix explains how to interpret the LED indicators on your CompactLogix controllers.

1769-L3*xx* Controllers LED Indicators

These are the 1769-L3*xx* CompactLogix controller LED indicators.

Indicator	Condition	Interpretation
RUN	Off	The controller is in program or test mode.
	Steady green	The controller is in run mode.
FORCE	Off	• No tags contain I/O force values. • I/O forces are inactive (disabled).
	Steady amber	• I/O forces are active (enabled). • I/O force values may or may not exist.
	Flashing amber	One or more input or output addresses have been forced to an On or Off condition, but the forces have not been enabled.
BAT	Off	The battery supports memory.
	Steady red	The battery is: • not installed. • 95% discharged and should be replaced.
I/O	Off	• There are no devices in the I/O configuration of the controller. • The controller does not contain a project.
	Steady green	The controller is communicating with all the devices in its I/O configuration.
	Flashing green	One or more devices in the I/O configuration of the controller are not responding.
	Flashing red	• The controller is not communicating with any devices. • The controller is faulted.

<table>
<tr><th>Indicator</th><th>Condition</th><th>Interpretation</th></tr>
<tr><td rowspan="4">OK</td><td>Off</td><td>No power is applied.</td></tr>
<tr><td>Flashing red</td><td>
• The controller requires a firmware update.
• A major recoverable fault occurred on the controller. To clear the fault, perform this procedure.
1. Turn the controller keyswitch from PROG to RUN to PROG.
2. Go online with RSLogix 5000.
• A nonrecoverable major fault occurred on the controller. In this case, the controller:
1. initially displays a steady red LED.
2. resets itself.
3. clears the project from its memory.
4. sets the LED to flashing red.
5. produces a major recoverable fault.
6. generates a fault code in the RSLogix 5000 project.
The fault code displayed in RSLogix 5000, and the subsequent fault recovery method, depends on whether you have installed a CompactFlash card in the controller.
<table>
<tr><th>Code</th><th>Condition</th><th>Fault recovery method</th></tr>
<tr><td>60</td><td>CompactFlash card is not installed.</td><td>A. Clear the fault.
B. Download the project.
C. Change to Remote Run/Run mode.
If the problem persists:
A. Before you cycle power to the controller, record the state of the OK and RS232 LED indicators.
B. Contact Rockwell Automation support. See the back of this publication.</td></tr>
<tr><td>61</td><td>CompactFlash is installed.</td><td>A. Clear the fault.
B. Download the project.
C. Change to Remote Run/Run mode.
If the problem persists, contact Rockwell Automation support. See the back of this publication.</td></tr>
</table>
</td></tr>
<tr><td>Steady red</td><td>The controller detected a nonrecoverable major fault, so it cleared the project from memory. To recover from a major fault, perform this procedure.
1. Cycle power to the chassis.
2. Download the project.
3. Change to Run mode.
If the OK LED remains steady red, contact your Rockwell Automation representative or local distributor.</td></tr>
<tr><td>Steady green</td><td>Controller is OK.</td></tr>
<tr><td>Flashing green</td><td>The controller is storing or loading a project to or from nonvolatile memory.</td></tr>
</table>

CompactFlash LED Indicator

ATTENTION

Do not remove the CompactFlash card while the controller is reading from or writing to the card, as indicated by a flashing green CF LED. This could corrupt the data on the card or in the controller, as well as corrupt the latest firmware in the controller.

This is the CompactFlash card LED indicator present on all CompactLogix controllers.

Indicator	Condition	Interpretation
CF	Off	There is no activity.
	Flashing green	The controller is reading from or writing to the CompactFlash card.
	Flashing red	CompactFlash card does not have a valid file system.

RS-232 Serial Port LED Indicators

These are the RS-232 serial port LED indicators present on all CompactLogix controllers.

Indicator	Condition	Interpretation
DCH0	Off	Channel 0 configuration differs from the default serial configuration.
	Steady green	Channel 0 has the default serial configuration.
CH0	Off	No RS-232 activity.
	Flashing green	RS-232 activity.
CH1 (1769-L31 only)	Off	No RS-232 activity.
	Flashing green	RS-232 activity.

ControlNet LED Indicators

The ControlNet LED indicators are only on the 1769-L32C and 1769-L35CR controllers.

Interpret ControlNet Network LED Indicators

Use these LED indicators to determine how your CompactLogix 1769-L32C or 1769-L35CR controller is operating on the ControlNet network:

- Module Status
- Network Status

These LED indicators provide information about the controller and network when the controller is connected to ControlNet via the BNC connectors.

ControlNet Network LED States

LED State	Interpretation
Steady	The indicator is on continuously in the defined state.
Alternating	When viewed together, two indicators alternate between two defined states; the two indicators are always in opposite states, out of phase.
Flashing	When viewed independent of another, an indicator alternates between the two defined states; if both indicators are flashing, they flash together, in phase.

IMPORTANT

Keep in mind that the Module Status LED indicator reflects the module state (for example, self-test, firmware update, normal operation but no connection established). The network LED indicators, A and B, reflect network status. Remember that the host is able to engage in local messaging with the card although it is detached from the network. Therefore, the Module Status LED indicator is flashing green if the host has successfully started the card. Note, however, that until the host removes reset, all communication port LEDs.

When you view the indicators, always view the Module Status LED indicator first to determine the state of the communication port. This information may help you to interpret the network LED indicators. As a general practice, view all LED indicators (Module Status and Network Status) together to gain a full understanding of the daughtercard's status.

Module Status (MS) LED Indicator

These are the ControlNet module LED indicators.

Indicator	Condition	Recommended Action
Off	The controller has no power.	Apply power.
	The controller is faulted.	Make sure that the controller is firmly seated in the slot.
Steady red	A major fault has occurred on the controller.	1. Cycle power. 2. If the problem persists, replace the controller.
Flashing red	A minor fault has occurred because a firmware update is in progress.	Normal operation - No action is required.
	A node address switch change has occurred. The controller's node address switches may have been changed since power-up.	Change the node address switches back to the original setting. The module will continue to operate properly.
	The controller uses invalid firmware.	Update the controller firmware with the ControlFlash Update utility.
	The controller's node address duplicates that of another device.	1. Remove power. 2. Change the node address to a unique setting. 3. Reapply power.
Steady green	Connections are established.	Normal operation - No action is required.
Flashing green	No connections are established.	Establish connections, if necessary.
Flashing red/green	The controller is diagnosing a problem.	Wait briefly to see if problem corrects itself. If problem persists, check the host. If the daughtercard cannot communicate with the host, the card may remain in self-test mode.

Network Channel LED Indicators

These are the ControlNet network channel LED indicators.

Channel B is only labelled on the 1769-L35CR controller. The 1769-L32C controller only has channel A but uses the second indicator in some LED patterns as described below.

Indicator	Condition	Recommended Action
Off	A channel is disabled.	Program network for redundant media, if necessary.
Steady green	Normal operation is occurring.	Normal operation - No action is required.
Flashing green/off	Temporary network errors have occurred.	1. Check media for broken cables, loose connectors, and missing terminators. 2. If condition persists, refer to the ControlNet Planning and Installation Manual, publication 1786-6.2.1.
	The node is not configured to go online.	Make sure the network keeper is present and working and the selected address is less or equal to the UMAX[1].
Flashing red/off	Media fault has occurred.	1. Check media for broken cables, loose connectors, and missing terminators. 2. If condition persists, refer to the ControlNet Planning and Installation Manual, publication 1786-6.2.1.
	No other nodes are present on the network.	Add other nodes to the network.
Flashing red/green	The network is configured incorrectly.	Reconfigure the ControlNet network so that UMAX is greater than or equal to the card's node address.
Off	You should check the MS indicators.	Check the MS indicators.
Steady red	The controller is faulted.	1. Cycle power. 2. If the fault persists, contact your Rockwell Automation representative or distributor.
Alternating red/green	The controller is performing a self test.	Normal operation - No action is required.
Alternating red/off	The node is configured incorrectly.	Check the card's network address and other ControlNet configuration parameters.

(1) UMAX is the highest node address on a ControlNet network that can transmit data.

EtherNet/IP LED Indicators

The EtherNet/IP LED indicators are only on 1769-L32E and 1769-L35E controllers.

Module Status (MS) LED Indicator

These are the EtherNet/IP module LED indicators.

Indicator	Condition	Recommended Action
Off	The controller does not have power.	Check the controller power supply.
Flashing green	The port is in standby mode; it does not have an IP address and is operating in BOOTP mode.	Verify that the BOOTP server is running.
Steady green	The port is operating correctly.	Normal operation - No action is required.
Steady red	The controller is holding the port in reset or the controller has faulted.	1. Clear the controller fault. 2. If the fault will not clear, replace the controller.
	The port is performing its power-up self test.	Normal operation - No action is required.
	A nonrecoverable fault has occurred.	1. Cycle power to the controller. 2. If the fault will not clear, replace the controller.
Flashing red	The port firmware is being updated.	Normal operation - No action is required.

Network Status (NS) LED Indicator

These are the EtherNet/IP network LED indicators.

Indicator	Condition	Recommended Action
Off	The port is not initialized; it does not have an IP address and is operating in BOOTP mode.	Verify that the BOOTP server is running.
Flashing green	The port has an IP address, but no CIP connections are established.	• If no connections are configured, no action is required. • If connections are configured, check connection originator for connection error code.
Steady green	The port has an IP address and CIP connections (Class 1 or Class 3) are established.	Normal operation - No action is required.
Steady red	The port has detected that the assigned IP address is already in use.	Verify that all IP addresses are unique.
Flashing red/green	The port is performing its power-up self test.	Normal operation - No action is required.

Link Status (LNK) LED Indicator

Indicator	Condition	Recommended Action
Off	The port is not connected to a powered Ethernet device. Therefore, the port cannot communicate on Ethernet.	1. Verify that all Ethernet cables are connected. 2. Verify that Ethernet switch is powered.
Flashing green	The port is performing its power-up self-test.	Normal operation - No action is required.
	The port is communicating on Ethernet.	
Steady green	The port is connected to a powered Ethernet device. Therefore, the port can communicate on Ethernet.	

Dynamic Memory Allocation in CompactLogix Controllers

Introduction

This appendix explains the dynamic allocation of memory in CompactLogix controllers.

Certain operations cause the controller to dynamically allocate and remove user-available memory, affecting the space available for program logic. As these functions become active, memory is allocated. Memory is then removed when these functions become inactive.

Operations that dynamically allocate memory are:

- messages.
- connections to processors with RSLogix 5000 programming software.
- RSLinx tag optimization.
- trends.
- DDE/OPC topics.

Messages

Messages come in and go out of the controller via the Ethernet, ControlNet, and serial ports, causing memory allocation. The memory allocations for messages destined to I/O are accounted for in these allocations. To prevent message instructions from using too much memory, do not send messages simultaneously.

Message Types

Message Path		Connection Established?	Memory Allocated
ControlNet Port	Incoming	Yes - The message is connected.	1200 bytes
		No - The message is unconnected.	1200 bytes
	Outgoing	All outgoing messages whether connected or unconnnected	1200 bytes
Ethernet Port	Incoming	Yes - The message is connected.	1200 bytes
		No - The message is unconnected.	1200 bytes
	Outgoing	All outgoing messages whether connected or unconnnected	1200 bytes
Serial Port	Incoming	All incoming messages whether connected or unconnected	1200 bytes
	Outgoing	All outgoing messages whether connected or unconnected	1200 bytes

RSLinx Tag Optimization

With tag optimization, trend objects, trend drivers, and connections allocate memory.

Tag Functions

Item	Description	Memory Allocated
Trend Object	Object is created in the controller to group the requested tags. One trend object can handle approximately 100 tags.	80 bytes
Trend Driver	Drive is created to communicate with the trend object.	36 bytes
Connection	Connection is created between the controller and RSLinx.	1200 bytes

EXAMPLE

To monitor 100 points:

100 points x 36 bytes = 3600 bytes (Trend Driver)

3600 (Trend Driver) + 80 (Trend Object) + 1200 (Connection) = approximately 4000 bytes

We estimate that one tag consumes about 40 bytes of memory.

Trends

Each trend created in a controller creates a trend object and allocates a buffer for logging.

Controller Trends

Item	Memory Allocated
Trend Object	80 bytes
Log Buffer	4000 bytes

DDE/OPC Topics

A DDE/OPC topic uses connections based on these variables:

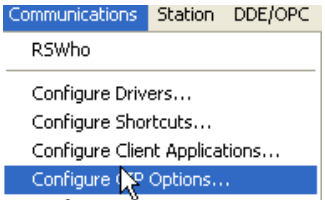
- Maximum number of messaging connections per PLC configured in RSLinx
- Number of connections needed to optimize throughput
- Configuration of RSLinx to use connections for writing to a ControlLogix processor

IMPORTANT These variables are per path. For example, if you set up two different DDE/OPC topics, with different paths to the same controller, the variables limit the connections for each path. Therefore, if you have a limit of 5 connections, it is possible to have 10 connections, with 5 over each path.

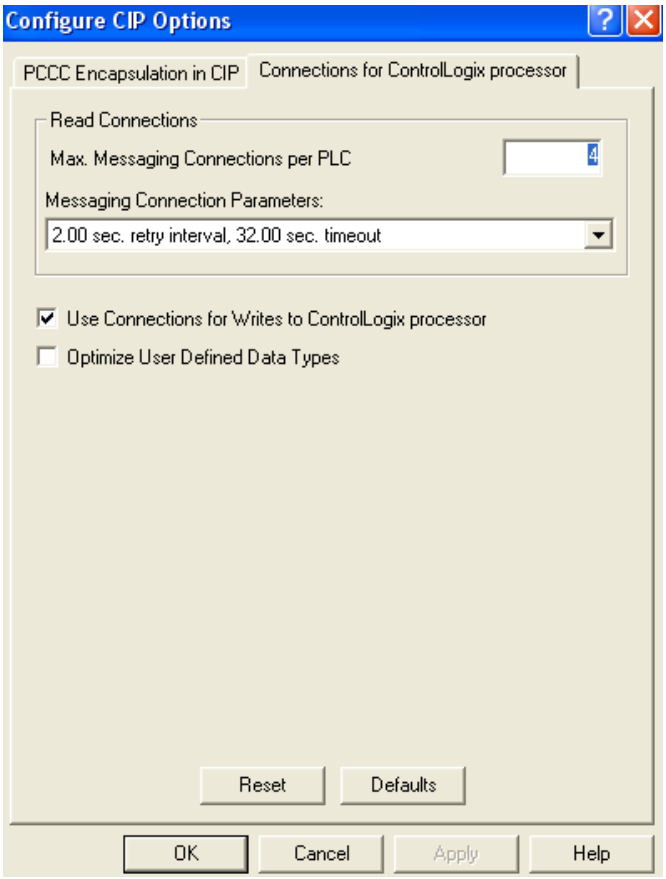
Specify Connections per PLC

To specify the maximum messaging connections per PLC, perform this procedure.

1. In RSLinx programming software, from the Communications pull-down menu, choose Configure CIP Options.



The Configure CIP Options dialog appears.



2. In the Max. Messaging Connections per PLC field, enter the maximum number of read connections you want a particular workstation to make to a ControlLogix controller.

3. Click OK.

Specify Number of Connections Needed to Optimize Throughput

To specify the number of connections needed to optimize throughput, perform this procedure.

1. Repeat step 1 from the previous procedure.

2. In the Configure CIP Options dialog, click the Use Connections for Writes to ControlLogix processor check box.

IMPORTANT Once you have selected this feature, you cannot limit the number of connections established.

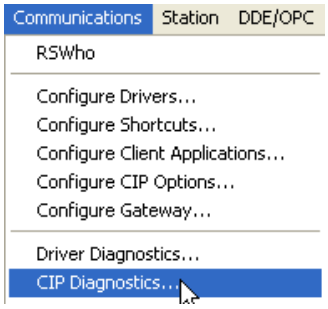
Number of Connections Needed to Optimize Throughput

RSLinx software only opens the number of connections required to optimize throughput. For example, if you have one tag on scan, but have configured RSLinx software to allow five connections as the maximum number of connections, RSLinx software only opens one connection for the tag. Conversely, if you have thousands of tags on scan and limit the maximum number of CIP connections to five, RSLinx software cannot establish more than five connections to the CompactLogix controller. RSLinx software then funnels all of the tags through those five available connections.

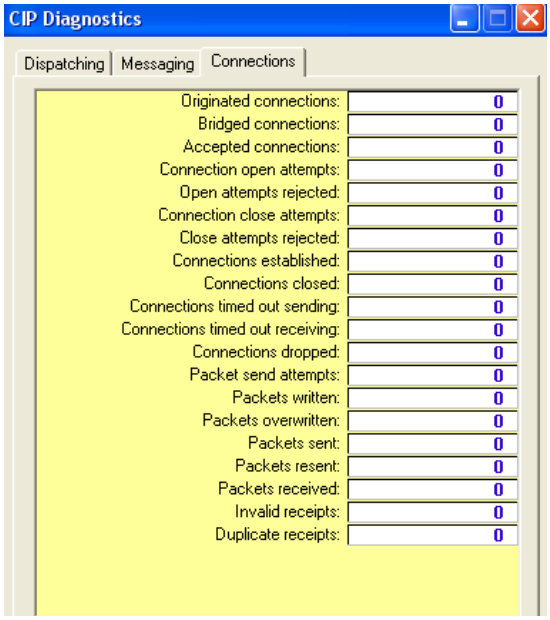
View the Number of Open Connections

To view the number of open connections made from your workstation to the CompactLogix controller, perform this procedure.

1. In RSLinx programming software, from the Communications pull-down menu, choose CIP Diagnostics.



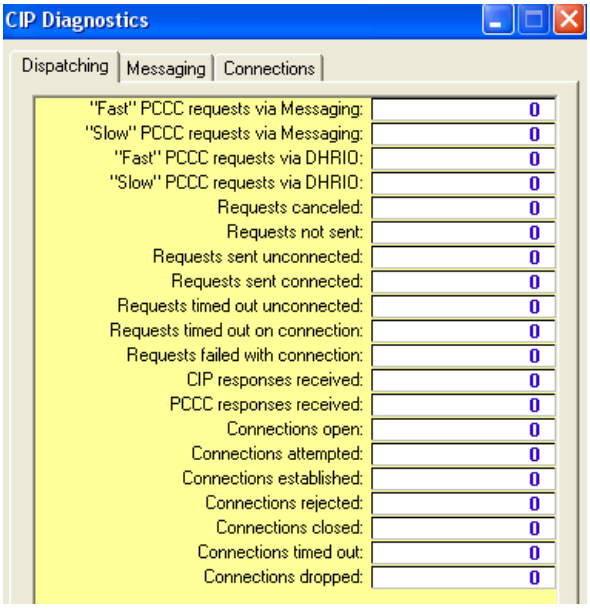
The CIP Diagnostics dialog appears.



2. Click the Connections tab.

   Here you see an itemized list of open connections.

3. Click the Dispatching tab.



   In the Connections Established box you see the total number of connections open to the CompactLogix controller.

Numerics

A

B

C

R

S

T

U

V

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Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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CompactLogix Controllers

User Manual