Allen-Bradley

PowerFlex® Communications

ControlNet Adapter

22-COMM-C
FRN 1.xxx

User Manual

Rockwell Automation

Important User Information

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

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

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

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

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

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 the hazard
- recognize the consequences

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

The information below summarizes the changes made to this manual since its last release (May 2005):

Description of New or Updated Information	Page(s)
In the Chapter 4 introduction, added an Important paragraph about I/O connections.	4-1
In the “About Explicit Messaging” section, added an Important paragraph about “unconnected” and “connected” messages.	6-1
In the “Configuring the RS-485 Network” section, corrected the Important paragraph text. The daisy-chained drive(s) parameter A106 - [Comm Loss Time] is not used in Multi-Drive mode.	7-7
In the “ControlLogix Explicit Messaging” section, corrected these drive parameter subheading names: • Parameter D003 from [Current Output] to [Output Current] • Parameter P039 from [Current Output] to [Accel Time 1]	7-22
In the “Environmental” specifications section, corrected the maximum Farenheit Operating Temperature value from 149°F to 122°F.	A-2

Table of Contents

Preface **About This Manual**

Related Documentation P-1
Conventions Used in this Manual P-2
Rockwell Automation Support. P-3

Chapter 1 **Getting Started**

Components 1-1
Features 1-2
Compatible Products 1-3
Required Equipment 1-3
Safety Precautions 1-4
Quick Start 1-5
Modes of Operation 1-6

Chapter 2 **Installing the Adapter**

Preparing for an Installation. 2-1
Setting Operating Mode and Node Address Switches. 2-1
Connecting the Adapter to the Network 2-3
Connecting the Adapter to the Drive 2-4
Applying Power 2-7

Chapter 3 **Configuring the Adapter**

Configuration Tools 3-1
Using the PowerFlex 4-Class HIM 3-2
Setting the Node Address. 3-3
Setting the I/O Configuration. 3-3
Setting a Fault Action 3-4
Resetting the Adapter 3-6
Viewing the Adapter Configuration 3-7

Chapter 4 **Configuring the I/O**

ControlLogix Example 4-1
PLC-5 Example 4-12

Chapter 5 **Using the I/O**

About I/O Messaging 5-1
Understanding the I/O Image 5-2
Using Logic Command/Status 5-3
Using Reference/Feedback 5-3
Example Ladder Logic Program Information 5-4
ControlLogix Example 5-5
PLC-5 Example 5-8

Chapter 6 Using Explicit Messaging
About Explicit Messaging 6-1
Performing Explicit Messages 6-2
ControlLogix Example 6-3
PLC-5 Example 6-6

Chapter 7 Using Multi-Drive Mode
Single Mode vs. Multi-Drive Mode 7-1
System Wiring 7-4
Understanding the I/O Image 7-5
Configuring the RS-485 Network 7-7
Example Configuration Settings 7-8
ControlLogix I/O Example 7-9
ControlLogix Explicit Messaging 7-22
PLC-5 I/O Example 7-24
Additional Information 7-36

Chapter 8 Troubleshooting
Locating the Status Indicators 8-1
PORT Status Indicator 8-2
MOD Status Indicator 8-3
Net A and B Status Indicators Together 8-4
Net A or B Status Indicators Independently 8-4
Adapter Diagnostic Items in Single Mode 8-5
Adapter Diagnostic Items in Multi-Drive Mode 8-6
Viewing and Clearing Events 8-7

Appendix A Specifications
Communications A-1
Electrical A-1
Mechanical A-1
Environmental A-2
Regulatory Compliance A-2

Appendix B Adapter Parameters
About Parameter Numbers B-1
Parameter List B-1

Appendix C ControlNet Objects

Identity Object C-2
Assembly Object C-4
Register Object. C-6
Parameter Object C-9
Parameter Group Object (Single Mode only) C-12
PCCC Object C-14
DSI Device Object C-20
DSI Parameter Object C-23
DSI Fault Object C-27
DSI Diagnostic Object C-29

Appendix D Logic Command/Status Words

PowerFlex 4/40/400 Drives D-1

Glossary

Index

About This Manual

Topic	Page
Related Documentation	P-1
Conventions Used in this Manual	P-2
Rockwell Automation Support	P-3

Related Documentation

For:	Refer to:	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer, and DriveExplorer online Help (installed with the software)	—
DriveTools™ SP (includes DriveExecutive™)	http://www.ab.com/drives/drivetools, and DriveTools SP online Help (installed with the software)	—
HIM	*HIM Quick Reference*	22HIM-QR001…
PowerFlex® 4 Drive	*PowerFlex 4 User Manual* *PowerFlex 4 Quick Start*	22A-UM001… 22A-QS001…
PowerFlex® 40 Drive	*PowerFlex 40 User Manual* *PowerFlex 40 Quick Start*	22B-UM001… 22B-QS001…
PowerFlex® 400 Drive	*PowerFlex 400 User Manual*	22C-UM001…
RSLinx™ or RSLinx Lite	*Getting Results with RSLinx Guide*, and online help (installed with the software)	LINX-GR001…
RSLogix™ 5 RSLogix™ 5000	*RSLogix 5 Getting Results Guide** *RSLogix 5000 Getting Results Guide** * And online help (installed with the software)	LG5-GR001… 9399-RLD300GR
RSNetWorx™ for ControlNet™	*RSNetWorx for ControlNet Getting Results Guide*, and online help (installed with the software)	CNET-GR001…
ControlLogix® and 1756-CNB/R	*ControlLogix ControlNet Interface Module User Manual*	1756-6.5.3

Documentation can be obtained online at http://www.rockwellautomation.com/literature.

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number, and the * represents the parameter name — for example, **Parameter 01 - [Mode]**.

- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.

- The firmware release is displayed as FRN X.xxx. The "FRN" signifies Firmware Release Number. The "X" is the major release number. The "xxx" is the minor update number.

- RSNetWorx for ControlNet (version 5.11), RSLinx (version 2.43), RSLogix 5000 (version 13.03) and RSLogix 5 (version 6.30) were used for the screen shots in this manual. Different versions of the software may differ in appearance and procedures.

- This manual provides information about the 22-COMM-C ControlNet adapter and using it with PowerFlex 4-Class drives. The adapter can be used with other products that support a DSI adapter, such as the DSI External Comms Kit (22-XCOMM-DC-BASE). Refer to the documentation for your product for specific information about how it works with the adapter.

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- Sales and order support
- Product technical training
- Warranty support
- Support service agreements

Technical Product Assistance

If you need to contact Rockwell Automation, Inc. for technical assistance, please review the information in Chapter 8, Troubleshooting first. If you still have problems, then call your local Rockwell Automation, Inc. representative.

U.S. Allen-Bradley Drives Technical Support:
E-mail: support@drives.ra.rockwell.com
Tel: (1) 262.512.8176
Fax (1) 262.512.2222
Online: www.ab.com/support/abdrives

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Notes:

Getting Started

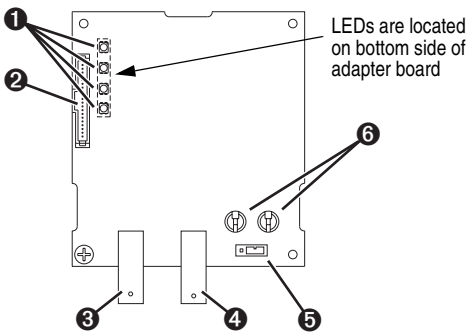
The 22-COMM-C ControlNet adapter is a communication option intended for installation into a PowerFlex 40 or PowerFlex 400 drive. It can also be used with other Allen-Bradley products that support a DSI communication adapter, such as the DSI External Comms Kit (22-XCOMM-DC-BASE). The External Comms Kit enables PowerFlex 4 drives (which cannot support an internally-mounted adapter) to connect to a ControlNet network.

Topic	Page
Components	1-1
Features	1-2
Compatible Products	1-3
Required Equipment	1-3

Topic	Page
Safety Precautions	1-4
Quick Start	1-5
Modes of Operation	1-6

Components

Figure 1.1 Components of the Adapter



Item	Component	Description
1	Status Indicators	Four LEDs that indicate the status of the ControlNet connection, DSI, and the adapter. Refer to Chapter 8, Troubleshooting.
2	DSI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
3	Channel A Coax Receptacle	Channel A BNC connection for the ControlNet cable.
4	Channel B Coax Receptacle	Channel B BNC connection for the ControlNet cable.
5	1x/5x Operating Mode Jumper (J7)	Selects Single (1x) or Multi-Drive (5x) mode of operation. Refer to Setting Operating Mode and Node Address Switches on page 2-1.
6	ControlNet Node Address Switches	Sets a unique node address for the adapter. Refer to Setting Operating Mode and Node Address Switches on page 2-1.

Features

The ControlNet adapter features the following:

- The adapter is normally installed in a PowerFlex 40 or PowerFlex 400 drive. It can also be used in a DSI External Comms Kit (22-XCOMM-DC-BASE).
- A jumper lets you select between Single or Multi-Drive mode of operation. In Single mode (default), the adapter represents a single drive on one node. In Multi-Drive mode, the adapter represents up to 5 drives on one node.
- A number of configuration tools can be used to configure the adapter and connected drive. The tools include an external PowerFlex 4-Class HIM (22-HIM-*) or drive-configuration software such as DriveExplorer (version 3.01 or higher) or DriveExecutive (version 3.01 or higher).
- Status indicators report the status of drive communications, the adapter, and network.
- Supports I/O, including Logic Command/Reference, for all drives connected in Single or Multi-Drive mode.
- The following table shows the various controllers that can be used with the 22-COMM-C adapter and whether they support explicit messaging (parameter read/write, etc.) on a ControlNet network:

Controller Used With 22-COMM-C	Supports Explicit Messaging			
	Single Mode		Multi-Drive	
	Yes	No	Yes	No
ControlLogix 1756-L55/L61/L62/L63	✔		✔	
FlexLogix 1794-L33/L34	✔		✔	
CompactLogix 1769-L20/L30/L35E	✔		✔	
MicroLogix1000 1761-L10/L16/L20/L32	✔		✔	
MicroLogix1200 1762-L24/L40	✔		✔	
MicroLogix1500 1764-LSP/LRP	✔		✔	
PLC-5 1785-L20C/L40C/L46C/L80C	✔ (1)			✔
SoftLogix 1789-L10/L30/L60	✔		✔	

(1) Due to controller limitations, explicit messaging can only be performed on drive parameters up to Parameter 256.

- User-defined fault actions determine how the adapter and drive (or DSI External Comms Kit) respond to communication disruptions on the network and controllers in program mode.

Compatible Products

The adapter is compatible with Allen-Bradley PowerFlex 4-Class (Component-Class) drives and other products that support an internal DSI adapter. At the time of publication, compatible products include:

- PowerFlex 4 drives with DSI External Comms Kit
- PowerFlex 40 drives
- PowerFlex 400 drives

Required Equipment

Equipment Shipped with the Adapter

When you unpack the adapter, verify that the package includes:

- ❑ One ControlNet adapter
- ❑ One 15.24 cm (6 in.) Internal Interface Cable
- ❑ This manual

User-Supplied Equipment

To install and configure the adapter, you must supply:

- ❑ A small flathead screwdriver
- ❑ Appropriate ControlNet cables (refer to the *ControlNet Fiber Media Planning and Installation Guide*, Publication CNET-IN001…, for details.)
- ❑ A configuration tool, such as:
  - PowerFlex 4-Class HIM (22-HIM-*)
  - DriveExplorer (version 3.01 or higher)
  - DriveExecutive stand-alone software (version 3.01 or higher) or bundled with the DriveTools SP suite (version 1.01 or higher)
  - RSNetWorx for ControlNet
- ❑ Controller configuration software (Example: RSLogix 5000)
- ❑ A PC connection to the ControlNet network

Safety Precautions

Please read the following safety precautions carefully.

ATTENTION: Risk of injury or death exists. The PowerFlex drive may contain high voltages that can cause injury or death. Remove power from the PowerFlex drive, and then verify power has been discharged before installing or removing the adapter.

ATTENTION: Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start-up, configuration, and subsequent maintenance of the product using the adapter. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of equipment damage exists. The adapter contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Publication 8000-4.5.2.

ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting control I/O to the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting the adapter.

ATTENTION: Risk of injury or equipment damage exists. **Parameters 08 - [Comm Flt Action]** and **09 - [Idle Flt Action]** let you determine the action of the adapter and connected PowerFlex drive if communications are disrupted. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable or a faulted controller).

ATTENTION: Risk of injury or equipment damage exists. When a system is configured for the first time, there may be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing.

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation, Inc. does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

Quick Start

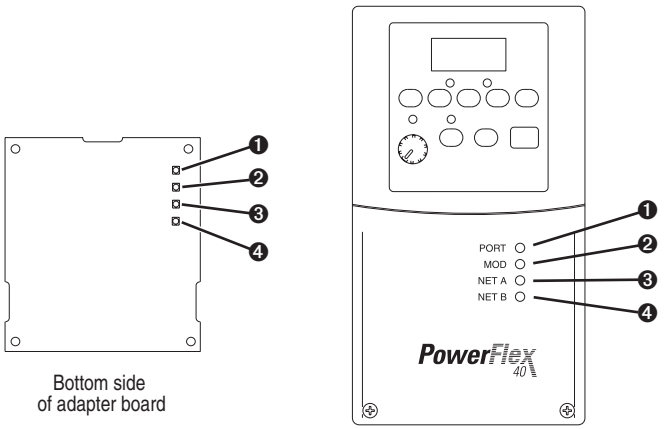
This section is provided to help experienced users quickly start using the adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step		Refer to …
1	**Review the safety precautions for the adapter.**	Throughout this manual
2	**Verify that the PowerFlex drive is properly installed.**	Drive User Manual
3	**Install the adapter.** Verify that the PowerFlex drive is not powered. Then, connect the adapter to the network using a ControlNet cable and to the drive using the Internal Interface cable. Use the captive screw to secure and ground the adapter to the drive. When installing the adapter in a DSI External Comms Kit, refer to the *22-XCOMM-DC-BASE Installation Instructions* (Publication No. 22COMM-IN001…) supplied with the kit.	Chapter 2, Installing the Adapter
4	**Apply power to the adapter.** The adapter receives power from the drive. Apply power to the drive. The status indicators should be green. If they flash red, there is a problem. Refer to Chapter 8, Troubleshooting.	Chapter 2, Installing the Adapter
5	**Configure the adapter for your application.** Set the following parameters for the adapter as required by your application: • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
6	**Apply power to the ControlNet scanner and other devices on the network.** Verify that the scanner and network are installed and functioning in accordance with ControlNet standards, and then apply power to them.	—
7	**Configure the scanner or bridge to communicate with the adapter.** Use a network tool such as RSNetWorx for ControlNet to configure the scanner or bridge on the network.	Chapter 4, Configuring the I/O
8	**Create a ladder logic program.** Use a programming tool such as RSLogix to create a ladder logic program that enables you to: • Control the adapter and connected drive using I/O. • Monitor or configure the drive using Explicit Messages.	Chapter 5, Using the I/O Chapter 6, Using Explicit Messaging

Modes of Operation

The adapter uses four status indicators to report its operating status. They can be viewed on the adapter or through the drive cover (Figure 1.2).

Figure 1.2 Status Indicators *(location on drive may vary)*



Item	Status Indicator	Normal Status (1)	Description
❶	PORT	Green	Normal Operation. The adapter is properly connected and is communicating with the drive.
❷	MOD	Green	Normal Operation. The adapter is operational and is transferring I/O data.
		Flashing Green	Normal Operation. The adapter is operational but is not transferring I/O data.
❸ ❹	NET A or NET B	Green	Normal Operation. The adapter channel is properly connected and communicating on the network.
		Flashing Green	Normal Operation. The adapter channel has a temporary error, or is in listen-only mode.
		Off	Normal Operation. The adapter channel is disabled or not supported.

(1) If all status indicators are off, the adapter is not receiving power. Refer to Chapter 2, Installing the Adapter, for instructions on installing the adapter.

If any other conditions occur, refer to Chapter 8, Troubleshooting.

Installing the Adapter

Chapter 2 provides instructions for installing the adapter in a PowerFlex 40 or PowerFlex 400 drive. This adapter can also be installed in a DSI External Comms Kit. In this case, refer to the *22-XCOMM-DC-BASE Installation Instructions* (Publication No. 22COMM-IN001…) supplied with the kit.

Topic	Page
Preparing for an Installation	2-1
Setting Operating Mode and Node Address Switches	2-1
Connecting the Adapter to the Network	2-3
Connecting the Adapter to the Drive	2-4
Applying Power	2-7

Preparing for an Installation

Before installing the adapter, verify that you have all required equipment. Refer to Chapter 1, Getting Started.

Setting Operating Mode and Node Address Switches

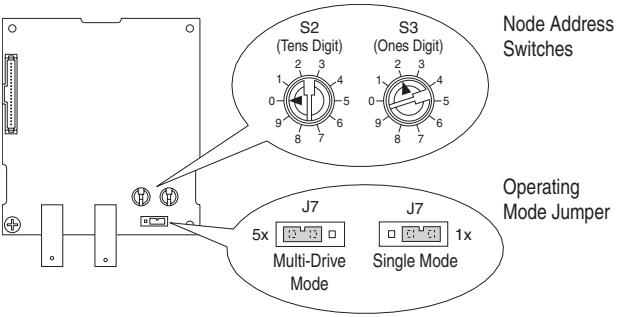
Before installing the adapter, you must set its Operating Mode Jumper for Single or Multi-Drive operation, and its Node Address Switches to a unique ControlNet node address.

Important: New settings are recognized only when power is applied to the adapter, or the adapter is reset. If you change a setting, cycle power or reset the adapter to invoke the change.

ATTENTION: Risk of equipment damage exists. The adapter contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Publication 8000-4.5.2.

1. Set the adapter Operating Mode Jumper (J7) for Single (1x) or Multi-Drive (5x) operation (see Figure 2.1 and setting descriptions below). For complete details on Multi-Drive mode operation, see Chapter 7, Using Multi-Drive Mode.

Figure 2.1 Setting Single/Multi-Drive Operation and Node Address Switches



Jumper Setting	Description
Right (1x) position or jumper missing	Sets the adapter for Single mode (default setting) using a single drive connection. **Important:** In this mode, connections to multiple drives must be removed since all powered and connected hosts will respond to any message sent by the adapter.
Left (5x) position	Sets the adapter for Multi-Drive mode using up to 5 different drives. DSI peripherals (22-HIM-*, 22-SCM-*, etc.) do not operate with the adapter in this mode.

2. Set the adapter node address by rotating the Node Address Switches to the desired value for each digit.

Important: Each node on the network must have a unique address. The node address must be set before power is applied because the adapter uses the node address it detects when it first receives power. To change a node address, you must set the new value. Then remove and reapply power to the adapter, or reset the adapter.

Switch Settings	Description
00-99	Node address used by the adapter if switches are enabled. The default switch setting is 02. **Important:** If the address switches are set to "00," the adapter will use the setting of **Parameter 02 - [CN Addr Cfg]** for the node address. Refer to Setting the Node Address on page 3-3.

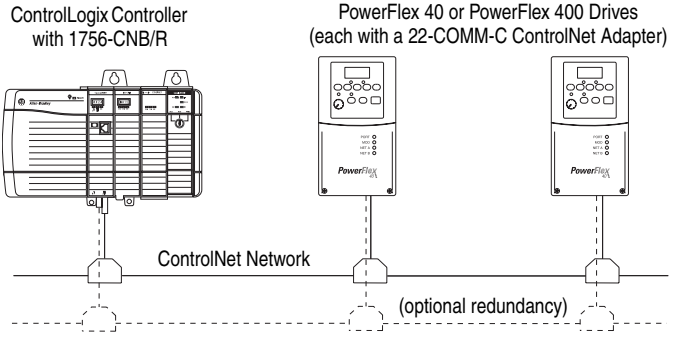
The node address switch settings can be verified using a PowerFlex 4-Class HIM, DriveExplorer, or DriveExecutive to view Diagnostic Item number 28 (listed on page 8-5 or page 8-6).

Connecting the Adapter to the Network

ATTENTION: Risk of injury or death exists. The PowerFlex drive may contain high voltages that can cause injury or death. Remove power from the PowerFlex drive, and then verify power has been discharged before installing or removing an adapter.

1. Remove power from the drive.
2. Use static control precautions.
3. Remove the drive cover.
4. Connect a ControlNet cable to the ControlNet network. See Figure 2.2 for an example of wiring to a ControlNet network.

Figure 2.2 Connecting the ControlNet Cable to the Network



5. Route the ControlNet cable through the bottom of the PowerFlex drive (Figure 2.3), and insert the cable plug into the adapter's mating receptacle.

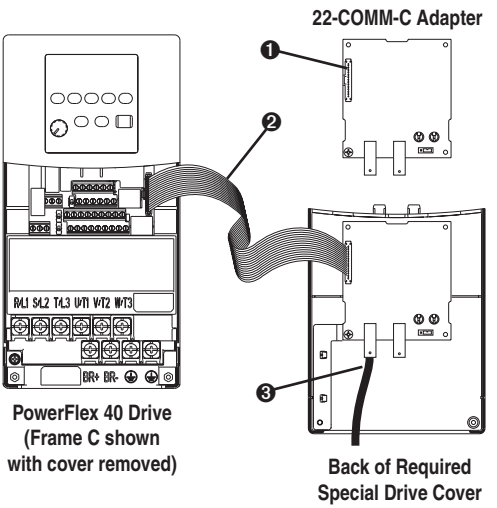
Connecting the Adapter to the Drive

PowerFlex 40 Frames B and C, and PowerFlex 400 Frame C

1. Remove power from the drive.
2. Use static control precautions.
3. Mount the adapter on the *required special* drive cover (ordered separately — see Figure 2.4 for part numbers).
   - Frame C: Use the adapter screw to secure the adapter to the cover.
   - Frame B: Disregard the screw and snap the adapter in place.

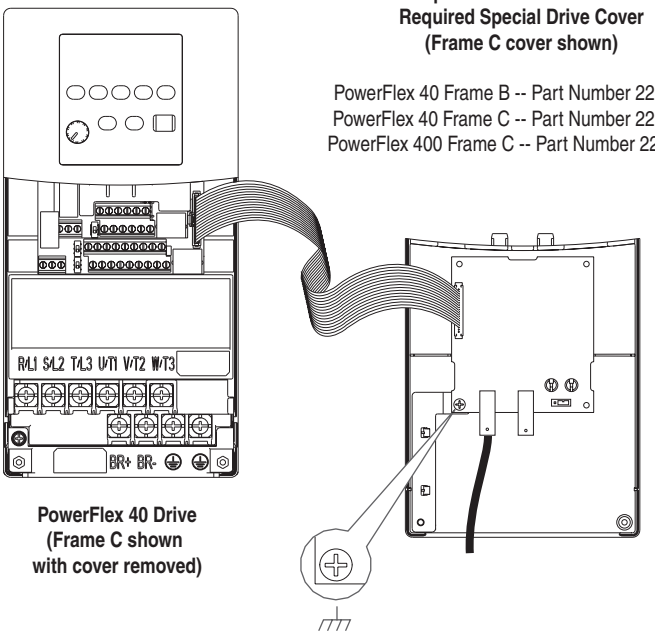
   Important: For Frame C drives, tighten the adapter's lower left screw to ground the adapter (see Figure 2.4). For Frame B drives, install the special drive cover onto the drive using both cover fasteners to ground the adapter.
4. Connect the Internal Interface cable to the DSI port on the drive and then to the mating DSI connector on the adapter.

Figure 2.3 Connecting DSI Ports with Internal Interface Cable



Item	Description
❶	DSI connector
❷	15.24 cm (6 in.) Internal Interface cable
❸	ControlNet cable

Figure 2.4 Mounting and Grounding the Adapter – PowerFlex 40 Frames B and C, and PowerFlex 400 Frame C



Adapter Mounted on Back of Required Special Drive Cover (Frame C cover shown)

PowerFlex 40 Frame B -- Part Number 22B-CCB
PowerFlex 40 Frame C -- Part Number 22B-CCC
PowerFlex 400 Frame C -- Part Number 22C-CCC

PowerFlex 40 Drive (Frame C shown with cover removed)

Ground for Frame C Drives

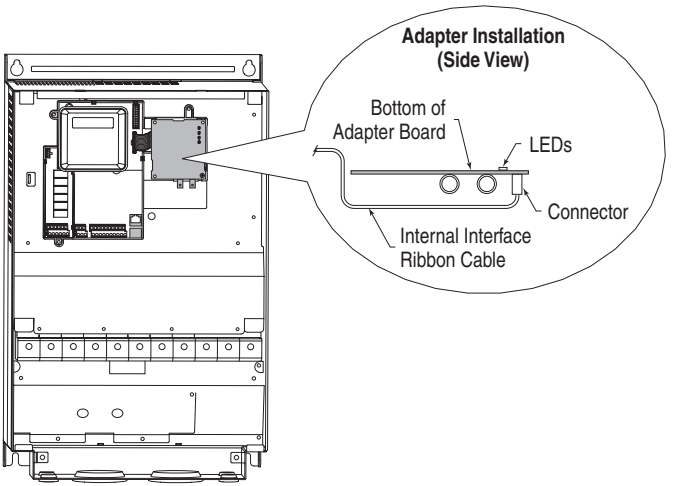
NOTE: For Frame B drives, the lower left adapter screw does not ground the adapter. To ground the adapter, install the special drive cover onto the drive using both cover fasteners.

PowerFlex 400 Frames D, E, and F

1. Remove power from the drive.
2. Use static control precautions.
3. Remove the drive cover.
4. With the adapter board right side up, remove its mounting screw from the lower left hole. Save the screw for mounting in Step 7.
5. Connect the Internal Interface cable to the DSI port on the drive (see Figure 2.5).
6. With the adapter board oriented bottom side up, route the Internal Interface cable under the adapter, and then to the mating DSI connector on the adapter.
7. Install the adapter, bottom side up, to the right side of the display board by snapping it into place. Then insert the adapter mounting screw into the lower left hole on the board.

   Important: Tighten the mounting screw in the adapter's lower left hole to ground the adapter to the drive.

Figure 2.5 Mounting and Connecting the Adapter – PowerFlex 400 Frame D, E, and F Drives



Applying Power

ATTENTION: Risk of equipment damage, injury, or death exists. Unpredictable operation may occur if you fail to verify that parameter settings and switch settings are compatible with your application. Verify that settings are compatible with your application before applying power to the drive.

1. Install the drive cover. The status indicators can be viewed on the front of the drive after power has been applied.

2. Apply power to the PowerFlex drive. The adapter receives its power from the connected drive. When you apply power to the adapter for the first time, the status indicators should be green or off after an initialization. If the status indicators are red, there is a problem. Refer to Chapter 8, Troubleshooting.

Notes:

Configuring the Adapter

Chapter 3 provides instructions and information for setting the parameters in the adapter.

Topic	Page
Configuration Tools	3-1
Using the PowerFlex 4-Class HIM	3-2
Setting the Node Address	3-3
Setting the I/O Configuration	3-3
Setting a Fault Action	3-4
Resetting the Adapter	3-6
Viewing the Adapter Configuration	3-7

For a list of parameters, refer to Appendix B, Adapter Parameters. For definitions of terms in this chapter, refer to the Glossary.

Configuration Tools

The adapter stores parameters and other information in its own non-volatile memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters:

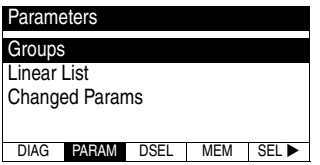
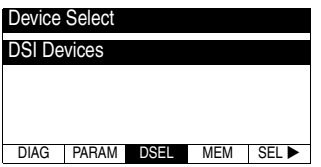
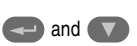
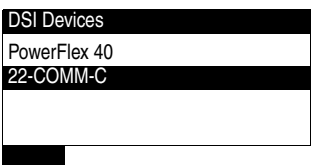
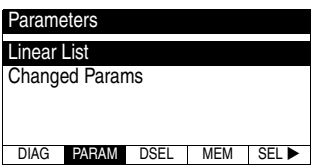
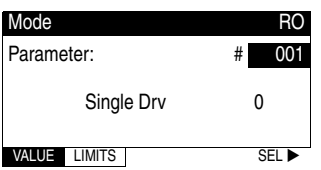
Tool	Refer to…
PowerFlex 4-Class HIM (22-HIM-*)	page 3-2
DriveExplorer Software (version 3.01 or higher)	http://www.ab.com/drives/driveexplorer, and DriveExplorer online help (installed with the software)
DriveExecutive Software (version 3.01 or higher)	http://www.ab.com/drives/drivetools, and DriveExecutive online help (installed with the software)

Using the PowerFlex 4-Class HIM

The PowerFlex 4-Class HIM (Human Interface Module) can be used to access parameters in the adapter (see basic steps shown below). It is recommended that you read through the steps for your HIM before performing the sequence. For additional HIM information, refer to the HIM Quick Reference card.

Note: The HIM will only work when the adapter is set to Single mode.

Using the HIM

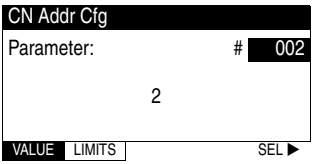
Step	Key(s)	Example Screens
1. Power up the drive. Then plug the HIM into the drive. The **Parameters** menu for the drive will be displayed.		
2. Press Sel key once to display the **Device Select** menu.		
3. Press Enter to display the **DSI Devices** menu. Press Down Arrow to scroll to **22-COMM-C**.		
4. Press Enter to select the adapter. The **Parameters** menu for the adapter will be displayed.		
5. Press Enter to access the parameters. Edit the adapter parameters using the same techniques that you use to edit drive parameters.		

Setting the Node Address

If the Node Address Switches on the adapter are set to a node address of "00," the value of **Parameter 02 - [CN Addr Cfg]** determines the ControlNet node address.

1. Set the value of **Parameter 02 - [CN Addr Cfg]** to a unique node address.

Figure 3.1 Node Address Screen on PowerFlex 4-Class HIM (22-HIM-*)



Default = 2

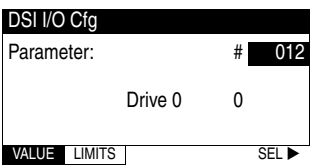
2. Reset the adapter (see Resetting the Adapter on Page 3-6).

Setting the I/O Configuration

The I/O configuration determines the number of drives that will be represented on the network as one node by the adapter. If the Operating Mode Jumper (J7 in Figure 2.1) is set to the "1x" (Single mode) default position, only one drive is represented by the adapter and **Parameter 12 - [DSI I/O Cfg]** has no effect. If the Operating Mode Jumper is set to the "5x" (Multi-Drive) position, up to five drives can be represented as one node by the adapter.

1. Set the value in **Parameter 12 - [DSI I/O Cfg]**.

Figure 3.2 I/O Configuration Screen on Powerflex 4-Class HIM (22-HIM-*)



Value	Description	Mode Jumper Position	
		Single	Multi-Drive
0	Drive 0 (Default)	✓	✓
1	Drives 0-1		✓
2	Drives 0-2		✓
3	Drives 0-3		✓
4	Drives 0-4		✓

When the adapter is internally mounted in a PowerFlex 40 or 400 drive, this drive is always Drive 0. Drives 1 through 4 are PowerFlex

4-Class drives that are daisy-chained to the RJ45 (RS-485) port on Drive 0. When the adapter is externally mounted in a DSI External Comms Kit, Drives 0 through 4 are daisy-chained to the RJ45 (RS-485) port on the Comms Kit. Refer to Chapter 7, Using Multi-Drive Mode for more information.

2. If a drive is enabled, configure the parameters in the drive to accept the Logic Command and Reference from the adapter. For example, set a PowerFlex 40 drive's parameter P036 - [Start Source] and parameter P038 - [Speed Reference] both to "5" (Comm Port). When using the adapter in Multi-Drive mode, each daisy-chained drive requires that additional parameters be set. See Configuring the RS-485 Network on page 7-7 for these parameters and their settings.

3. Reset the adapter (see Resetting the Adapter on page 3-6).

Setting a Fault Action

By default, when communications are disrupted (for example, a cable is disconnected) or the controller is in program mode, the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruptions using **Parameter 08 - [Comm Flt Action]** and a different response to a controller in program mode using **Parameter 09 - [Idle Flt Action]**.

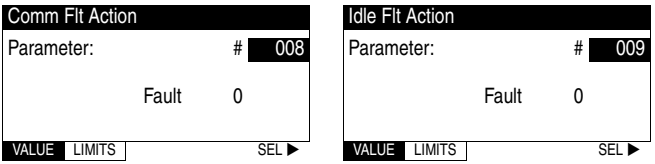
ATTENTION: Risk of injury or equipment damage exists. **Parameters 08 - [Comm Flt Action]** and **09 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if communications are disrupted or the controller is in program mode. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Some ControlNet scanners may operate differently when a controller is in program mode which could limit the Idle Fault Action's operating states. Precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable or faulted controller).

To change the fault action

Set the values of **Parameters 08 - [Comm Flt Action]** and **09 - [Idle Flt Action]** to the desired responses:

Value	Action	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent 0 for output data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameter 10 - [Flt Cfg Logic]** and **Parameter 11 - [Flt Cfg Ref]**).

Figure 3.3 Fault Action Screens on PowerFlex 4-Class HIM (22-HIM-*)



Changes to these parameters take effect immediately. A reset is not required.

If Multi-Drive mode is used, the same fault action is used by the adapter for all of the drives (Drive 0 - Drive 4) it controls.

To set the fault configuration parameters

If you set **Parameter 08 - [Comm Flt Action]** or **09 - [Idle Flt Action]** to "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault and/or idle fault occurs. You must set these parameters to values required by your application:

Parameter	Name	Description
10	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command.
11	Flt Cfg Ref	A 16-bit value (0 – 65535) sent to the drive as a Reference.

Changes to these parameters take effect immediately. A reset is not required.

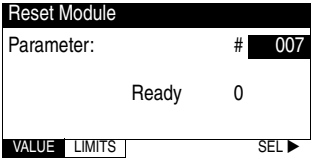
Resetting the Adapter

Changes to switch settings and some adapter parameters require that you reset the adapter before the new settings take effect. You can reset the adapter by cycling power to the drive or by using the following parameter:

ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting control I/O to the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.

Set **Parameter 07 - [Reset Module]** to **Reset Module**.

Figure 3.4 Reset Screen on PowerFlex 4-Class HIM (22-HIM-*)



Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

When you enter **1 = Reset Module**, the adapter will be immediately reset. When you enter **2 = Set Defaults**, the adapter will set all adapter parameters to their factory-default settings. After performing a Set Defaults, enter **1 = Reset Module** so that the new values take effect. The value of this parameter will be restored to **0 = Ready** after the adapter is reset.

Viewing the Adapter Configuration

The following parameters provide information about how the adapter is configured. You can view these parameters at any time.

Number	Name	Description
01	Mode	The operating mode in which the adapter is set: Values 0 = Single Drv 1 = Multiple Drv
03	CN Addr Act	The node address used by the adapter. This will be one of the following values: • The address set by the adapter Node Address switches. • The value of **Parameter 02 - [CN Addr Cfg]** if the switches are set to 0. • An old address of the switches or parameter if they have been changed and the adapter has not been reset.
13	DSI I/O Act	Indicates the drives that are active in the Multi-Drive mode: Bit Definitions 0 = Drive 0 Active 1 = Drive 1 Active 2 = Drive 2 Active 3 = Drive 3 Active 4 = Drive 4 Active

Notes:

Configuring the I/O

Chapter 4 provides instructions on how to configure a ControlLogix controller with 1756-CNB/R bridge or PLC-5 controller to communicate with the adapter and connected PowerFlex drive.

Topic	Page
ControlLogix Example	4-1
PLC-5 Example	4-12

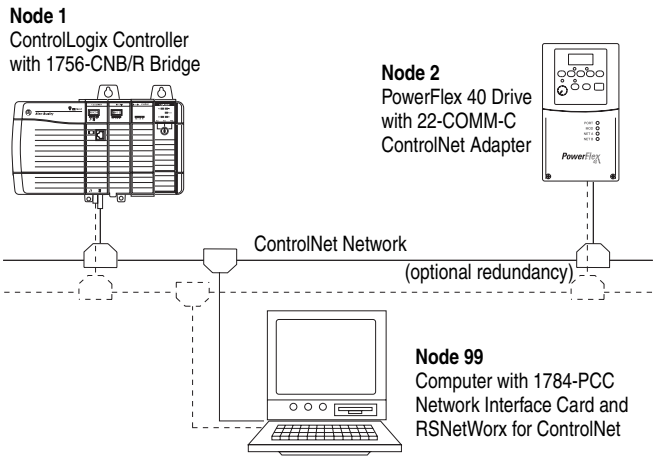
Important: The I/O consumes only one connection between the controller and drive(s) regardless of whether the adapter is in Single or Multi-Drive mode. When using DriveExecutive to configure/monitor the drive, an additional I/O connection will be consumed between the computer and controller. When using Explicit Messaging for time-critical messages, you can create additional dedicated message connections to ensure the timing of their transactions. For more details, see the Important statement in About Explicit Messaging on Page 6-1.

ControlLogix Example

Example Network

After the adapter is configured, the connected drive and adapter will be a single node on the network. This section provides the steps that are needed to configure a simple network like the network in Figure 4.1. In our example, we will configure a 1756-CNB/R bridge to communicate with a drive using Logic Command/Status and Reference/Feedback over the network.

Figure 4.1 Example ControlNet Network

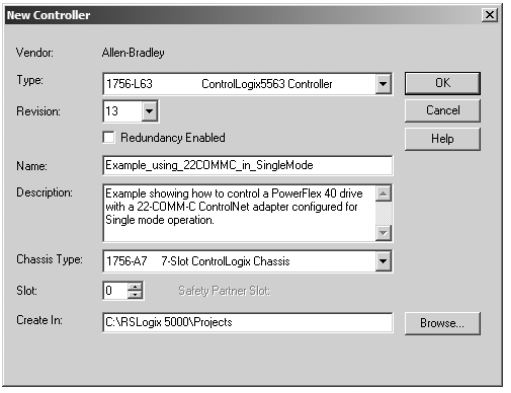


Adding the Bridge to the I/O Configuration

To establish communications over a ControlNet network, you must first add the ControlLogix controller and its bridge to the I/O configuration.

1. Start RSLogix 5000. The RSLogix 5000 window appears. Select **File > New** to display the New Controller screen (Figure 4.2).

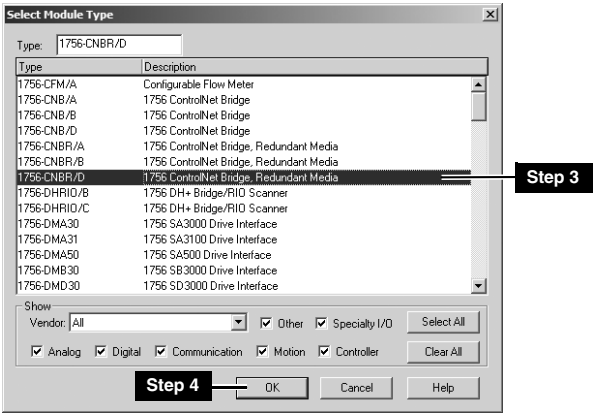
Figure 4.2 New Controller Screen



Select the appropriate choices for the fields in the screen to match your application. Then click **OK**. The RSLogix 5000 window reappears with the project tree in the left pane.

2. In the project tree, right-click the **I/O Configuration** folder and select **New Module**. The Select Module Type screen (Figure 4.3) appears.

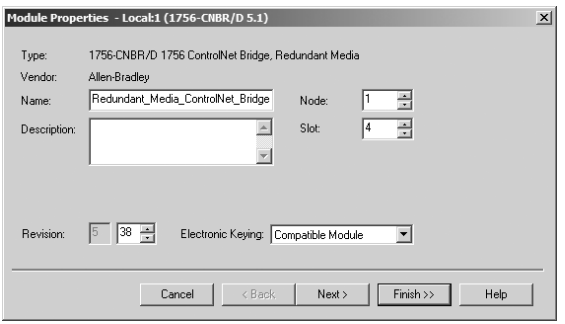
Figure 4.3 Select Module Type Screen



3. In the list, select the ControlNet bridge used by your controller. In this example (Figure 4.3), we use a 1756-CNBR/D ControlNet Bridge (Series D), so the 1756-CNBR/D option is selected.

4. Click **OK**. The Module Properties screen (Figure 4.4) appears.

Figure 4.4 Module Properties Screen



5. Edit the following:

Box	Setting
Name	A name to identify the bridge.
Node	Select the node address setting of the ControlNet bridge (default = 1).
Slot	The slot of the ControlNet bridge in the rack.
Revision	The minor revision of the firmware in the bridge. (You already set the major revision by selecting the bridge series in Step 3.)

Box	Setting
Electronic Keying	**Compatible Module**. The "Compatible Module" setting for Electronic Keying ensures that the physical module is consistent with the software configuration before the controller and bridge make a connection. Therefore, ensure that you have set the correct revision in this screen. Refer to the online help if the controller and bridge have problems making a connection and you want to change this setting.

6. Click **Finish>>**. The bridge is now configured for the ControlNet network. It appears in the I/O Configuration folder. In our example, a 1756-CNBR/D bridge appears under the I/O Configuration folder (Figure 4.5) with its assigned name.

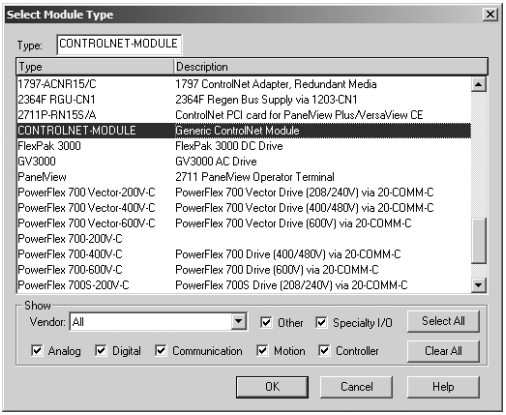
Figure 4.5 RSLogix 5000: I/O Configuration Folder

Adding the Adapter and Drive to the I/O Configuration

To transmit data between the bridge and the adapter, you must add the 22-COMM-C adapter as a child device to the parent bridge.

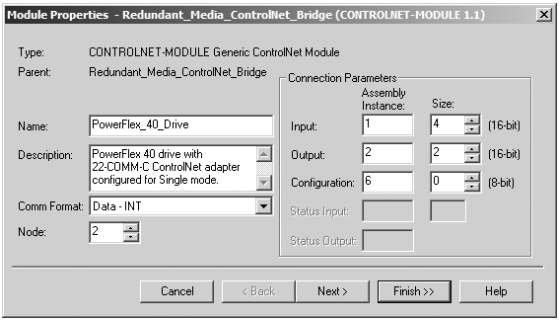
1. In the project tree, right-click on the bridge and select **New Module** to display the Select Module Type screen (Figure 4.6). For this example, right-click on the 1756-CNBR/D bridge.

Figure 4.6 Select Module Type Screen



2. Select **CONTROLNET-MODULE** (Figure 4.6) to configure the 22-COMM-C adapter, and then click **OK**. The Module Properties screen (Figure 4.7) appears.

Figure 4.7 Module Properties Screen



3. Edit the following information about the adapter:

Box	Setting
Name	A name to identify the adapter and drive.
Comm Format	**Data - INT** (This setting formats the data in 16-bit words.)
Node	The node address setting of the adapter.

4. Under Connection Parameters, edit the following:

Box	Assembly Instance	Size
Input	**1** (This value is required.)	The value will vary based on your application (setting of **Parameter 12 - [DSI I/O Cfg]**). It will contain 2 additional words for ControlNet bridge overhead. Refer to Table 4.A.
Output	**2** (This value is required.)	The value will vary based on your application (setting of **Parameter 12 - [DSI I/O Cfg]**). Refer to Table 4.A.
Configuration	**6** (This value is required.)	**0** (This value is required.)

Enter the number of words that are required for your I/O in the Input Size and Output Size boxes. The size will depend on the I/O that you enabled in the adapter. This information can be found in **Parameter 12 - [DSI I/O Cfg]** in the adapter. Table 4.A shows common configuration Input/Output sizes.

In our example, we entered “4” in the Input Size and “2” in the Output Size boxes because the Operating Mode Jumper on the adapter is set to “1x” (Single mode, which is the default). Logic Status/Feedback uses 2 words of input and an additional 2 words of input are reserved for ControlNet bridge overhead. Logic Command/Reference uses 2 words of output.

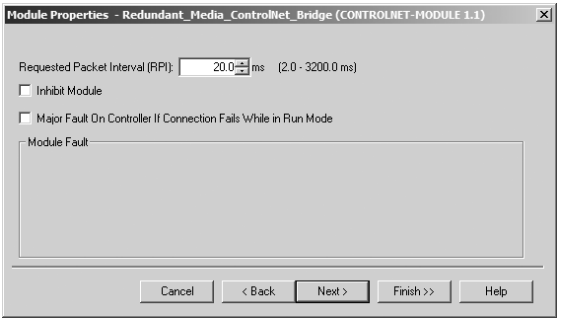
Table 4.A ControlLogix Input/Output Size Configurations

Input Size	Output Size	Logic Command/ Status	Reference/ Feedback	Parameter 12 - [DSI I/O Cfg]	Parameter 01 - [Mode]
4	2	✔	✔	Drive 0	Single
6	4	✔	✔	Drives 0-1	Multi-Drive
8	6	✔	✔	Drives 0-2	
10	8	✔	✔	Drives 0-3	
12	10	✔	✔	Drives 0-4	

TIP: For instructions on configuring the I/O for the adapter (**Parameter 12 - [DSI I/O Cfg]**), see Setting the I/O Configuration on page 3-3.

5. Click **Next >** to display the Requested Packet Interval screen (Figure 4.8).

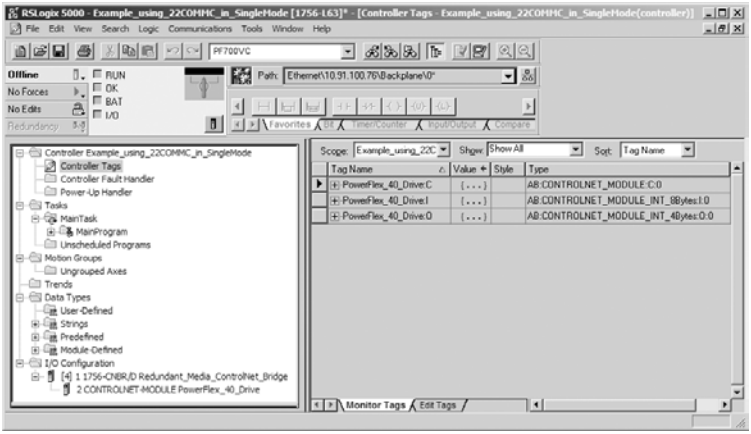
Figure 4.8 Requested Packet Interval Screen



6. In the **Requested Packet Interval (RPI)** box, set the value to 5.0 milliseconds or greater. This value determines the maximum interval that a controller should use to move data to and from the adapter. To conserve bandwidth, use higher values for communicating with low priority devices.

7. Click **Finish >>**. The new node (“PowerFlex_40_Drive” in this example) now appears under the bridge (“1756-CNBR/D” in this example) in the I/O Configuration folder. If you double-click on the Controller Tags (Figure 4.9), you will see that module-defined data types and tags have been automatically created. After you save and download the configuration, these tags allow you to access the Input and Output data of the adapter via the controller’s ladder logic.

Figure 4.9 Controller Tags Overview Window

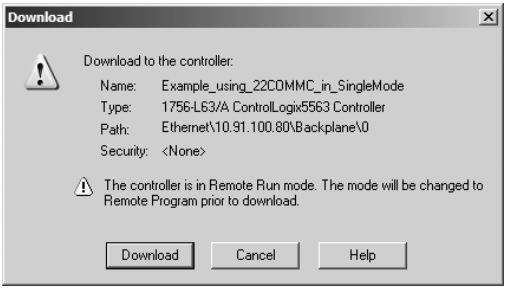


Saving the I/O Configuration to the Controller

After adding the bridge and the adapter to the I/O configuration, you must download the configuration to the controller. You should also save the configuration to a file on your computer.

1. Select **Communications > Download**. The **Download** dialog box (Figure 4.10) appears.

Figure 4.10 Download Dialog Box



TIP: If a message box reports that RSLogix 5000 is unable to go online, select **Communications > Who Active** to try to find your controller in the Who Active screen. After finding the controller, click the **Set Project Path** button to establish the path. If your controller does not appear, you need to add or configure the ControlNet driver in RSLinx. Refer to the RSLinx online help.

2. Click **Download** to download the configuration to the controller. When the download is completed successfully, click **Yes**. RSLogix 5000 enters the Rem Prog (Remote Program) mode.

3. Select **File > Save**. If this is the first time that you saved the project, the Save As dialog box appears. Navigate to a folder, type a file name, and click **Save** to save the configuration to a file on your computer.

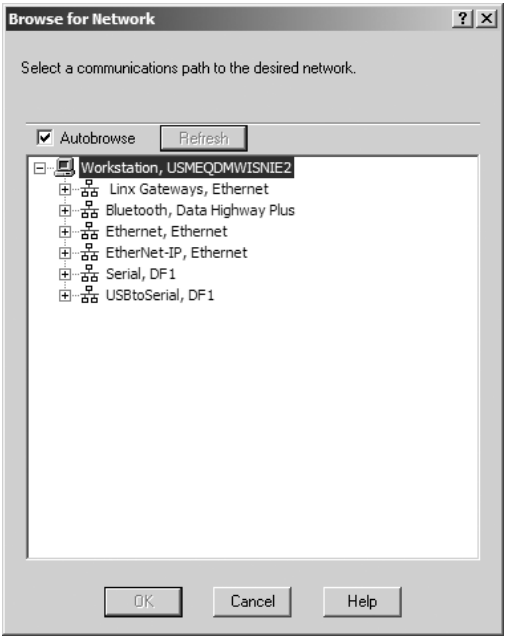
Saving the I/O Configuration to the Bridge

You also need to download the I/O configuration to the bridge. You should also save the configuration to a file on your computer.

1. Launch RSNetWorx for ControlNet. In the RSNetWorx for ControlNet window, select **File > New** to display the New File screen. Then select "ControlNet Configuration" as the network configuration type, and click **OK**.

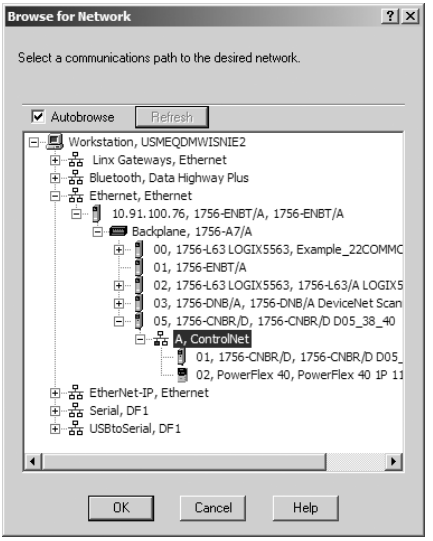
2. Select **Network > Online** to display the Browse for Network screen (Figure 4.11).

Figure 4.11 Browse for Network Screen



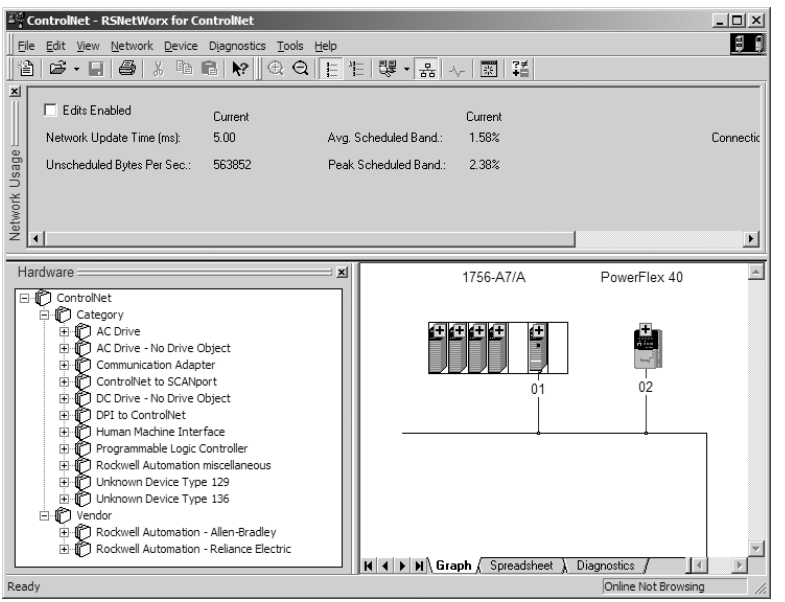
3. Expand the communications path from your computer to the ControlNet bridge. Figure 4.12 shows our example navigating to devices that are on a ControlNet network. Depending on the communication link you are using, the navigation path may be different. After selecting a valid ControlNet path (for this example, A, ControlNet), click **OK**.

Figure 4.12 Expanded Browse for Network Screen



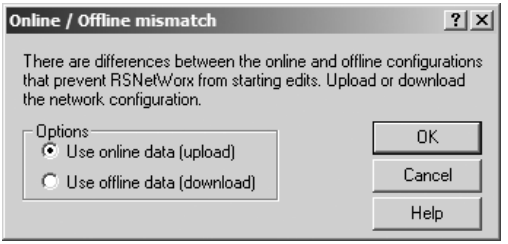
4. As the selected ControlNet path is browsed, RSNetWorx for ControlNet creates a graphical representation of the devices on the network (Figure 4.13).

Figure 4.13 RSNetWorx for ControlNet Graph View Screen



5. Select **Network > Enable Edits**. If the bridge has a different I/O configuration than the configuration now being saved, the Online / Offline mismatch dialog box (Figure 4.14) will appear.

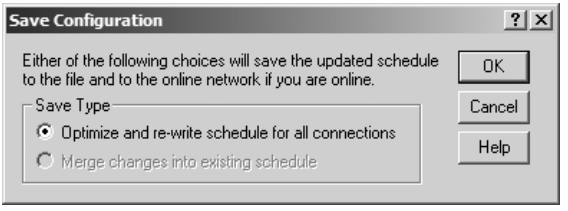
Figure 4.14 Online / Offline mismatch Dialog Box



When both radio button choices are available, use the preselected default "Use online data (upload)." When this choice is unavailable (grayed out), you must select "Use offline data (download)." Then click **OK**.

6. Select **File > Save** to save the I/O configuration file to the computer. If this is the first time that you saved the project, the Save As dialog box appears. Navigate to a folder, type a file name, and click **Save** to save the configuration to a file on your computer. The Save Configuration dialog box (Figure 4.15) appears. Then click **OK** to download the I/O configuration to the bridge.

Figure 4.15 Save Configuration Dialog Box



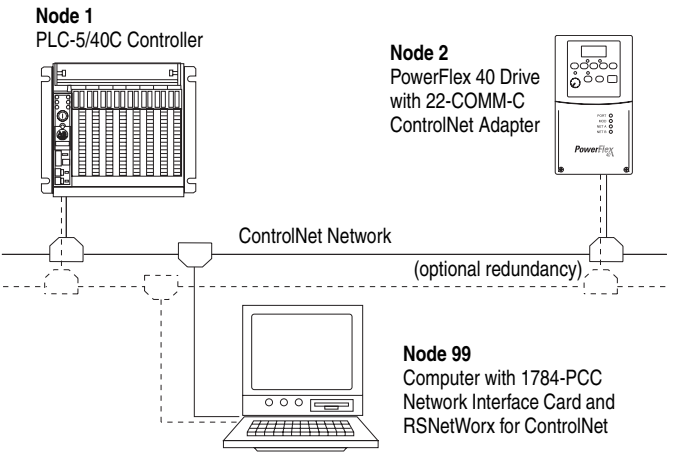
TIP: If both Save Type choices are available, it is recommended to select the "Optimize and re-write schedule for all connections" radio button.

PLC-5 Example

Example Network

After the adapter is configured, the connected drive and adapter will be a single node on the network. This section provides the steps that are needed to configure a simple network like the network in Figure 4.16. In our example, we will configure a PLC-5/40C controller to communicate with a drive using Logic Command/Status and Reference/Feedback over the network.

Figure 4.16 Example ControlNet Network



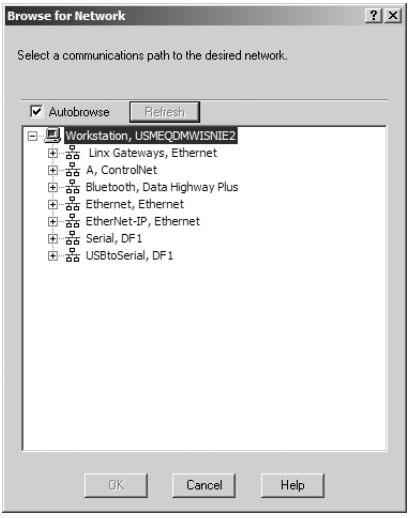
Adding the Drive and Adapter I/O to the Controller

To establish an I/O configuration that can be used between the controller and drive over a ControlNet network, you must first create an I/O image for the PLC-5/40C controller's built-in scanner.

1. Launch RSNetWorx for ControlNet. In the RSNetWorx for ControlNet window, select **File > New** to display the New File screen. Then select **ControlNet Configuration** as the network configuration type, and click **OK**.

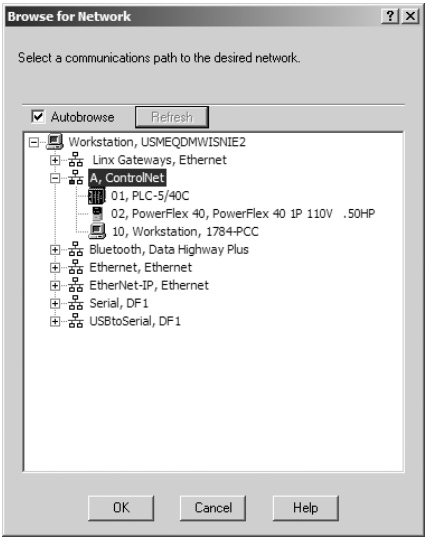
2. Select **Network > Online** to display the Browse for Network screen (Figure 4.17).

Figure 4.17 Browse for Network Screen



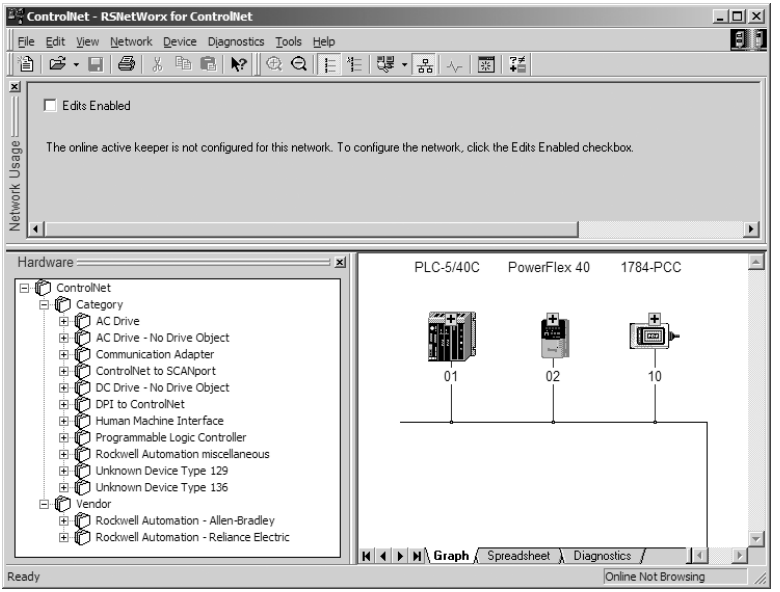
3. Expand the communications path from your computer to the ControlNet scanner. Figure 4.18 shows our example navigating to devices that are on a ControlNet network. Depending on the communication link you are using, the navigation path may be different. After selecting a valid ControlNet path (for example, A, ControlNet), click **OK**.

Figure 4.18 Expanded Browse for Network Screen



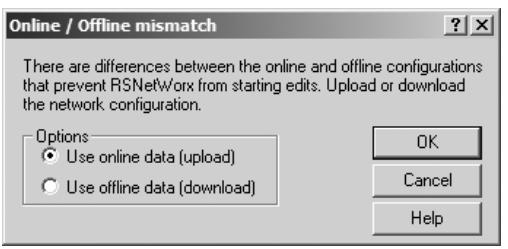
4. As the selected ControlNet path is browsed, RSNetWorx for ControlNet creates a graphical representation of the devices on the network (Figure 4.19).

Figure 4.19 RSNetWorx for ControlNet Graph View Screen



5. Select **Network > Enable Edits**. If the scanner has a different I/O configuration than the configuration now being saved, the Online / Offline mismatch dialog box (Figure 4.20) will appear.

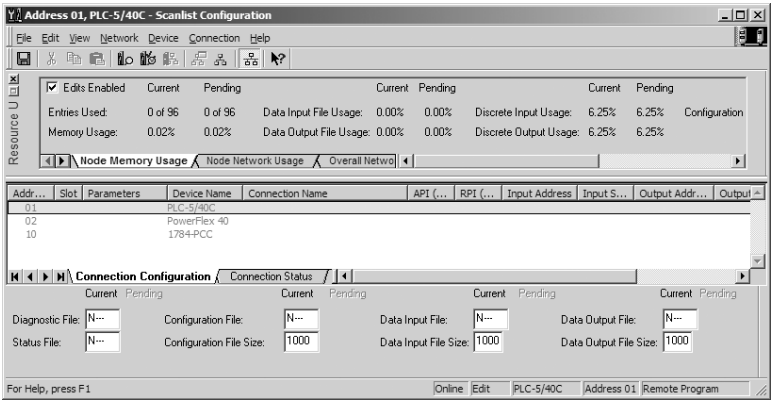
Figure 4.20 Online / Offline mismatch Dialog Box



When both radio button choices are available, use the preselected default “Use online data (upload).” When this choice is unavailable (grayed out), you must select “Use offline data (download).” Then click **OK**.

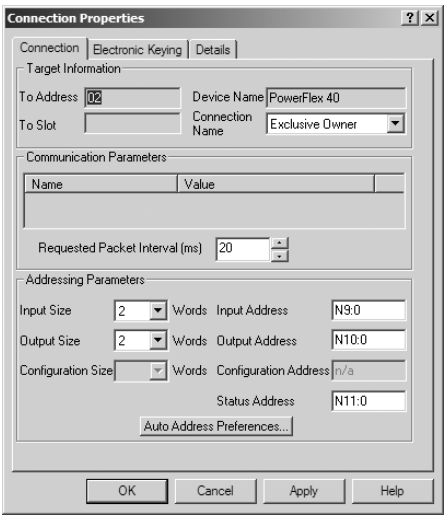
6. In the RSNetWorx for ControlNet graph view screen, right-click the PLC-5/40C icon and select **Scanlist Configuration** to display the Scanlist Configuration screen (Figure 4.21).

Figure 4.21 Scanlist Configuration Screen



7. Right-click on the PowerFlex 40 drive row in the screen and select **Insert Connection…** to display the Connection Properties screen (Figure 4.22).

Figure 4.22 Connection Properties Screen



In this screen, leave the Connection Name box at the default value shown. Choose a Requested Packet Interval that is suitable for your application, but is at least 5 ms. Use the pull-down lists to select the

number of words that are required for your I/O in the Input Size and Output Size boxes. The size will depend on the I/O that you enabled in the adapter. This information can be found in **Parameter 12 - [DSI I/O Cfg]** in the adapter. Table 4.B shows common configuration Input/Output sizes.

Table 4.B PLC-5/40C Input/Output Size Configurations

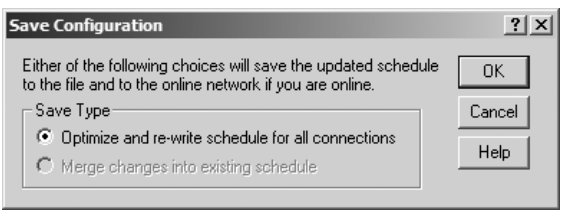
Input Size	Output Size	Logic Command/ Status	Reference/ Feedback	Parameter 12 - [DSI I/O Cfg]	Parameter 01 - [Mode]
2	2	✔	✔	Drive 0	Single
4	4	✔	✔	Drives 0-1	Multi-Drive
6	6	✔	✔	Drives 0-2	
8	8	✔	✔	Drives 0-3	
10	10	✔	✔	Drives 0-4	

TIP: If necessary, the N9:0, N10:0, and N11:0 address defaults can be changed to meet processor address requirements or eliminate address conflicts.

8. Then click **OK**. An address row (in blue text) will be added below the PowerFlex 40 drive row.

9. Select **File > Save** to save the I/O configuration file to the computer. If this is the first time that you saved the project, the Save As dialog box appears. Navigate to a folder, type a file name, and click **Save** to save the configuration to a file on your computer. The Save Configuration dialog box (Figure 4.23) appears. Then click **OK** to download the I/O configuration to the scanner.

Figure 4.23 Save Configuration Dialog Box



TIP: If both Save Type choices are available, it is recommended to select the "Optimize and re-write schedule for all connections" radio button.

10. A warning will appear about communication and I/O disruption on the network. Click **Yes**.

Using the I/O

Chapter 5 provides information and examples that explain how to use the I/O to control, configure, and monitor a PowerFlex 4-Class drive.

Topic	Page
About I/O Messaging	5-1
Understanding the I/O Image	5-2
Using Logic Command/Status	5-3
Using Reference/Feedback	5-3
Example Ladder Logic Program Information	5-4
ControlLogix Example	5-5
PLC-5 Example	5-8

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About I/O Messaging

On ControlNet, I/O messaging is used to transfer the data which controls the PowerFlex drive and sets its Reference.

The adapter provides many options for configuring and using I/O, including configuring the size of I/O by selecting the number of attached drives (Single or Multi-Drive mode).

Chapter 3, Configuring the Adapter, and Chapter 4, Configuring the I/O, discuss how to configure the adapter and controller on the network for these options. The Glossary defines the different options. This chapter discusses how to use I/O after you have configured the adapter and controller.

Understanding the I/O Image

The terms *input* and *output* are defined from the controller's point of view. Therefore, output I/O is data that is produced by the controller and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the controller. The I/O image table will vary based on the configuration of the adapter:

- Operating Mode Jumper J7 (Figure 2.1)
- **Parameter 12 - [DSI I/O Cfg]**

The image table always uses consecutive words starting at word 0. Figure 5.1 and Figure 5.2 illustrate examples of a Single drive I/O image (16-bit words) for ControlLogix and PLC-5 controllers respectively.

Figure 5.1 Single Drive Example of I/O Image for ControlLogix

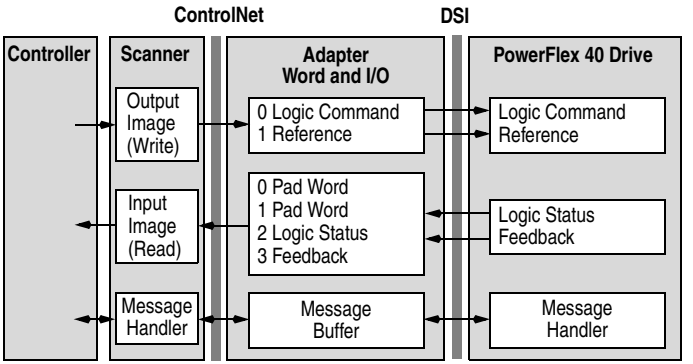
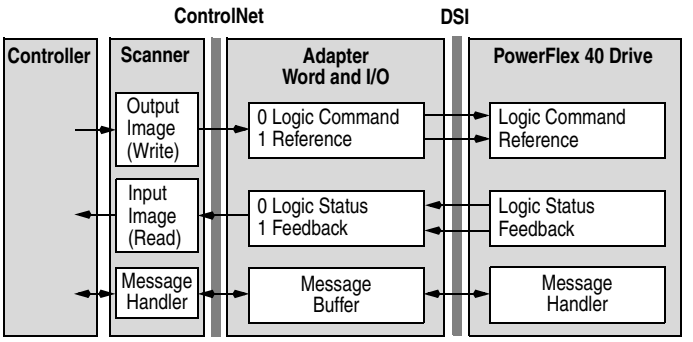


Figure 5.2 Single Drive Example of I/O Image for PLC-5



Single mode is the typical configuration, where one node consists of a PowerFlex 40 or PowerFlex 400 drive with a 22-COMM-C adapter. For Multi-Drive mode, where one node can consist of up to 5 drives, refer to Chapter 7, Using Multi-Drive Mode.

Using Logic Command/Status

The Logic Command word is always word 0 in the output image. The *Logic Command* is a 16-bit word of control produced by the controller and consumed by the adapter. The Logic Status word is input word 2 for ControlLogix or input word 0 for PLC-5. The *Logic Status* is a 16-bit word of status produced by the adapter and consumed by the controller.

This manual contains the bit definitions for compatible products available at the time of publication in Appendix D, Logic Command/Status Words. For other products, refer to their documentation.

Using Reference/Feedback

The Reference word is always word 1 in the output image. The *Reference* (16 bits) is produced by the controller and consumed by the adapter. The Feedback word begins at input word 3 for ControlLogix or input word 1 for PLC-5. The *Feedback* (16 bits) is produced by the adapter and consumed by the controller.

Size	Drive	Valid Values (1)	Example
16-bit	PowerFlex 4	-240.0 to +240.0 Hz	Figure 5.1 or Figure 5.2
	PowerFlex 40	-400.0 to +400.0 Hz	
	PowerFlex 400	-320.00 to +320.00 Hz	

(1) The Reference/Feedback for a PowerFlex 4, PowerFlex 40 or Powerflex 400 drive is set in Hz and not in engineering units like PowerFlex 7-Class drives. For example, “300” equates to 30.0 Hz (the decimal point is always implied) for PowerFlex 4/40, and “3000” equates to 30.00 Hz for PowerFlex 400. Also, a minus value equates to reverse motor direction, and a plus value equates to forward motor direction.

Example Ladder Logic Program Information

The example ladder logic programs in the ControlLogix Example and PLC-5 Example sections of this chapter are intended for and operate PowerFlex 4-Class drives.

Functions of the Example Programs

The example programs enable an operator to perform the following:

- Obtain status information from the drive.
- Use the Logic Command to control the drive (for example, start, stop).
- Send a Reference to the drive and receive Feedback from the drive.

Adapter Settings for the Example Programs

- Node address 2 is set using parameters.
- The adapter is configured for Single mode operation (Operating Mode Jumper J7 is set to “1x”).

Scanner Settings for the ControlLogix Example Program

- The scanner is in slot 1 and is node 1 on the ControlNet network.
- Output to the adapter is mapped in word 0 and word 1, and input from the adapter is in words 2 and 3 (0 and 1 are pad words).

Scanner Settings for the PLC-5 Example Program

- The scanner is node 1 on the ControlNet network.
- Output to the adapter is mapped in N10:0 and N10:1, and input from the adapter is in N9:0 and N9:1.

Logic Command/Status Words

These examples use the Logic Command word and Logic Status word for PowerFlex 40 drives. Refer to Appendix D, Logic Command/Status Words to view these. The definition of the bits in these words may vary if you are using a different DSI product. Refer to the documentation for your product.

ControlLogix Example

The Drive I/O Control program (Figure 5.3) defines the I/O needed to control the drive.

The following program tags are used for the Drive I/O Control Routine:

Tag Name	Type	Description
Status_Ready	BOOL	Ready bit
Status_Active	BOOL	Active bit
Status_Forward	BOOL	Forward bit
Status_Reverse	BOOL	Reverse bit
Status_Faulted	BOOL	Faulted bit
Status_At_Speed	BOOL	At speed bit
Speed_Feedback	INT	Speed feedback word
Command_Stop	BOOL	Stop bit
Command_Start	BOOL	Start bit
Command_Jog	BOOL	Jog bit
Command_Clear_Faults	BOOL	Clear faults bit
Command_Forward_Reverse	BOOL	Forward/reverse bit
Speed_Reference	INT	Speed reference word

Figure 5.3 ControlLogix Ladder Logic Example for Drive I/O Control

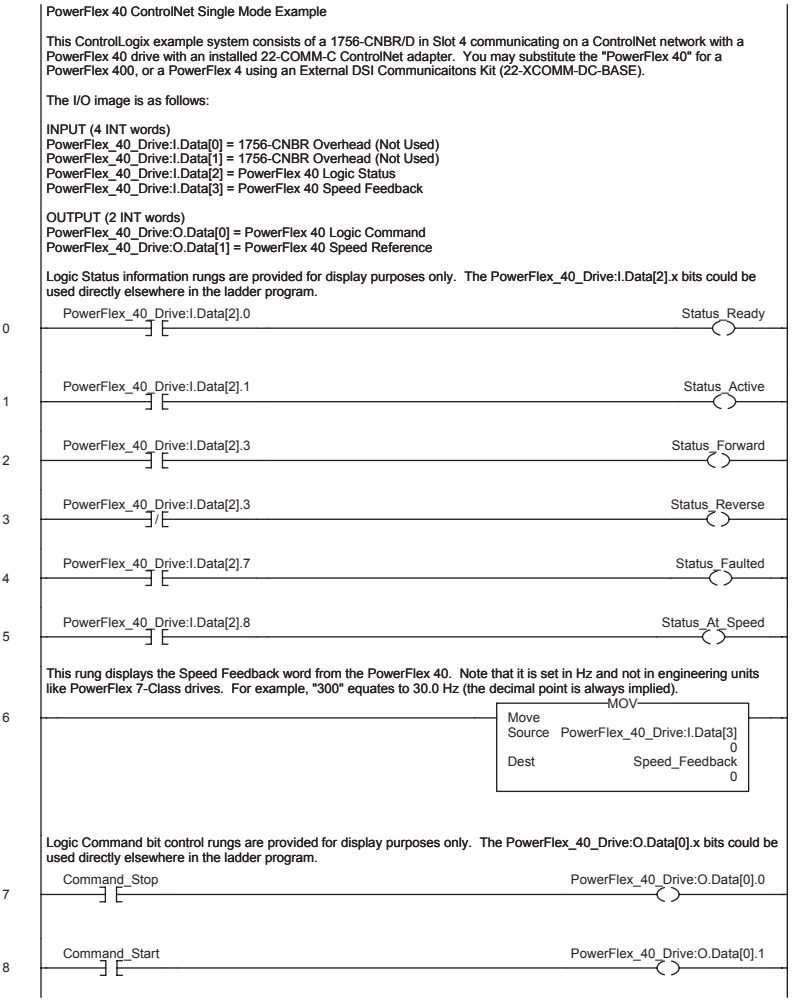
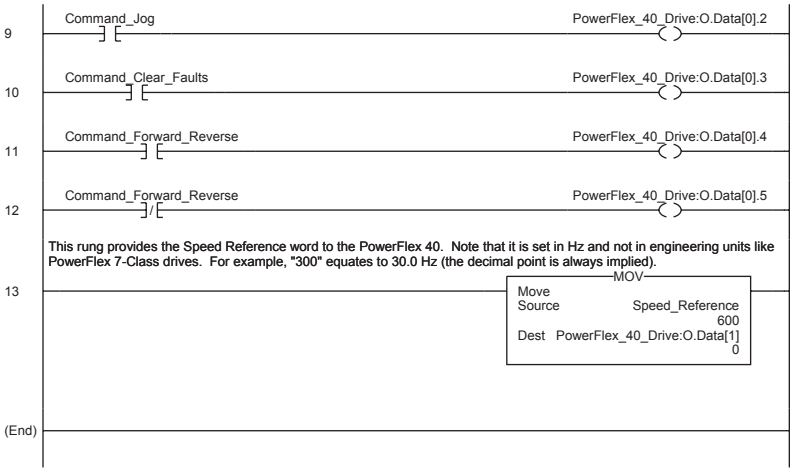


Figure 5.3 ControlLogix Ladder Logic Example for Drive I/O Control (Continued)



For a ControlLogix controller explicit message ladder example program, see Figure 6.4.

PLC-5 Example

The Drive I/O Control program (Figure 5.4) defines the I/O needed to control the drive.

Figure 5.4 PLC-5 Ladder Logic Example for Drive I/O Control

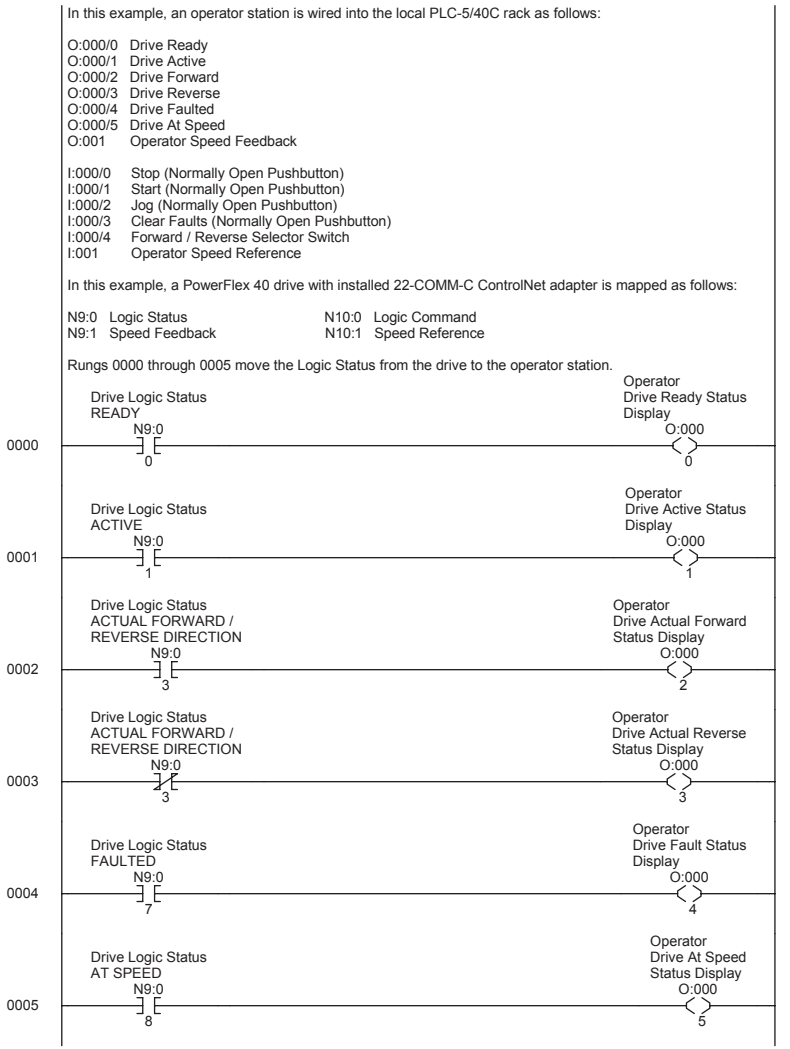
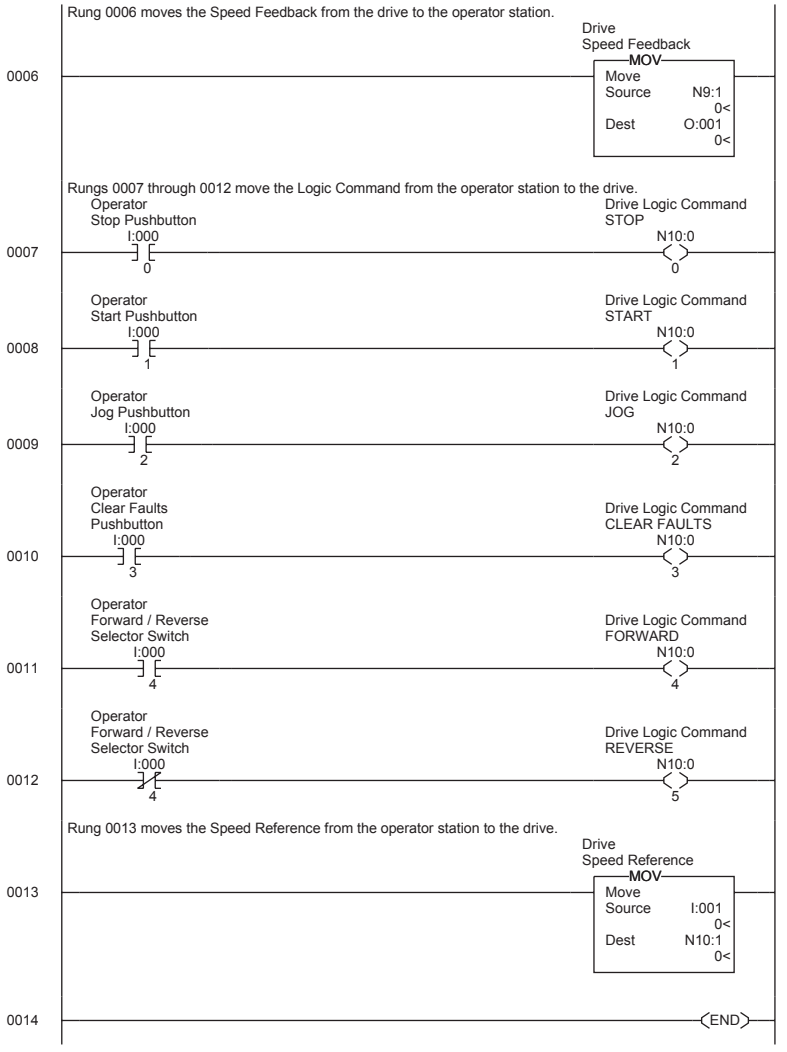


Figure 5.4 PLC-5 Ladder Logic Example for Drive I/O Control (Continued)



For a PLC-5 controller explicit message ladder example program, see Figure 6.5.

Notes:

Using Explicit Messaging

Chapter 6 provides information and examples that explain how to use Explicit Messaging to configure and monitor the 22-COMM-C adapter and PowerFlex 4-Class drive to which it is connected.

Topic	Page
About Explicit Messaging	6-1
Performing Explicit Messages	6-2

Topic	Page
ControlLogix Example	6-3
PLC-5 Example	6-6

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ATTENTION: Risk of equipment damage exists. If Explicit Messages are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses Explicit Messages to write parameter data to NVS.

Refer to Chapter 5 for information about the I/O image, using Logic Command/Status and Reference/Feedback.

About Explicit Messaging

Explicit Messaging is used to transfer data that does not require continuous updates. With Explicit Messaging, you can configure and monitor a slave device's parameters on the ControlNet network.

Important: When an explicit message is performed, by default no I/O connection is made since it is an "unconnected" message. When timing of the message transaction is important, you can create a dedicated message connection between the controller and drive by checking the "Connected" box on the Communications tab message configuration screen

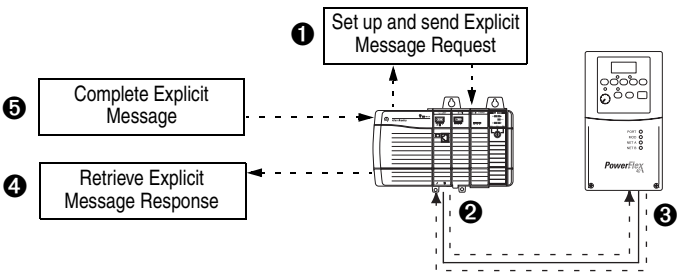
during message setup. These message connections are in addition to the I/O connection. However, the tradeoff for more message connections is decreased network performance. If your application cannot tolerate this, do not check the “Connected” box.

Performing Explicit Messages

There are five basic events in the Explicit Messaging process. The details of each step will vary depending on the type of controller being used. Refer to the documentation for your controller.

Important: There must be a request message and a response message for all Explicit Messages, whether you are reading or writing data.

Figure 6.1 Explicit Message Process



Event

1. You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner or bridge module (download).
2. The scanner or bridge module transmits the Explicit Message Request to the slave device over the ControlNet network.
3. The slave device transmits the Explicit Message Response back to the scanner or bridge. The data is stored in the scanner buffer.
4. The controller retrieves the Explicit Message Response from the scanner’s buffer (upload).
5. The Explicit Message is complete. **Note:** When using a PLC-5 controller, delete the transaction ID so that it can be reused.

For information on the maximum number of Explicit Messages that can be executed at a time, refer to the user manual for the bridge or scanner and/or controller that is being used.

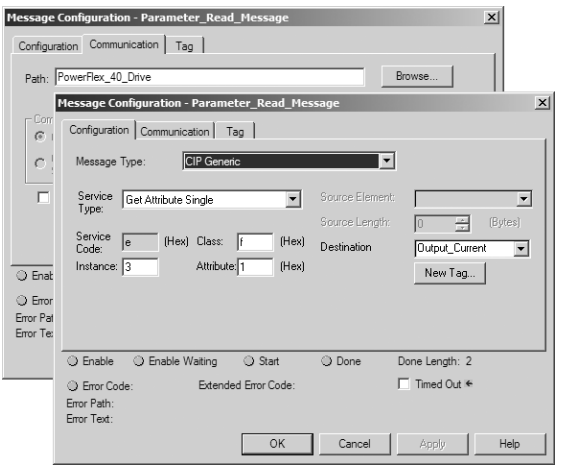
ControlLogix Example

TIP: To display the Message Configuration screen in RSLogix 5000, add a message instruction (MSG), create a new tag for the message (Properties: Base tag type, MESSAGE data type, controller scope), and click the ... button in the message instruction.

Formatting a Message to Read a Parameter

A Get Attribute Single message is used to read a single parameter. This example read message is for parameter d003 - [Output Current] for a PowerFlex 4-Class drive.

Figure 6.2 Get Attribute Single Message Configuration Screens



Configuration Tab	Example Value	Description
Message Type	CIP Generic	CIP messages are used to access the Parameter object in the 22-COMM-C.
Service Type (1)	Get Attribute Single	This service is used to read a parameter value.
Service Code (1)	e (Hex.)	The code for the requested service.
Class	f (Hex.)	The Class ID for the CIP Parameter object.
Instance	3 (Dec.)	The instance number is the same as the parameter number in Single mode operation.
Attribute	1 (Hex.)	The attribute number for the Parameter Value attribute.
Destination	Output_Current	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path (2)	PowerFlex_40…	The path is the route that the message will follow.

(1) The default setting for Service Type is "Custom," enabling entry of a Service Code not available from the Service Type pull-down menu. When selecting a Service Type other than "Custom" from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which grays out (unavailable).

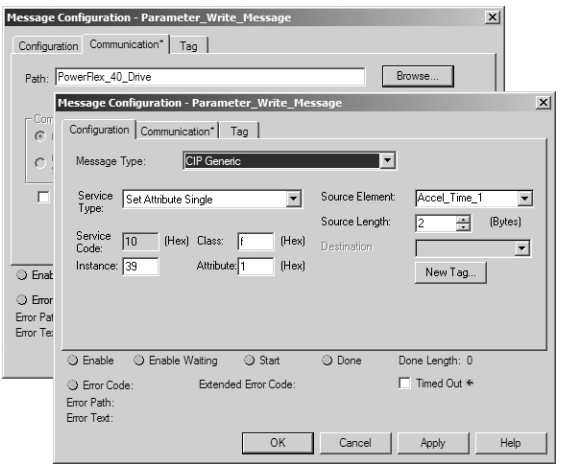
(2) Click Browse to find the path, or type in the name of the device listed in the I/O Configuration folder.

For supported classes, instances, and attributes, refer to Appendix C, ControlNet Objects.

Formatting a Message to Write to a Parameter

A Set Attribute Single message is used to write to a single parameter. This example write message is for parameter P039 - [Accel Time 1] for a PowerFlex 4-Class drive.

Figure 6.3 Set Attribute Single Message Configuration Screens



Configuration Tab	Example Value	Description
Message Type	CIP Generic	CIP messages are used to access the Parameter object in the 22-COMM-C.
Service Type (1)	Set Attribute Single	This service is used to write a parameter value.
Service Code (1)	10 (Hex.)	The code for the requested service.
Class	f (Hex.)	The Class ID for the CIP Parameter object.
Instance	39 (Dec.)	The instance number is the same as the parameter number in Single mode operation.
Attribute	1 (Hex.)	The attribute number for the Parameter Value attribute.
Source Element	Accel_Time_1	The tag where the data that is written is stored.
Source Length	2 bytes	The size of a parameter value in a PowerFlex 4-Class drive is always 2 bytes.
Communication Tab	**Example Value**	**Description**
Path (2)	PowerFlex_40…	The path is the route that the message will follow.

(1) The default setting for Service Type is “Custom,” enabling entry of a Service Code not available from the Service Type pull-down menu. When selecting a Service Type other than “Custom” from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which grays out (unavailable).

(2) Click Browse to find the path, or type in the name of the device listed in the I/O Configuration folder.

For supported classes, instances, and attributes, refer to Appendix C, ControlNet Objects.

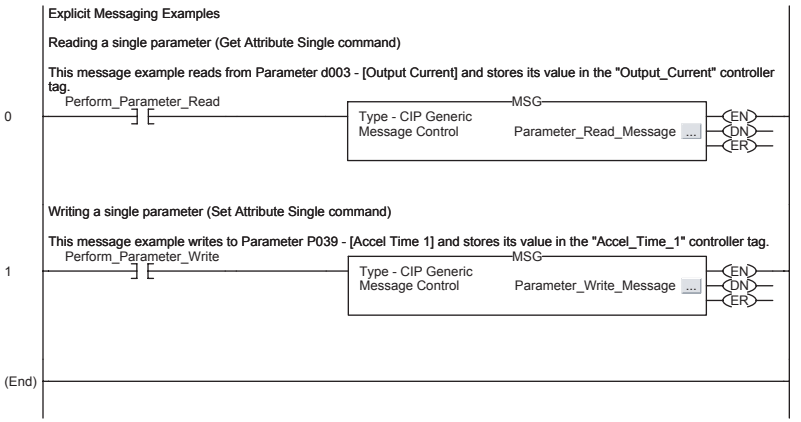
Table 6.A Tags for the ControlLogix Example Explicit Messaging Program

Tag Names for Read Message	Type
Perform_Parameter_Read	BOOL
Parameter_Read_Message	MESSAGE
Output_Current	INT

Tag Names for Write Message	Type
Perform_Parameter_Write	BOOL
Parameter_Write_Message	MESSAGE
Accel_Time_1	INT

Ladder Logic Program

Figure 6.4 Example ControlLogix Ladder Logic Explicit Messaging Program



For a ControlLogix controller I/O ladder example program, see Figure 5.3.

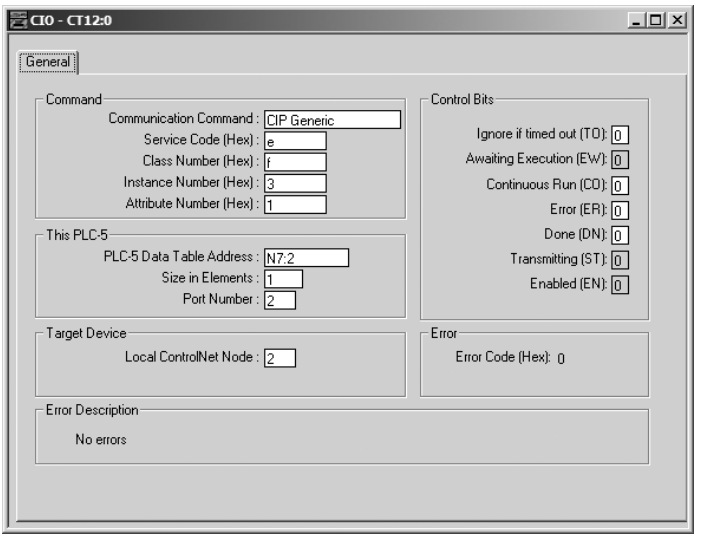
PLC-5 Example

Important: Due to controller limitations, explicit messaging can only be performed on drive parameters up to Parameter 256.

The ControlNet I/O Transfer (CIO) instruction is used for PLC-5 controllers to send explicit messages.

Formatting a Message to Read a Parameter

This read message example is for parameter d003 - [Output Current] for a PowerFlex 4-Class drive.

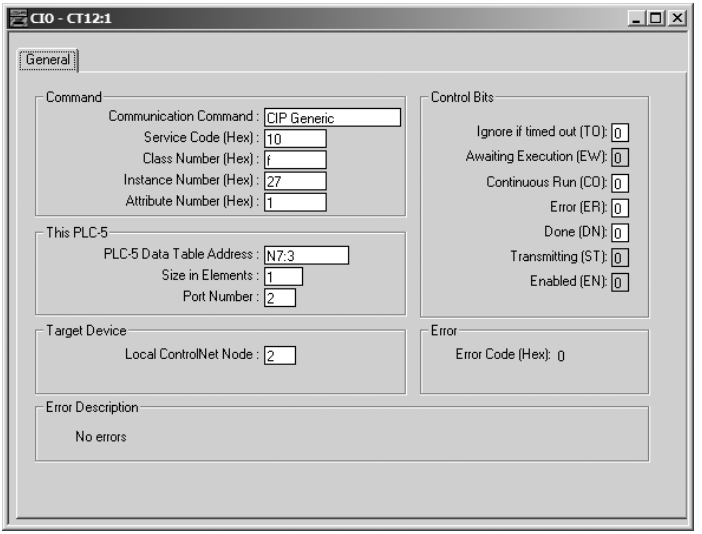


Configuration Box	Example Value	Description
Communication Command	CIP Generic	CIP messages are used to access the Parameter object in the 22-COMM-C.
Service Code	e (Hex.)	The code for the Get_Attribute_Single service.
Class Number	f (Hex.)	The Class ID for the CIP Parameter object.
Instance Number	3 (Hex.)	The instance number is the same as the parameter number in Single mode operation.
Attribute Number	1 (Hex.)	The attribute number for the Parameter Value attribute.
PLC-5 Data Table Address	N7:2	The user-defined address for any response service data received by the controller.
Size in Elements	1	The number of elements in the response data.
Port Number	2	The channel on the PLC-5 used for the ControlNet network.
Local ControlNet Node	2	The node address of the 22-COMM-C adapter.

For supported classes, instances, and attributes, refer to Appendix C, ControlNet Objects.

Formatting a Message to Write to a Parameter

This write message example is for parameter P039 - [Accel Time 1] for a PowerFlex 4-Class drive.

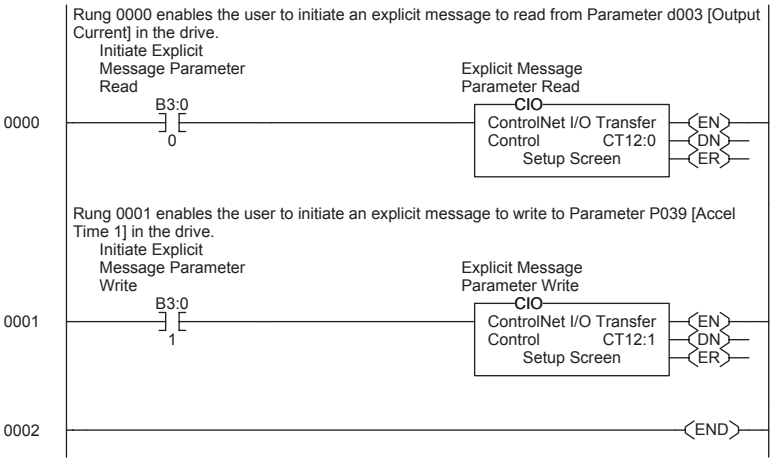


Configuration Box	Example Value	Description
Communication Command	CIP Generic	CIP messages are used to access the Parameter object in the 22-COMM-C.
Service Code	10 (Hex.)	The code for the Set_Attribute_Single service.
Class Number	f (Hex.)	The Class ID for the CIP Parameter object.
Instance Number	27 (Hex.)	The instance number is the same as the parameter number in Single mode operation.
Attribute Number	1 (Hex.)	The attribute number for the Parameter Value attribute.
PLC-5 Data Table Address	N7:3	The user-defined address for any request service data sent by the controller.
Size in Elements	1	The number of elements in the request data.
Port Number	2	The channel on the PLC-5 used for the ControlNet network.
Local ControlNet Node	2	The node address of the 22-COMM-C adapter.

For supported classes, instances, and attributes, refer to Appendix C, ControlNet Objects.

Ladder Logic Program

Figure 6.5 Example PLC-5 Ladder Logic Explicit Messaging Program



For a PLC-5 controller I/O ladder example program, see Figure 5.4.

Using Multi-Drive Mode

Chapter 7 provides information on how to use Multi-Drive mode and includes ControlLogix and PLC-5 ladder examples.

Topic	Page
Single Mode vs. Multi-Drive Mode	7-1
System Wiring	7-4
Understanding the I/O Image	7-5
Configuring the RS-485 Network	7-7
Example Configuration Settings	7-8
ControlLogix I/O Example	7-9
ControlLogix Explicit Messaging	7-22
PLC-5 I/O Example	7-24
Additional Information	7-36

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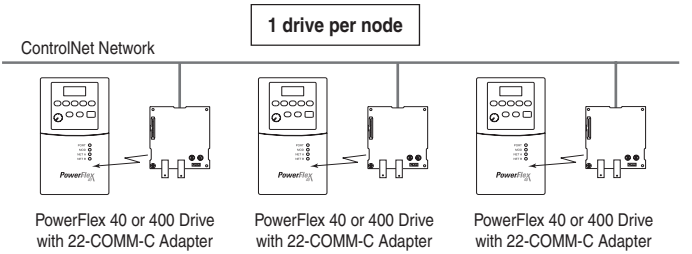
Single Mode vs. Multi-Drive Mode

Single mode is a typical network installation, where a single ControlNet node consists of a single drive with a 22-COMM-C adapter (Figure 7.1).

Figure 7.1 Single Mode Example for Network



Multi-Drive mode is an alternative to the typical network installation, where a single ControlNet node can consist of one to five drives. In Figure 7.2, the 22-COMM-C adapter is internally mounted in a PowerFlex 40/400 drive, and the remaining PowerFlex 4-Class drives are daisy-chained from the RS-485 port on the first drive. In Figure 7.3, the 22-COMM-C adapter is externally mounted in a DSI External Comms Kit, and all PowerFlex 4-Class drives are daisy-chained from it.

Figure 7.2 Multi-Drive Mode Example for Network - PowerFlex 40 Mounting

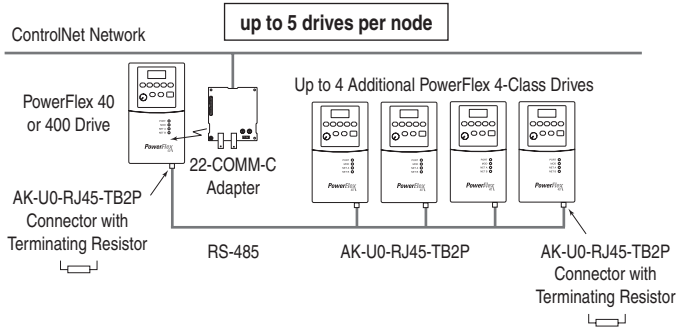
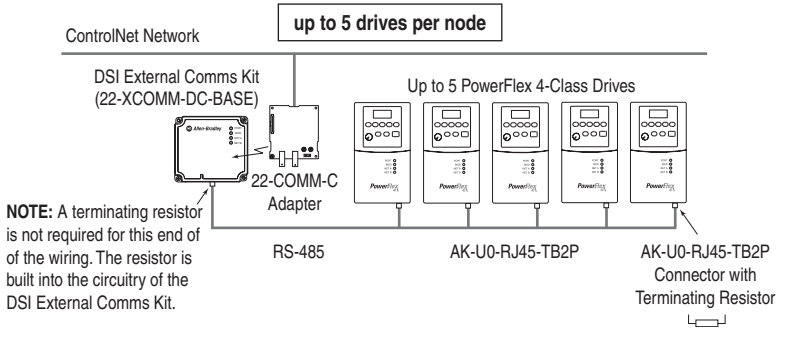


Figure 7.3 Multi-Drive Mode Example for Network - External Comms Kit Mounting



NOTE: A terminating resistor is not required for this end of of the wiring. The resistor is built into the circuitry of the DSI External Comms Kit.

Benefits of Multi-Drive mode include:

- Lower hardware costs. Only one adapter is needed for up to five drives. Any PowerFlex 4-Class drive can be daisy-chained.
- Reduces the network node count. For example, in Single mode 30 drives would consume 30 nodes. In Multi-Drive mode, 30 drives can be connected in 6 nodes.
- Provides a convenient way to put more than one PowerFlex 4 drive on the network using only one adapter (PowerFlex 4 drives do not have an internal communications adapter slot).
- Controller can control, monitor, and read/write parameters for all five drives.

Trade-offs of Multi-Drive mode include:

- When a PowerFlex 40/400 drive with an internal-mounted adapter is powered down, communications with the daisy-chained drives is disrupted and the drives will take the appropriate communications loss action set in each drive. However, communications will not be disrupted when the adapter is used in a DSI External Comms Kit and a daisy-chained drive is powered down.
- Communications throughput to the daisy-chained drives will be slower than if each drive was a separate node on the network (Single mode). This is because the adapter must take the network data for the other drives and sequentially send the respective data to each drive over RS-485. The approximate additional throughput time for Logic Command/Reference to be transmitted and received by each drive in Multi-Drive mode is:

Adapter Mounted In	Drives per Node	Additional Throughput Time versus Single Mode
PowerFlex 40/400 or DSI External Comms Kit	1 drive	0 milliseconds
	2 drives	+24 milliseconds
	3 drives	+48 milliseconds
	4 drives	+72 milliseconds
	5 drives	+96 milliseconds

- Since the RS-485 ports are used for daisy-chaining the drives, there is no connection for a peripheral device such as a HIM. The AK-U0-RJ45-SC1 DSI Splitter cable cannot be used to add a second connection for a peripheral device.

System Wiring

The AK-U0-RJ45-TB2P two-position terminal block connector (Figure 7.4) can be used to conveniently daisy-chain the PowerFlex 4-Class drives. Two terminating resistors are also included with terminal block connectors in the AK-U0-RJ45-TB2P kit.

Figure 7.4 AK-U0-RJ45-TB2P Terminal Block Connector

Figure 7.5 and Figure 7.6 show wiring diagrams for using the AK-U0-RJ45-TB2P terminal block connectors.

Figure 7.5 Connector Wiring Diagram - Adapter Mounted in PowerFlex 40/400

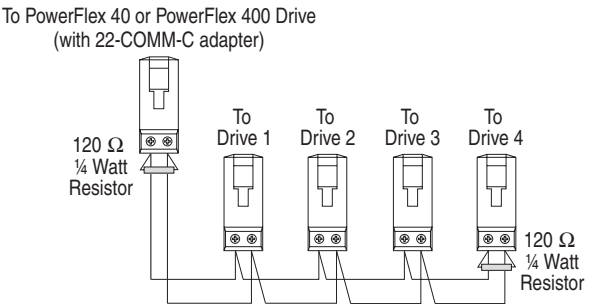
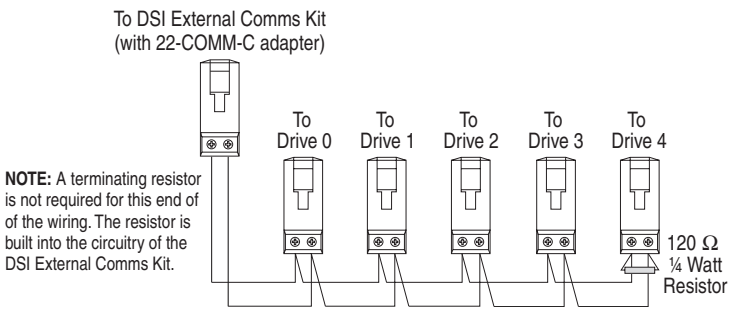


Figure 7.6 Connector Wiring Diagram - Adapter Mounted in DSI External Comms Kit



Understanding the I/O Image

The terms *input* and *output* are defined from the scanner's point of view. Therefore, output I/O is data that is output from the scanner and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the scanner. The I/O image table will vary based on the configuration of the adapter:

- Operating Mode Jumper J7 (Figure 2.1)
- **Parameter 12 - [DSI I/O Cfg]**

The image table always uses consecutive words starting at word 0. Figure 7.7 and Figure 7.8 illustrate examples of the Multi-Drive I/O image with 16-bit words for ControlLogix and PLC-5 controllers respectively.

Figure 7.7 Multi-Drive Example of I/O Image for ControlLogix

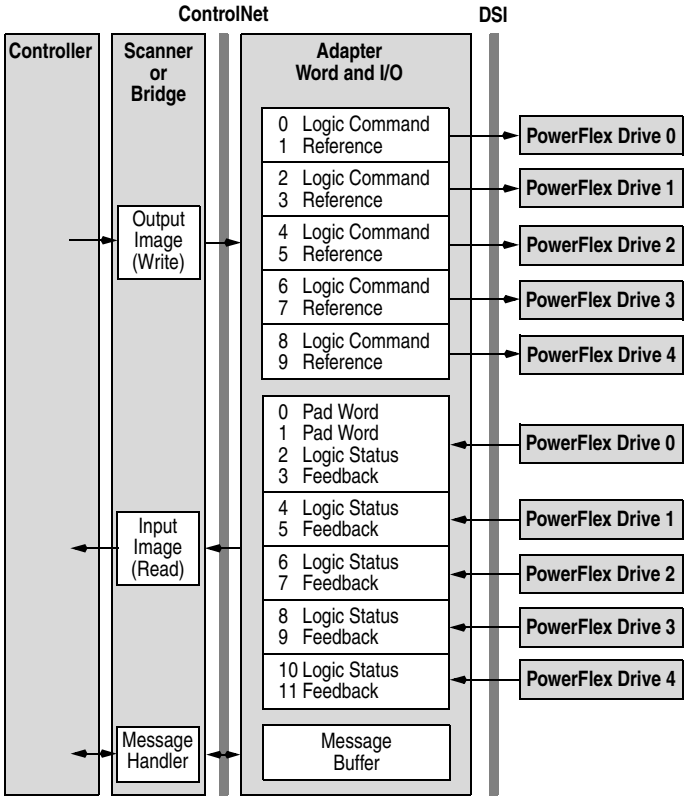
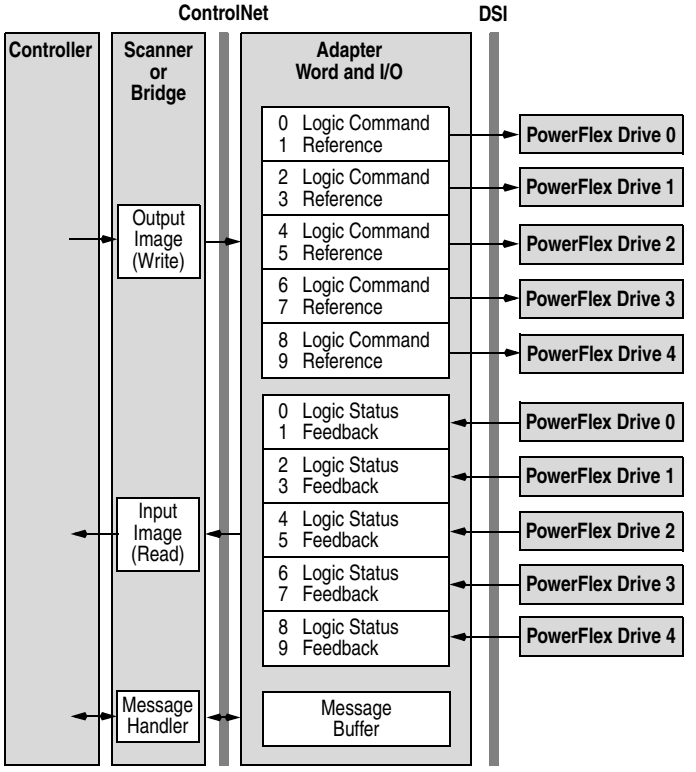


Figure 7.8 Multi-Drive Example of I/O Image for PLC-5



Note: If a daisy-chained drive is disconnected from the RS-485 (DSI) network or powered down, the Logic Status and Feedback words for the affected drive will be set to 0.

Configuring the RS-485 Network

The following parameters in each daisy-chained drive must be set to these values:

Parameter	Value
P36 - [Start Source]	5 (Comm Port)
P38 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	1-247 (must be unique)
A107 - [Comm Format]	0 (RTU 8-N-1)

Note that the RS-485 network is fixed at 19.2K baud, 8 data bits, no parity, and 1 stop bit.

Important: Parameter A105 - [Comm Loss Action] in the drives that are daisy chained is still used in Multi-Drive mode. If the RS-485 cable is disconnected or broken, the disconnected drive(s) will immediately take the corresponding Comm Loss Action(s). Drive parameter A106 - [Comm Loss Time] is not used in Multi-Drive mode. For a network disruption, adapter **Parameters 08 - [Comm Flt Action]** and **09 - [Idle Flt Action]** determine the action taken for ALL of the drives on the Multi-Drive node.

The following Multi-Drive parameters must be set in the 22-COMM-C:

Parameter	Value
12 - [DSI I/O Cfg]	0 = Drive 0 connected 1 = Drives 0-1 connected 2 = Drives 0-2 connected 3 = Drives 0-3 connected 4 = Drives 0-4 connected
14 - [Drv 0 Addr]	Equal to Drive 0 parameter A104 - [Comm Node Address]
15 - [Drv 1 Addr]	Equal to Drive 1 parameter A104 - [Comm Node Address]
16 - [Drv 2 Addr]	Equal to Drive 2 parameter A104 - [Comm Node Address]
17 - [Drv 3 Addr]	Equal to Drive 3 parameter A104 - [Comm Node Address]
18 - [Drv 4 Addr]	Equal to Drive 4 parameter A104 - [Comm Node Address]

After setting the 22-COMM-C parameters, set the Operating Mode Jumper (J7) from “1x” (Single mode) to “5x” (Multi-Drive) operation, and reset the adapter or cycle power to invoke the change. Refer to Setting Operating Mode and Node Address Switches on page 2-1.

Important: The 22-COMM-C parameters can be set using a DSI peripheral (HIM, DriveExplorer with 22-SCM-232, etc.) ONLY when the Operating Mode Jumper is in the “1x” (Single mode) position.

Example Configuration Settings

Adapter Settings

- The adapter Operating Mode Jumper (J7 in Figure 2.1) is set to the "5x" (Multi-Drive) position.
- The 22-COMM-C adapter parameters are set as follows:

Parameter	Value	Description
12 - [DSI I/O Cfg]	4	"Drives 0-4" (5 drives on 1 node)
14 - [Drv 0 Addr] (1)	1	Address of Drive 0
15 - [Drv 1 Addr] (1)	2	Address of Drive 1
16 - [Drv 2 Addr] (1)	3	Address of Drive 2
17 - [Drv 3 Addr] (1)	4	Address of Drive 3
18 - [Drv 4 Addr] (1)	5	Address of Drive 4

(1) The settings for these parameters must match the parameter A104 - [Comm Node Addr] settings in the respective drives.

Drive Settings

Parameters for the five drives are set as follows:

Parameter	Value				
	Drive 0	**Drive 1**	**Drive 2**	**Drive 3**	**Drive 4**
P36 - [Start Source]	5	5	5	5	5
P38 - [Speed Reference]	5	5	5	5	5
A103 - [Comm Data Rate] (1)	4	4	4	4	4
A104 - [Comm Node Addr] (1)(2)	1	2	3	4	5
A105 - [Comm Loss Action]	0	0	0	0	0
A106 - [Comm Loss Time]	5	5	5	5	5
A107 - [Comm Format] (1)	0	0	0	0	0

(1) The drive must be reset for a change to this parameter to take effect.

(2) The settings for these parameters must match the respective parameter settings in the adapter (**Parameter 14 - [Drv 0 Addr]** through **Parameter 18 - [Drv 4 Addr]**).

ControlLogix I/O Example

This example ladder logic program demonstrates using Multi-Drive mode with five drives. See Figure 7.2 or Figure 7.3 for a system layout diagram.

Function of the Example Program

This example program enables you to:

- View status information from the drives such as Ready, Faulted, At Speed, and Feedback.
- Control the drives using various Logic Command bits (Stop, Start, etc.) and Reference.
- Perform a single parameter read of drive parameter d003 - [Output Current] and a single parameter write to drive parameter P039 - [Accel Time 1].

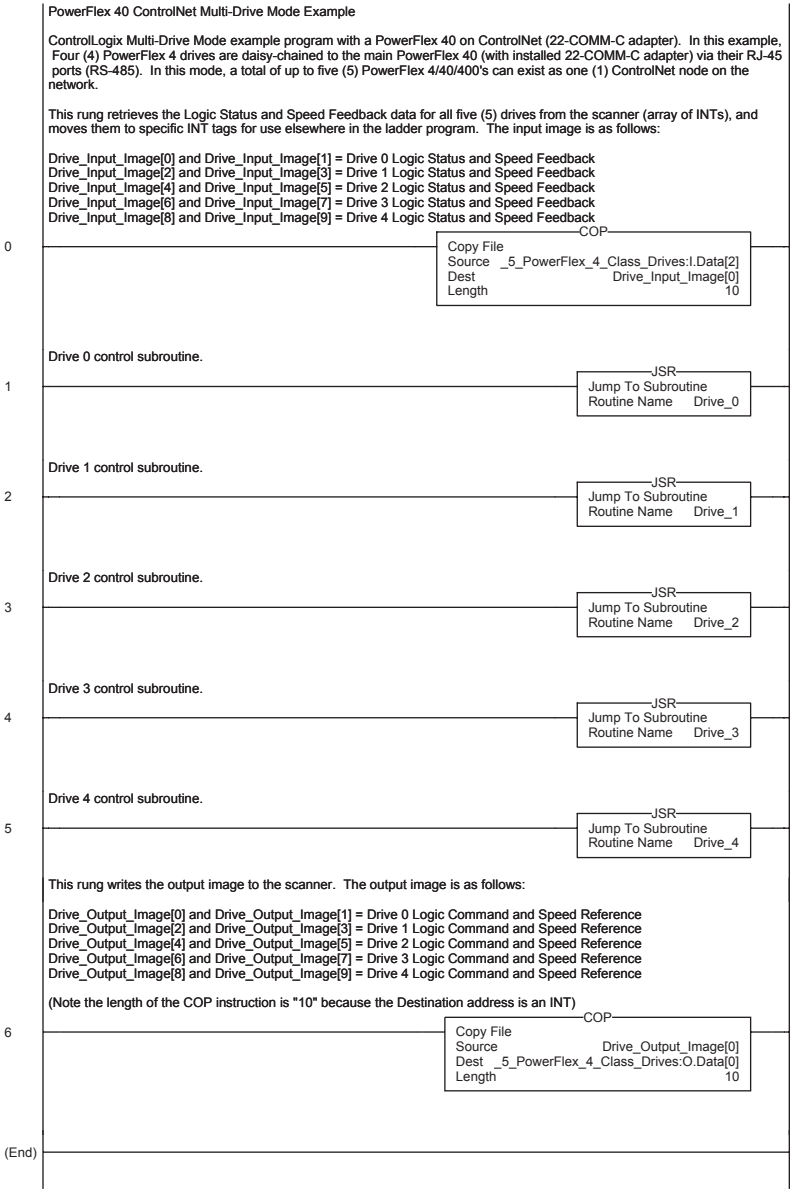
Main Routine

The Main Routine reads the network Input Image from the scanner, initiates Drive 0 through Drive 4 control subroutines, and writes the network Output Image to the scanner. See Figure 7.9. The Generic Controller Module is configured for an Input Size of 12 words and an Output Size of 10 words. For additional information about I/O connection sizes, see Table 4.A.

The following controller tags are used:

Tag Name	Type	Description
Drive_Input_Image	INT [10]	Input Image Table
Drive_Output_Image	INT [10]	Output Image Table

Figure 7.9 ControlLogix Main Routine



Drive 0 - Drive 4 Control Subroutines

The following Drive Control subroutines provide status information (Logic Status and Feedback), control (Logic Command and Reference), and parameter read/write for each of the respective drives:

Control Subroutine	Refer to...
Drive 0	Figure 7.10
Drive 1	Figure 7.11
Drive 2	Figure 7.12
Drive 3	Figure 7.13
Drive 4	Figure 7.14

The following program tags are used for the Drive 0 Control Subroutine:

Tag Name	Type	Description
Drive_0_Status_Ready	BOOL	Drive 0 ready bit
Drive_0_Status_Active	BOOL	Drive 0 active bit
Drive_0_Status_Forward	BOOL	Drive 0 forward bit
Drive_0_Status_Reverse	BOOL	Drive 0 reverse bit
Drive_0_Status_Faulted	BOOL	Drive 0 faulted bit
Drive_0_Status_At_Speed	BOOL	Drive 0 at speed bit
Drive_0_Speed_Feedback	INT	Drive 0 speed feedback word
Drive_0_Command_Stop	BOOL	Drive 0 stop bit
Drive_0_Command_Start	BOOL	Drive 0 start bit
Drive_0_Command_Jog	BOOL	Drive 0 jog bit
Drive_0_Command_Clear_Faults	BOOL	Drive 0 clear faults bit
Drive_0_Command_Forward_Reverse	BOOL	Drive 0 forward/reverse bit
Drive_0_Speed_Reference	INT	Drive 0 speed reference word
Drive_0_Parameter_Read_Message	MESSAGE	Get_Attribute_Single (Read)
Drive_0_Parameter_Write_Message	MESSAGE	Set_Atrribute_Single (Write)

Drive 1 through Drive 4 program tags are identical except for the naming convention. For example, “Drive_0_Status_Ready” for Drive 0 would be “Drive_1_Status_Ready” for Drive 1.

Figure 7.10 ControlLogix Drive 0 Control Subroutine

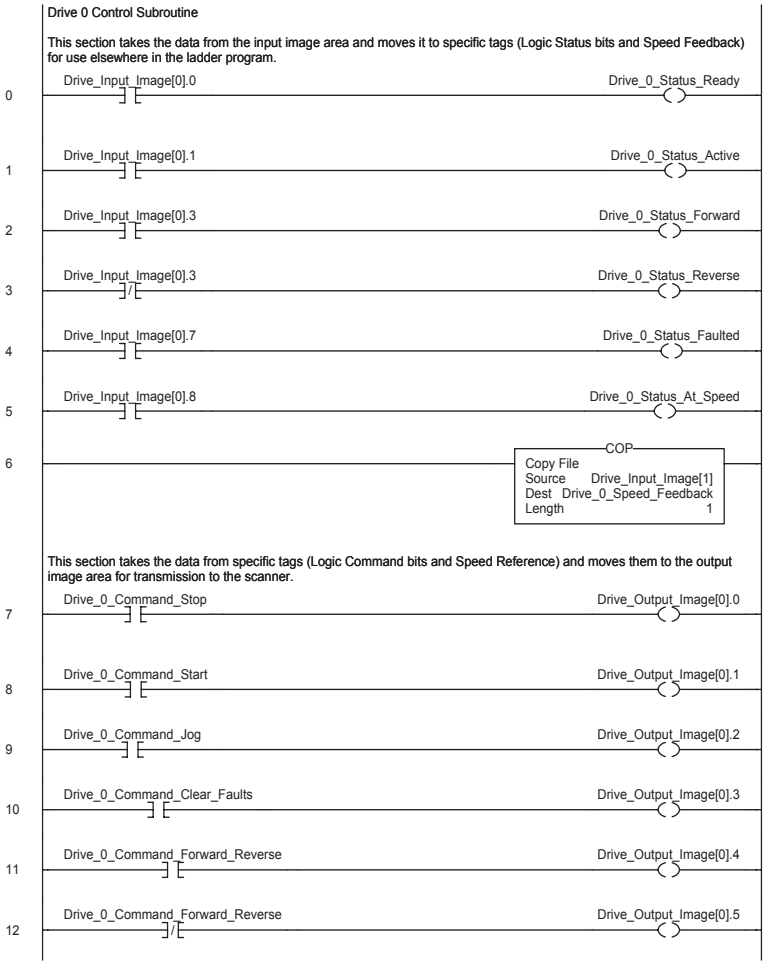


Figure 7.10 ControlLogix Drive 0 Control Subroutine (Continued)

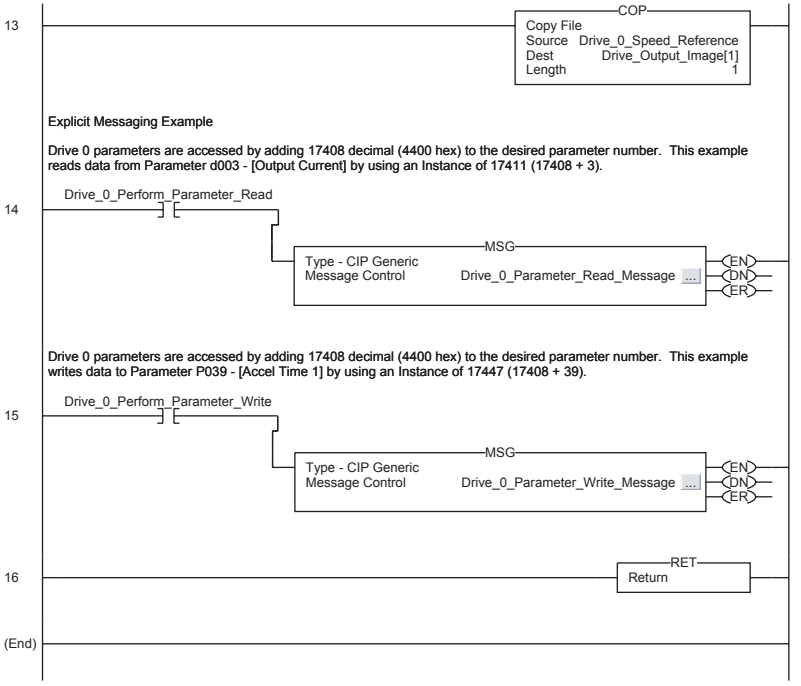


Figure 7.11 ControlLogix Drive 1 Control Subroutine

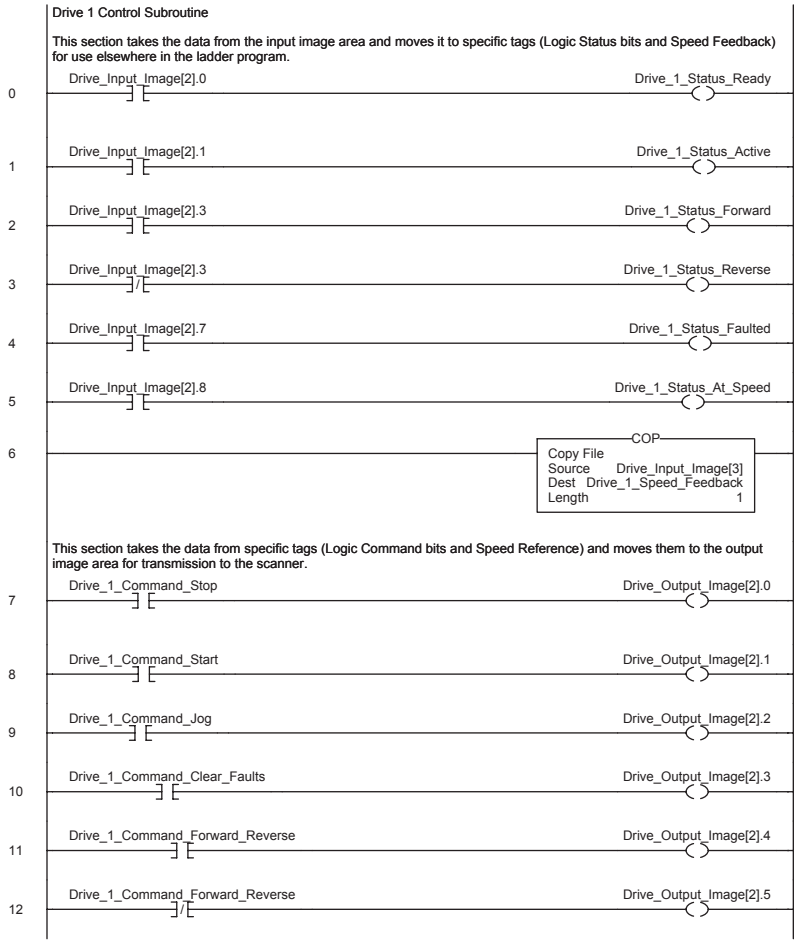


Figure 7.11 ControlLogix Drive 1 Control Subroutine (Continued)

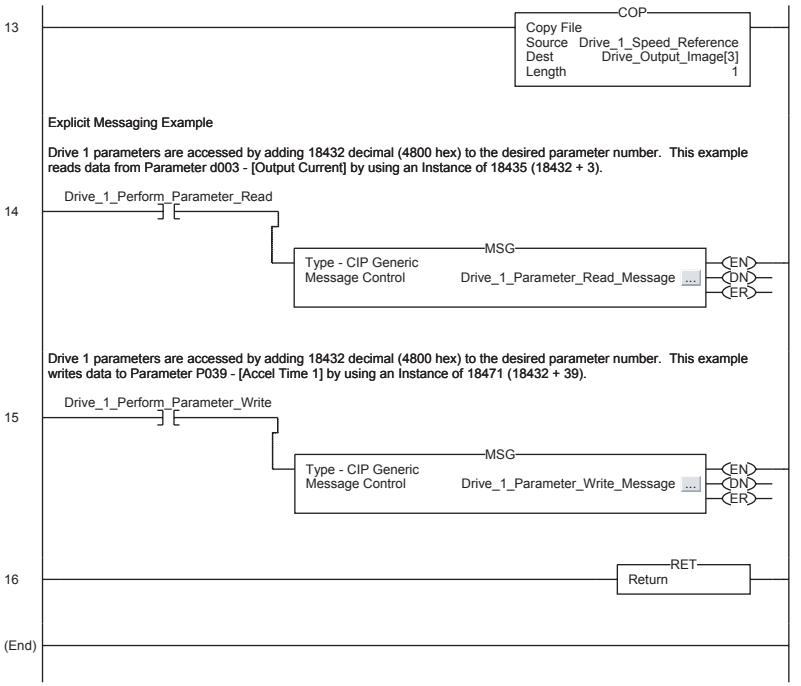


Figure 7.12 ControlLogix Drive 2 Control Subroutine

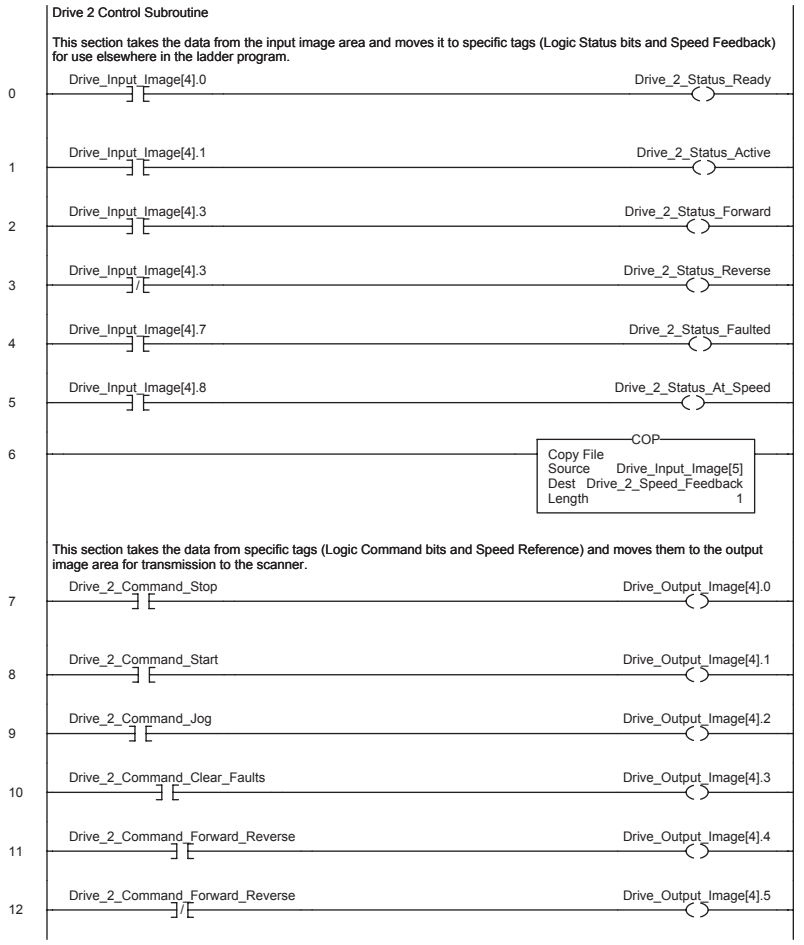


Figure 7.12 ControlLogix Drive 2 Control Subroutine (Continued)

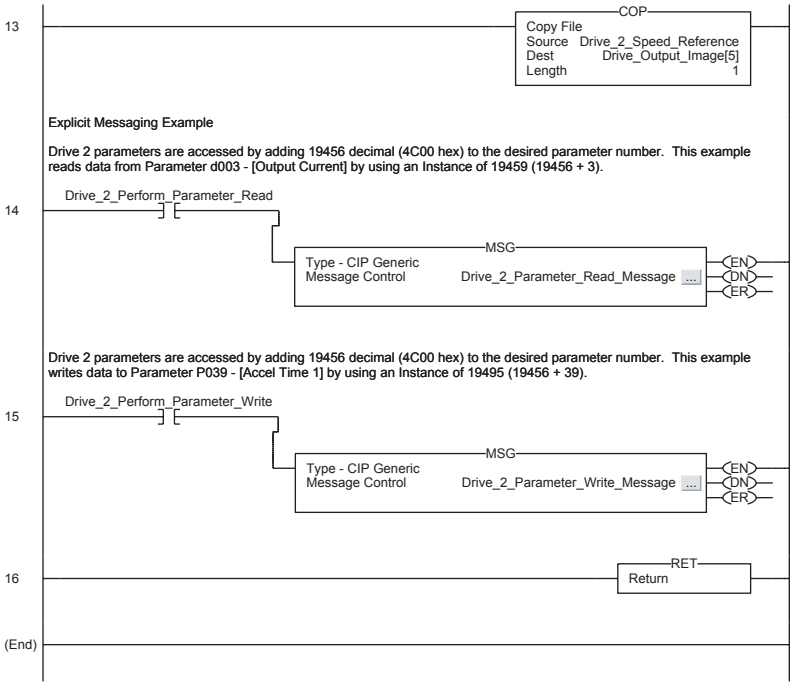


Figure 7.13 ControlLogix Drive 3 Control Subroutine

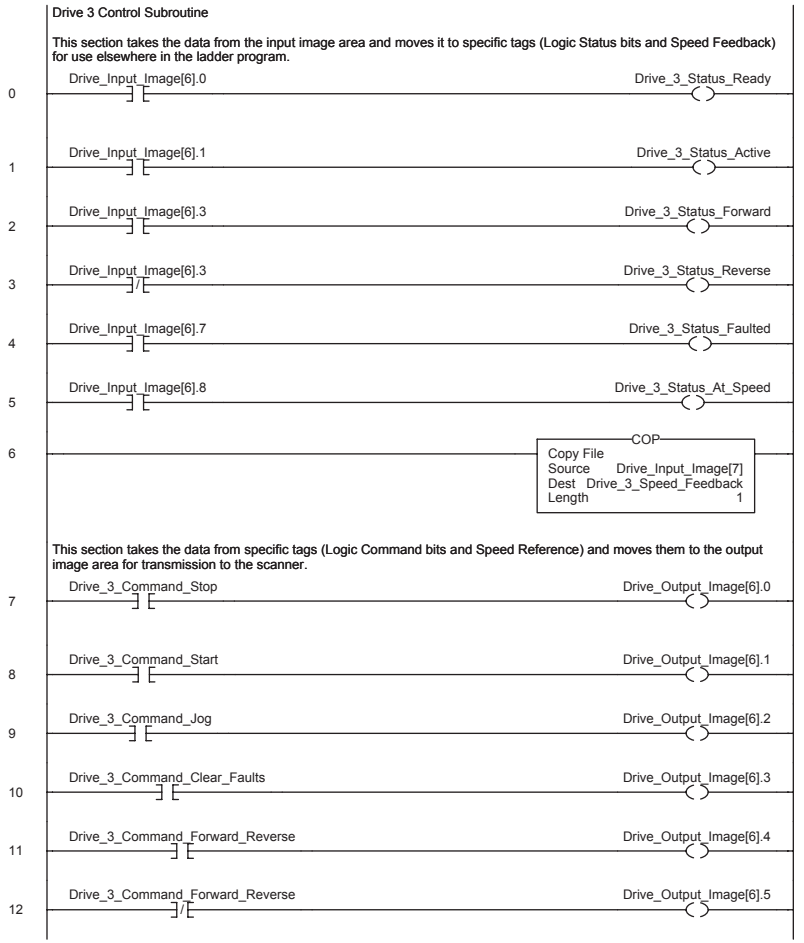


Figure 7.13 ControlLogix Drive 3 Control Subroutine (Continued)

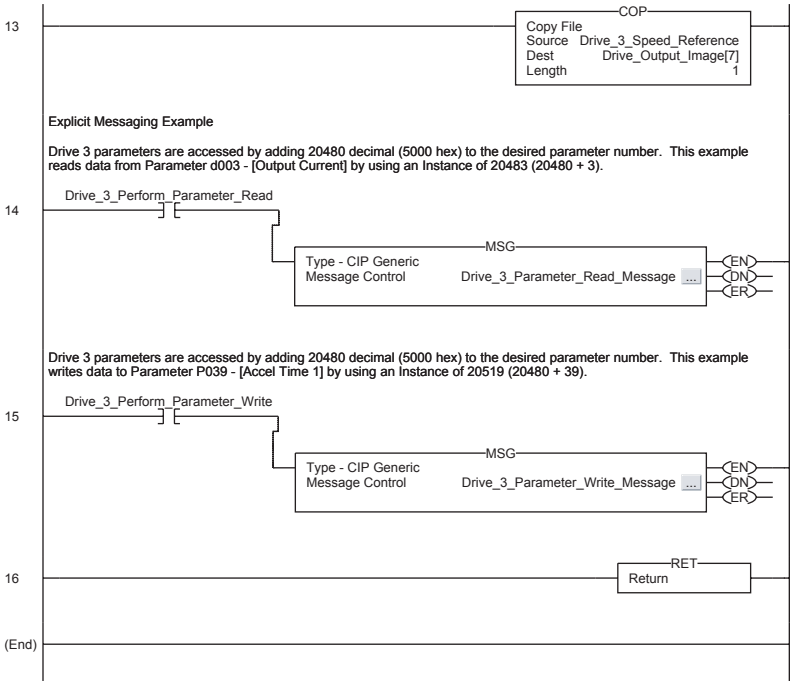


Figure 7.14 ControlLogix Drive 4 Control Subroutine

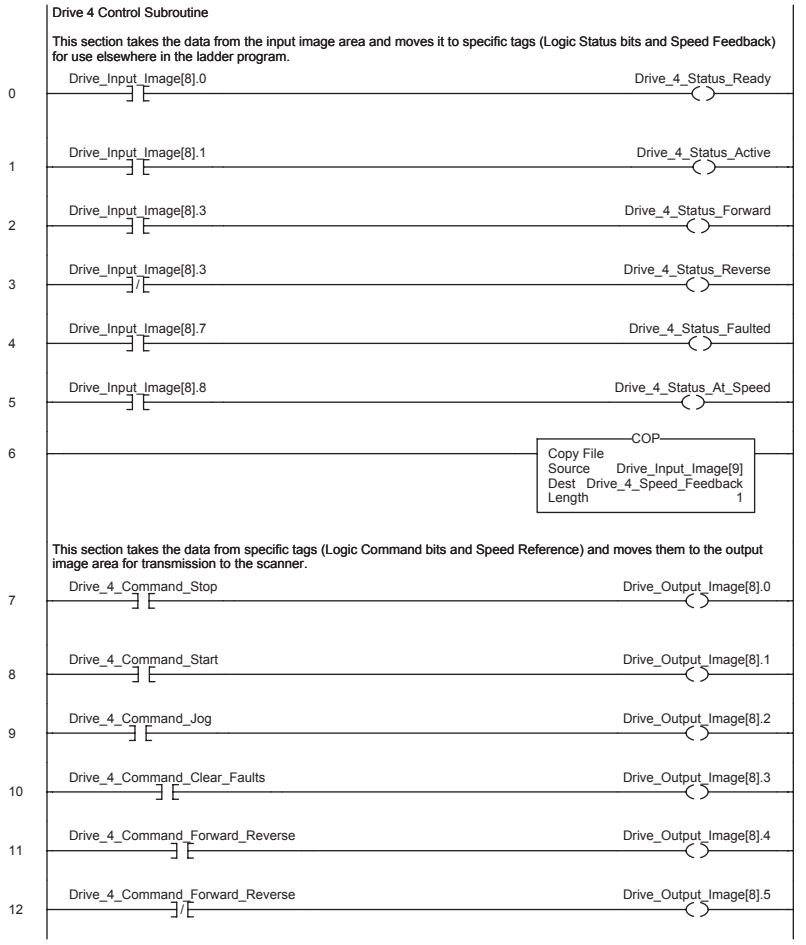
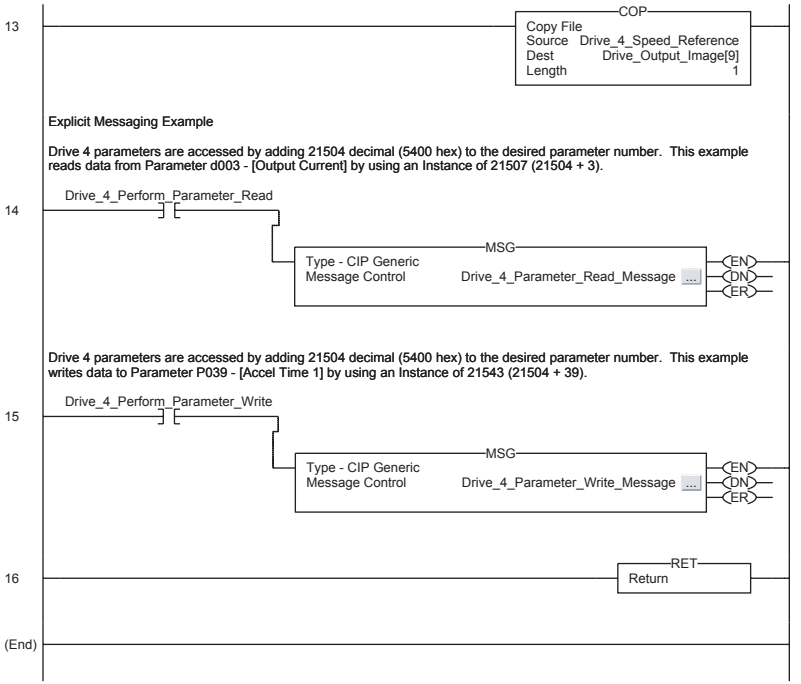


Figure 7.14 ControlLogix Drive 4 Control Subroutine (Continued)



ControlLogix Explicit Messaging

Parameter addressing for Explicit messaging is different in Multi-Drive than with Single mode. In Single mode, the Instance value in the message equals the desired parameter number in the drive. In Multi-Drive mode, an Instance table is used to account for the parameters in the adapter and up to 5 drives. The parameters in the adapter and each of the drives are offset by 400 hex (1024 decimal):

Instance (Hex.)	(Dec.)	Device	Parameter
4000 - 43FF	16384 - 17407	22-COMM-C	0 - 1023
4400 - 47FF	17408 - 18431	Drive 0	0 - 1023
4800 - 4BFF	18432 - 19455	Drive 1	0 - 1023
4C00 - 4FFF	19456 - 20479	Drive 2	0 - 1023
5000 - 53FF	20480 - 21503	Drive 3	0 - 1023
5400 - 57FF	21504 - 22527	Drive 4	0 - 1023

Explicit messages for Drive 0 through Drive 4 are identical except for the Instance values. The following PowerFlex 4-Class drive parameters used for the explicit message example in this section show the different Instance values required for each drive:

Parameter d003 - [Output Current]

Drive 0 Instance = 17411 (17408 + 3)
Drive 1 Instance = 18435 (18432 + 3)
Drive 2 Instance = 19459 (19456 + 3)
Drive 3 Instance = 20483 (20480 + 3)
Drive 4 Instance = 21507 (21504 + 3)

Parameter P039 - [Accel Time 1]

Drive 0 Instance = 17447 (17408 + 39)
Drive 1 Instance = 18471 (18432 + 39)
Drive 2 Instance = 19495 (19456 + 39)
Drive 3 Instance = 20519 (20480 + 39)
Drive 4 Instance = 21543 (21504 + 39)

Drive 0 Explicit Message Example

The Explicit message examples in the ControlLogix example program (Figure 7.10) perform a read (Get_Attribute_Single) of parameter d003 - [Output Current] and a write (Set_Attribute_Single) to parameter P039 - [Accel Time 1] for PowerFlex 4-Class drives. The configuration for the read is shown in Figure 7.15 and the write is shown in Figure 7.16.

Figure 7.15 ControlLogix Parameter Read Message Configuration

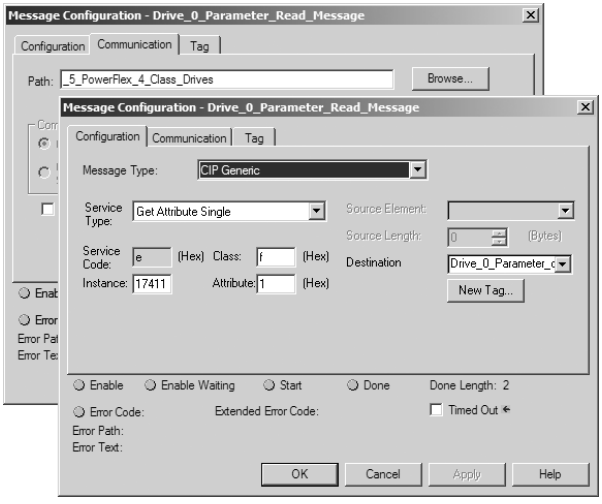
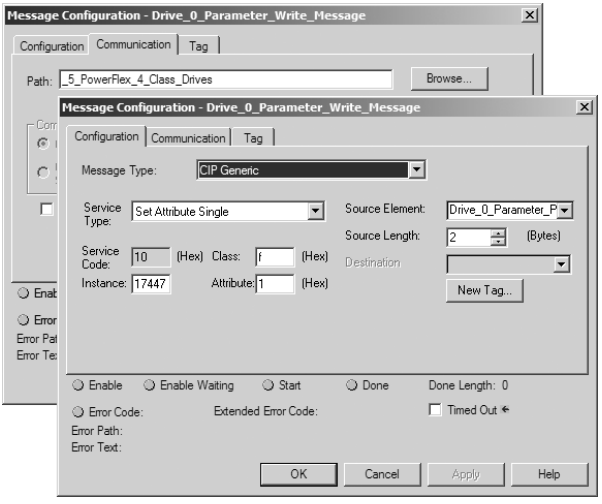


Figure 7.16 ControlLogix Parameter Write Message Configuration



The Class Code is “ f ” for the CIP Parameter Object and the Attribute is “1” to select the parameter value. See Appendix C, Parameter Object for more information. The Instance value is “17411” to access parameter d003 - [Output Current] and “17447” to access parameter P039 - [Accel Time 1].

PLC-5 I/O Example

Important: Due to PLC-5 controller limitations, explicit messaging cannot be performed in Multi-Drive mode.

This example ladder logic program demonstrates using Multi-Drive mode with five drives. See Figure 7.2 or Figure 7.3 for a system layout diagram.

Function of the Example Program

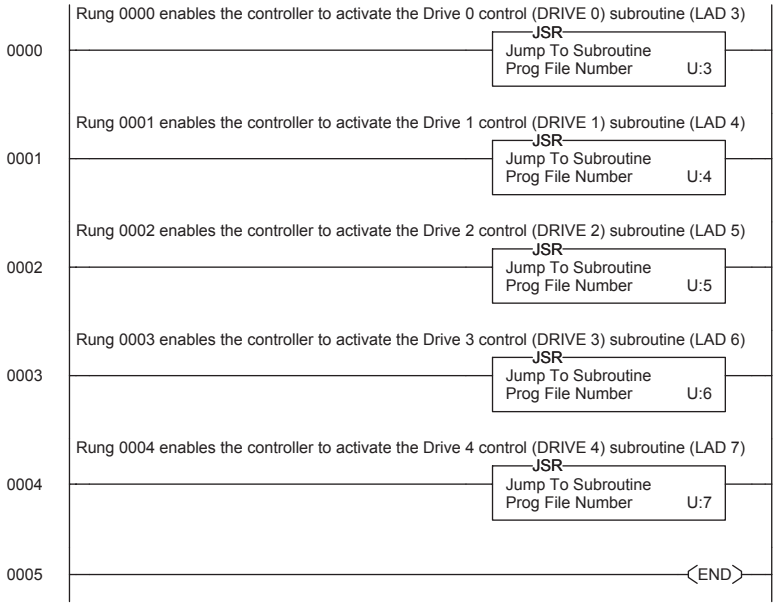
This example program enables you to:

- View status information from the drives such as Ready, Faulted, At Speed, and Feedback.
- Control the drives using various Logic Command bits (Stop, Start, etc.) and Reference.

Main Routine

The Main Routine reads the network Input Image from the scanner, initiates Drive 0 through Drive 4 control subroutines (U:3 through U:7 files), and writes the network Output Image to the scanner. See Figure 7.17.

Figure 7.17 PLC-5 Main Routine



Drive 0 - Drive 4 Control Subroutines

The following Drive Control Subroutines provide status information (Logic Status and Feedback) and control (Logic Command and Reference) for each of the respective drives:

Control Subroutine	Refer to...
Drive 0	Figure 7.18
Drive 1	Figure 7.19
Drive 2	Figure 7.20
Drive 3	Figure 7.21
Drive 4	Figure 7.22

Figure 7.18 PLC-5 Drive 0 Control Subroutine (U:3)

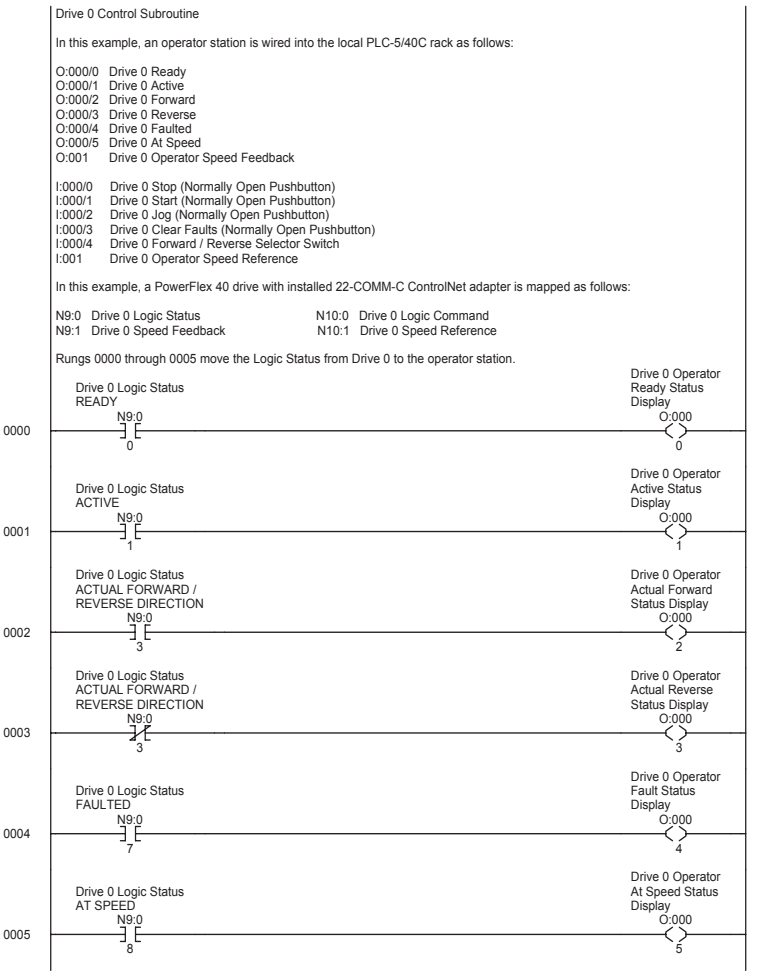


Figure 7.18 PLC-5 Drive 0 Control Subroutine (U:3) (Continued)

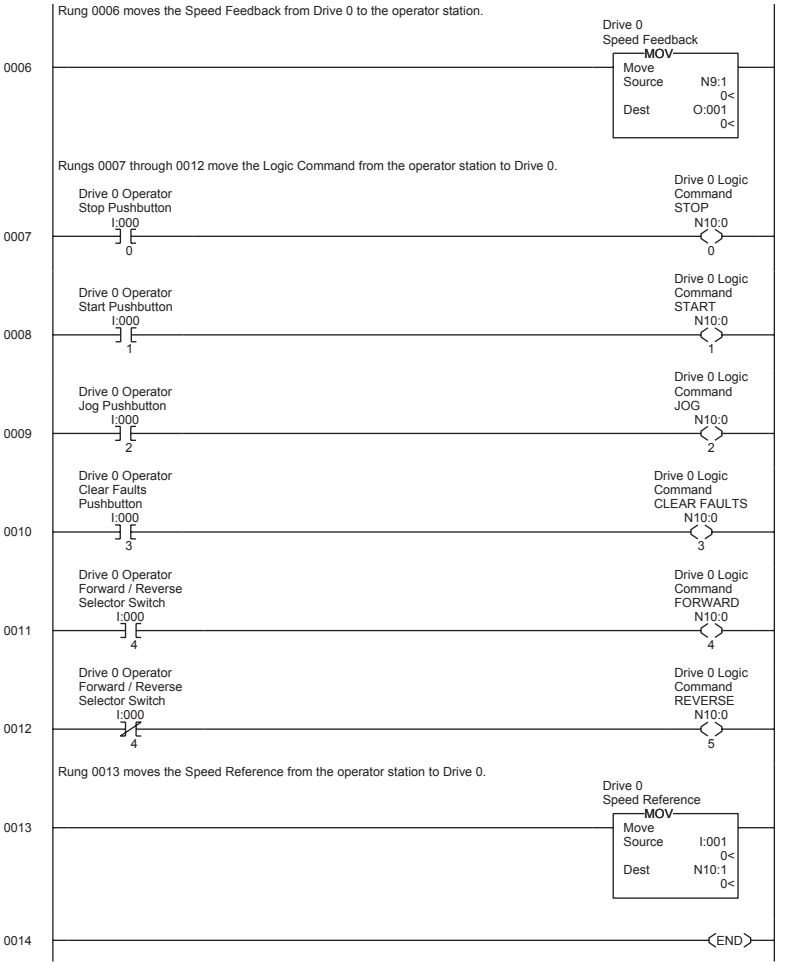


Figure 7.19 PLC-5 Drive 1 Control Subroutine (U:4)

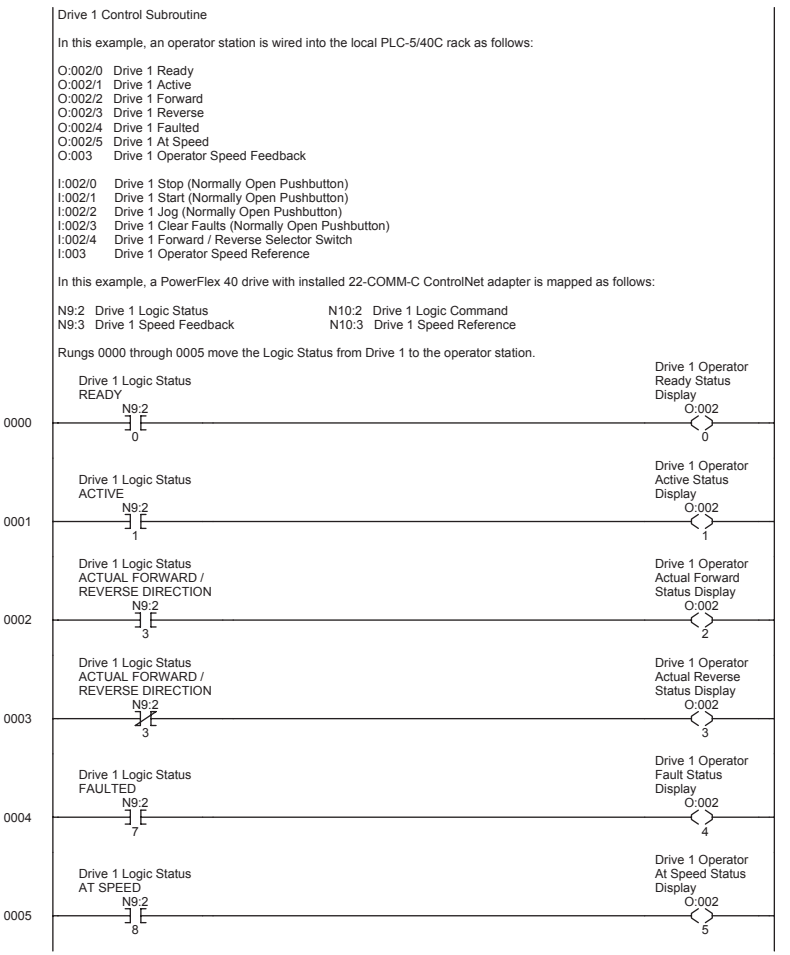


Figure 7.19 PLC-5 Drive 1 Control Subroutine (U:4) (Continued)

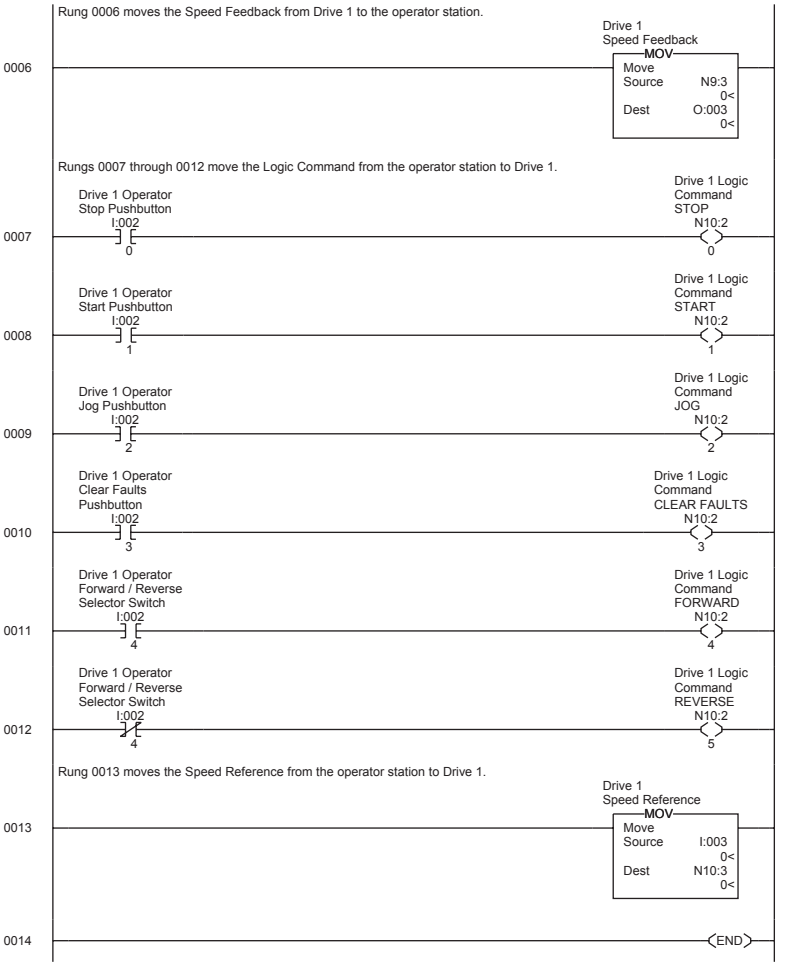


Figure 7.20 PLC-5 Drive 2 Control Subroutine (U:5)

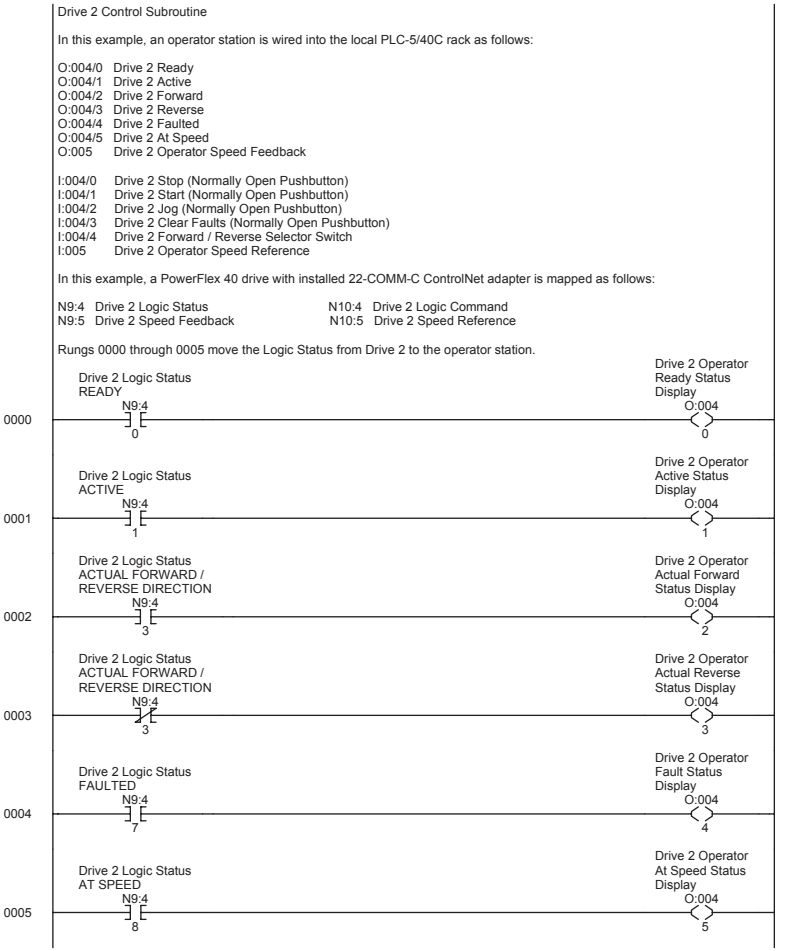


Figure 7.20 PLC-5 Drive 2 Control Subroutine (U:5) (Continued)

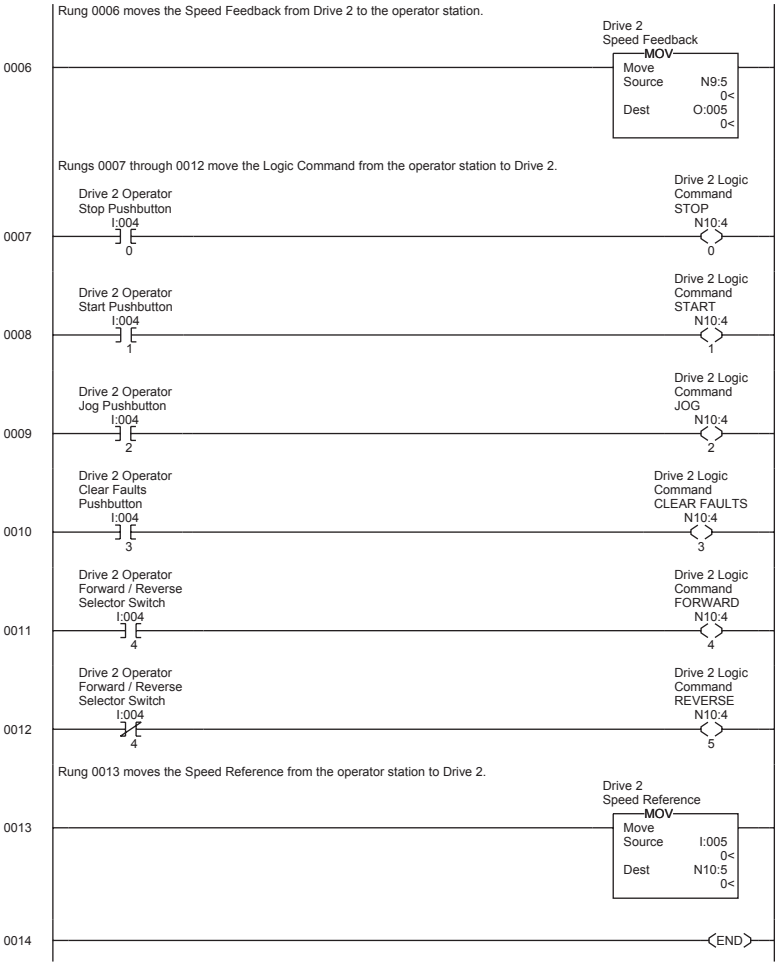


Figure 7.21 PLC-5 Drive 3 Control Subroutine (U:6)

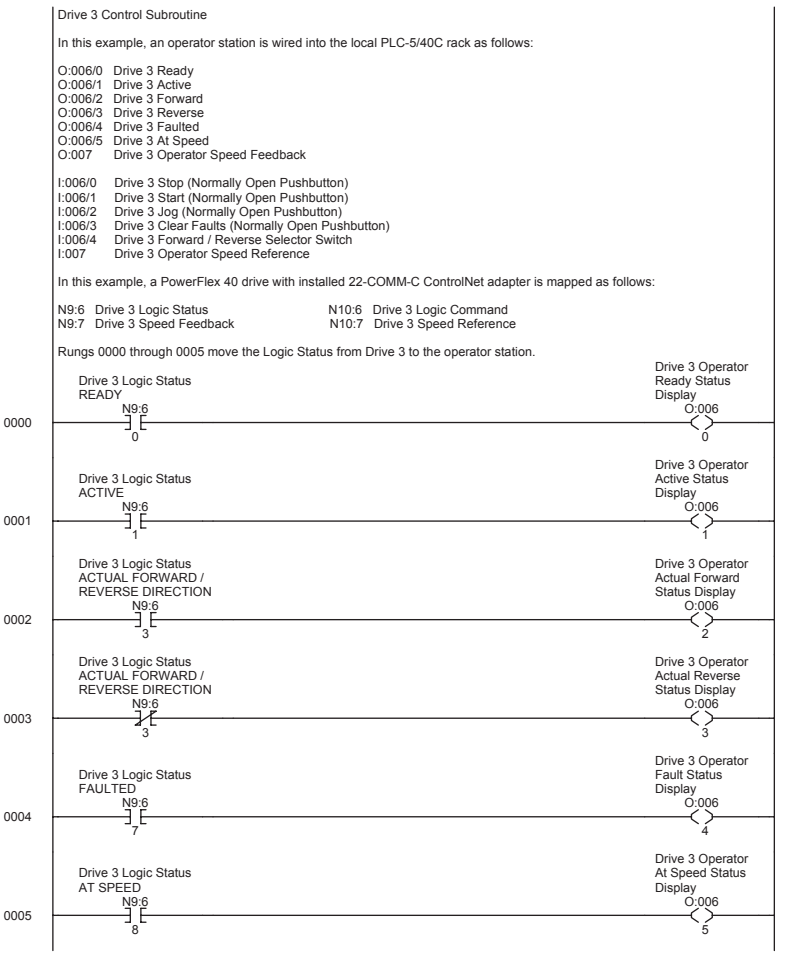


Figure 7.21 PLC-5 Drive 3 Control Subroutine (U:6) (Continued)

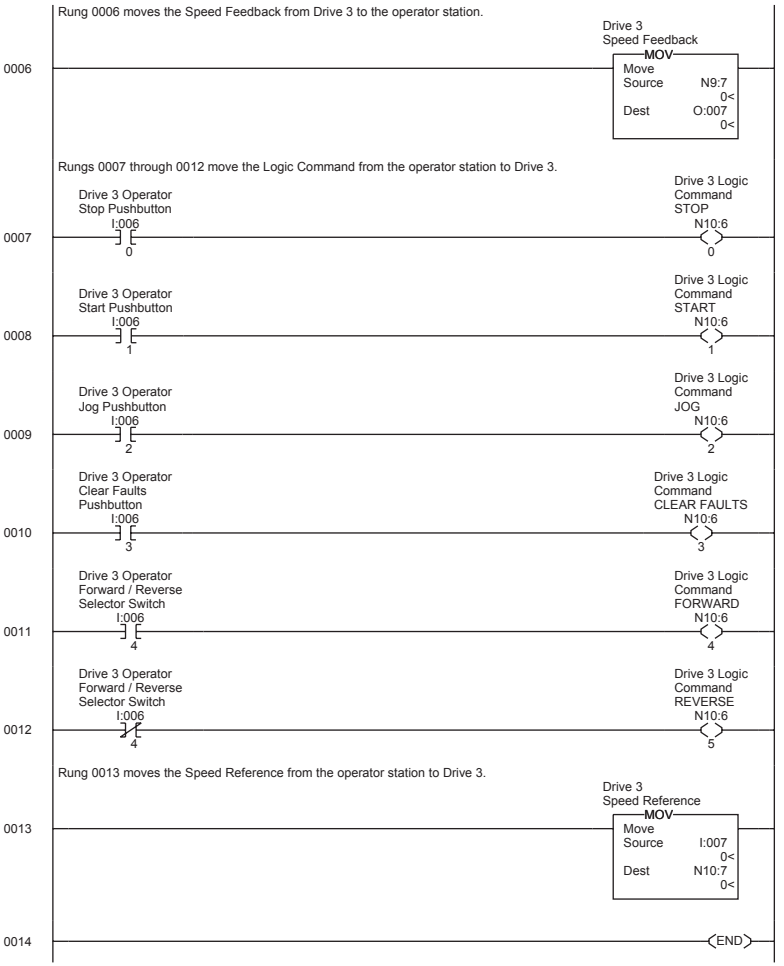


Figure 7.22 PLC-5 Drive 4 Control Subroutine (U:7)

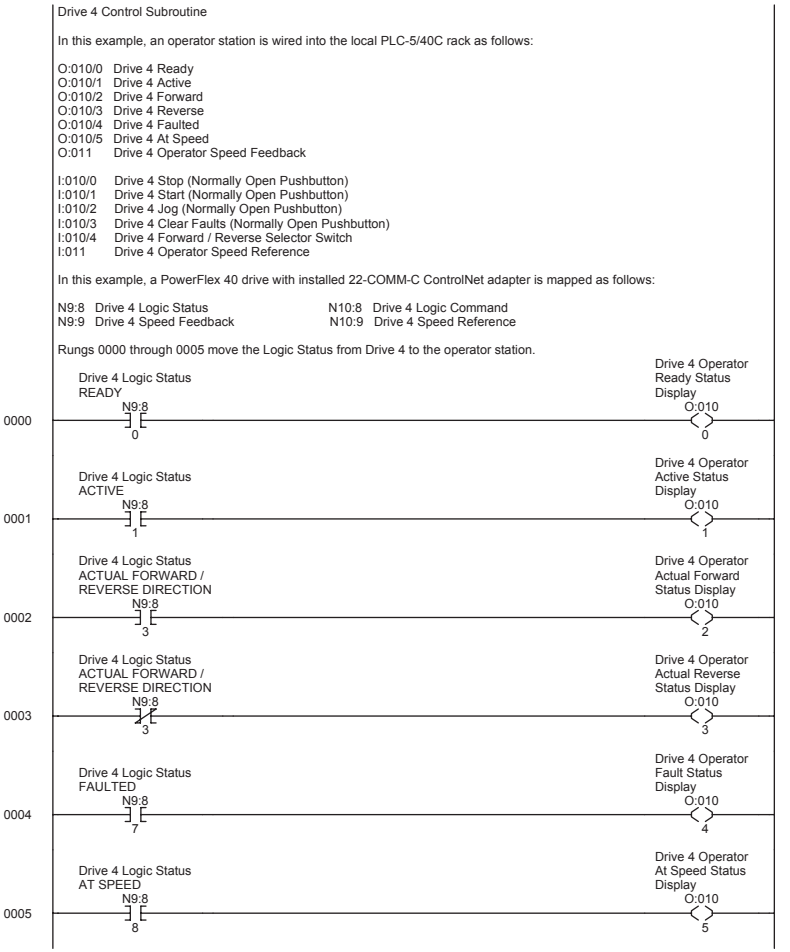
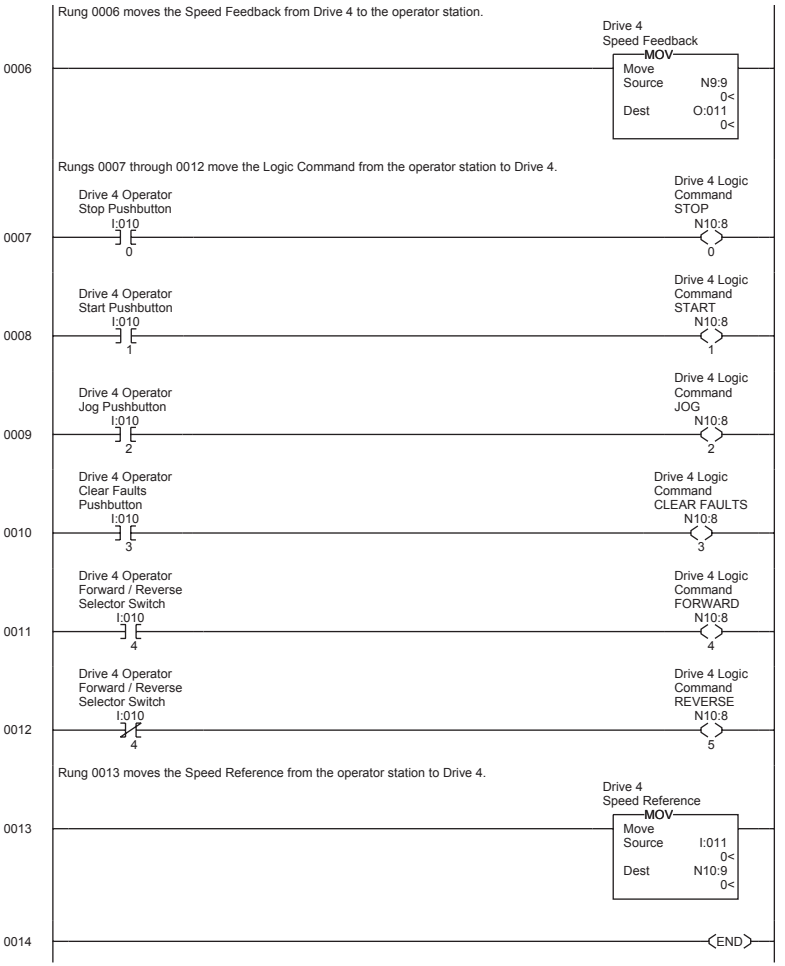


Figure 7.22 PLC-5 Drive 4 Control Subroutine (U:7) (Continued)



Additional Information

- When the adapter — mounted in a PowerFlex 40/400 drive (Drive 0) or a DSI External Comms Kit — is powered up, all configured daisy-chained drives must be present before an I/O connection is allowed on the network (i.e., before the drives can be controlled).

- When the PowerFlex 40/400 drive with the internal-mounted adapter (Drive 0) is powered down, communications with the daisy-chained drives is disrupted and the drives will take their respective Comm Loss Actions. When the adapter is used in a DSI External Comms Kit (22-XCOMM-DC-BASE), communications will not be disrupted when a daisy-chained drive is powered down.

- When any of the daisy-chained drives are powered down, the respective Input Image (Logic Status and Feedback) sent to the scanner will be zeros, and the PORT and MOD LEDs on the adapter will alternately flash red. The I/O connection will not be dropped until the last drive is disconnected or powered down.

  Important: Status information from the scanner will not indicate there is a fault at the node, and the I/O connection will not be dropped. If your application requires an action to be taken when DSI communication is lost with one or more drives, monitor adapter **Parameter 13 - [DSI I/O Act]** to verify that the adapter is communicating with all connected drives.

Troubleshooting

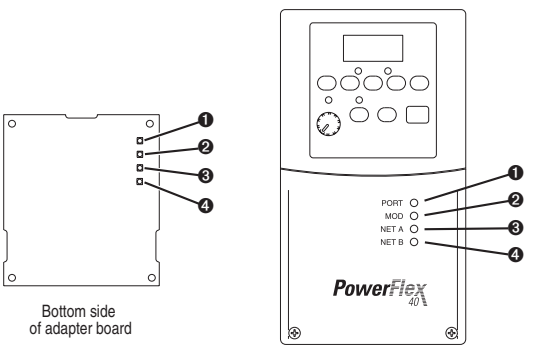
Chapter 8 provides information for troubleshooting potential problems with the adapter.

Topic	Page
Locating the Status Indicators	8-1
PORT Status Indicator	8-2
MOD Status Indicator	8-3
Net A and B Status Indicators Together	8-4
Net A or B Status Indicators Independently	8-4
Adapter Diagnostic Items in Single Mode	8-5
Adapter Diagnostic Items in Multi-Drive Mode	8-6
Viewing and Clearing Events	8-7

Locating the Status Indicators

The adapter has four status indicators. They can be viewed on the adapter or through the drive cover. See Figure 8.1.

Figure 8.1 Status Indicators *(location on drive may vary)*



Item	Status Indicator	Description	Page
❶	PORT	DSI Connection Status	8-2
❷	MOD	Adapter Status	8-3
❸	NET A	ControlNet A Status	8-4
❹	NET B	ControlNet B Status	8-4

PORT Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	In Single mode, the adapter is not receiving communication from the drive. In Multi-Drive mode, the adapter is not receiving communication from a drive, or a drive is not an Allen-Bradley drive.	• Verify that the Operating Mode Jumper (J7 in Figure 2.1) is in the position corresponding to the mode in which the adapter is being used. • Verify the setting for **Parameter 12 - [DSI I/O Cfg]**. • Verify that cables are securely connected and not damaged. Replace cables if necessary. • Cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • Use Allen-Bradley PowerFlex 4/40/400 drives.
Flashing Green	The adapter is establishing communications with the drive.	No action required. This status indicator will turn solid green or flashing red.
Solid Green	The adapter is properly connected and is communicating with the drive.	No action required.
Orange	The drive is not an Allen-Bradley drive.	Use an Allen-Bradley PowerFlex 4/40/400 drive.

MOD Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	The adapter has failed the firmware test.	• Cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • If cycling power does not correct the problem, the adapter parameter settings may have been corrupted. Reset defaults and reconfigure the adapter. • If resetting defaults does not correct the problem, flash the adapter with the latest firmware release.
Solid Red	The adapter has failed the hardware test.	• Cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Place the scanner in RUN mode. • Program the controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller.
Solid Green	The adapter is operational and transferring I/O data.	No action required.

Net A and B Status Indicators Together

Status	Cause	Corrective Actions
Both LEDs are Off.	A reset occurred or there is no power.	Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Both LEDs are steady Red.	A link interface failed.	• Check media for broken cables, loose connectors, missing terminators, etc. • Power cycle or reset the adapter. If the problem persists, contact Allen-Bradley Drives Technical Support.
LEDs are alternating Red/Green.	The adapter is in self-test mode.	No action required. The adapter will exit this mode when the self-test is completed.
LEDs are alternating Red/Off.	There is a bad node configuration.	• Verify that all node addresses are unique. • Check the adapter's configuration. • Check media for broken cables, loose connectors, missing terminators, etc. • Power cycle or reset the adapter.

Net A or B Status Indicators Independently

Status	Cause	Corrective Actions
One channel LED is steady Off.	That channel is disabled or not supported.	Program the network for redundant media, if required.
One channel LED is flashing Red/Green.	There is an invalid link configuration for that channel.	• Power cycle or reset the adapter. • Reset the controller. • If the problem persists, contact Allen-Bradley Drives Technical Support.
One channel LED is flashing Red/Off.	The channel is not receiving network activity.	Check media for broken cables, loose connectors, missing terminators, etc.
One channel LED is flashing Green/Off.	A temporary channel error has occurred, or the channel is in listen-only mode.	Verify the controller is present on the network and working.
One channel LED is steady Green.	Normal operation for that channel.	No action required.

Adapter Diagnostic Items in Single Mode

The following diagnostic items can be accessed using a PowerFlex 4-Class HIM, DriveExplorer (version 3.01 or higher), or DriveExecutive (version 3.01 or higher).

No.	Name	Description
1	Reserved	—
2	Logic Cmd	The Logic Command being transmitted to the drive by the adapter.
3	Reference	The Reference being transmitted to the drive by the adapter.
4	Reserved	—
5	Logic Sts	The Logic Status being received from the drive by the adapter.
6	Feedback	The Feedback being received from the drive by the adapter.
7 – 22	Reserved	—
23	DSI Overrun Errs	The number of DSI receive overrun errors.
24	DSI Framing Errs	The number of DSI receive framing errors.
25	DSI CRC Errs	The number of DSI receive CRC errors.
26	Boot Flash Count	The number of boot firmware flash updates made to the adapter after shipping.
27	App Flash Count	The number of application firmware flash updates made to the adapter after shipping.
28	Node Address SW	The current value of the node address switches.
29	CN Packets Rcvd	A count of the number of network packets received by the adapter.
30	CN Rx Underflows	A count of the number of network receive underflow errors.
31	CN Rx Overflows	A count of the number of network receive overflow errors.
32	CN Rx Bad Frames	A count of the number of network receive bad frame errors.
33	CN Packets Sent	A count of the number of network packets transmitted by the adapter.
34	CN Tx Underflows	A count of the number of network transmit underflow errors.
35	CN Tx Overflows	A count of the number of network transmit overflow errors.
36	CN Tx Out Of Steps	A count of the number of network transmit out of step errors.
37	CN Tx Blockages	A count of the number of network transmit blockage errors.

Adapter Diagnostic Items in Multi-Drive Mode

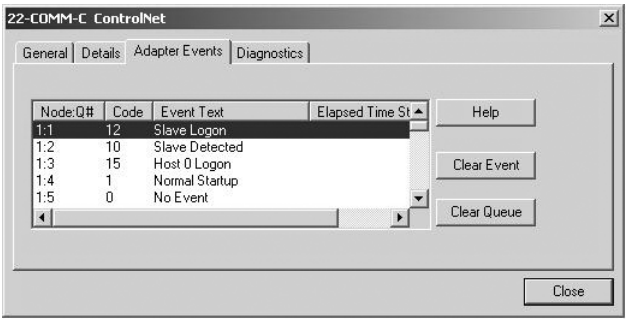
The following diagnostic items can be accessed using a PowerFlex 4-Class HIM or DriveExplorer (version 3.01 or higher).

No.	Name	Description
1	Reserved	—
2	Drv 0 Logic Cmd	The Logic Command being transmitted to drive 0 by the adapter.
3	Drv 0 Reference	The Reference being transmitted to drive 0 by the adapter.
4	Reserved	—
5	Drv 0 Logic Sts	The Logic Status being received from drive 0 by the adapter.
6	Drv 0 Feedback	The Feedback being received from drive 0 by the adapter.
7	Drv 1 Logic Cmd	The Logic Command being transmitted to drive 1 by the adapter.
8	Drv 1 Reference	The Reference being transmitted to drive 1 by the adapter.
9	Drv 1 Logic Sts	The Logic Status being received from drive 1 by the adapter.
10	Drv 1 Feedback	The Feedback being received from drive 1 by the adapter.
11	Drv 2 Logic Cmd	The Logic Command being transmitted to drive 2 by the adapter.
12	Drv 2 Reference	The Reference being transmitted to drive 2 by the adapter.
13	Drv 2 Logic Sts	The Logic Status being received from drive 2 by the adapter.
14	Drv 2 Feedback	The Feedback being received from drive 2 by the adapter.
15	Drv 3 Logic Cmd	The Logic Command being transmitted to drive 3 by the adapter.
16	Drv 3 Reference	The Reference being transmitted to drive 3 by the adapter.
17	Drv 3 Logic Sts	The Logic Status being received from drive 3 by the adapter.
18	Drv 3 Feedback	The Feedback being received from drive 3 by the adapter.
19	Drv 4 Logic Cmd	The Logic Command being transmitted to drive 4 by the adapter.
20	Drv 4 Reference	The Reference being transmitted to drive 4 by the adapter.
21	Drv 4 Logic Sts	The Logic Status being received from drive 4 by the adapter.
22	Drv 4 Feedback	The Feedback being received from drive 4 by the adapter.
23	DSI Overrun Errs	The number of DSI receive overrun errors.
24	DSI Framing Errs	The number of DSI receive framing errors.
25	DSI CRC Errs	The number of DSI receive CRC errors.
26	Boot Flash Count	The number of boot firmware flash updates made to the adapter after shipping.
27	App Flash Count	The number of application firmware flash updates made to the adapter after shipping.
28	Node Address SW	The current value of the node address switches.
29	CN Packets Rcvd	A count of the number of network packets received by the adapter.
30	CN Rx Underflows	A count of the number of network receive underflow errors.
31	CN Rx Overflows	A count of the number of network receive overflow errors.
32	CN Rx Bad Frames	A count of the number of network receive bad frame errors.
33	CN Packets Sent	A count of the number of network packets transmitted by the adapter.
34	CN Tx Underflows	A count of the number of network transmit underflow errors.
35	CN Tx Overflows	A count of the number of network transmit overflow errors.
36	CN Tx Out Of Steps	A count of the number of network transmit out of step errors.
37	CN Tx Blockages	A count of the number of network transmit blockage errors.

Viewing and Clearing Events

The adapter maintains an event queue that reports the history of its actions. You can view the event queue using a PowerFlex 4-Class HIM, DriveExplorer (version 3.01 or higher), or DriveExecutive (version 3.01 or higher).

Figure 8.2 DriveExplorer Event View/Clear Screen



Events

Many events in the event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Allen-Bradley personnel troubleshoot the problem. The following events may appear in the event queue:

Code	Event	Description
		Adapter Events
0	No Event	Text displayed in an empty event queue entry.
1	Normal Startup	Power is applied to the adapter.
2	Manual Reset	The adapter was reset from the “Reset Module” parameter.
3	Watchdog T/O Flt	The software watchdog detected a failure and reset the adapter.
4	App Updated	The application firmware has been flash updated.
5	Boot Updated	The boot firmware has been flash updated.
6	EEPROM Sum Flt	The EEPROM checksum/CRC is incorrect. The functionality of the adapter will be limited. Default parameter values must be loaded to clear the condition.
7 – 9	Reserved	—
		DSI Events
10	Slave Detected	The adapter detected that the slave has been connected.
11	Slave Removed	The adapter detected that the slave has been disconnected.
12	Slave Logon	The adapter has established communications with the slave.
13	Slave Timeout	The adapter has lost communications with the slave.
14	Slave Brand Flt	The slave brand is different than the adapter.

Code	Event	Description
15	Host 0 Logon	The adapter has established communications with Drive 0.
16	Host 1 Logon	The adapter has established communications with Drive 1.
17	Host 2 Logon	The adapter has established communications with Drive 2.
18	Host 3 Logon	The adapter has established communications with Drive 3.
19	Host 4 Logon	The adapter has established communications with Drive 4.
20	Host 0 Timeout	The adapter has lost communications with Drive 0.
21	Host 1 Timeout	The adapter has lost communications with Drive 1.
22	Host 2 Timeout	The adapter has lost communications with Drive 2.
23	Host 3 Timeout	The adapter has lost communications with Drive 3.
24	Host 4 Timeout	The adapter has lost communications with Drive 4.
25	Host 0 Brand Flt	Drive 0 is not an Allen-Bradley brand drive.
26	Host 1 Brand Flt	Drive 1 is not an Allen-Bradley brand drive.
27	Host 2 Brand Flt	Drive 2 is not an Allen-Bradley brand drive.
28	Host 3 Brand Flt	Drive 3 is not an Allen-Bradley brand drive.
29	Host 4 Brand Flt	Drive 4 is not an Allen-Bradley brand drive.
30 – 39	Reserved	—
	Network Events	
40	CN Link Up	The network link is established.
41	CN Link Down	The network link is lost.
42	Dup CN Addr	The adapter detected that another device is using its network address. In this case, the adapter will not participate in any network activity.
43	CN Open	An I/O connection from the network to the adapter was opened.
44	CN Close	An I/O connection from the network to the adapter was closed.
45	CN Timeout	An I/O connection from the network to the adapter has timed out.
46	CN Comm Flt	The adapter has performed the “Comm Flt” action specified by the user.
47	CN Idle Flt	The adapter has performed the “Idle Flt” action specified by the user.
48	PCCC IO Open	The adapter has begun receiving PCCC Control messages (the PCCC Control Timeout was previously set to a non-zero value).
49	PCCC IO Close	The device sending PCCC Control messages to the adapter has set the PCCC Control Timeout to a value of zero.
50	PCCC IO Time Flt	The adapter has not received a PCCC Control message for longer than the PCCC Control Timeout.
51	CN Sent Reset	The adapter received a reset from the network.
52	Msg Ctrl Open	The adapter has begun receiving Client-Server Control messages (the Client-Server Control Timeout was previously set to a non-zero value).
53	Msg Ctrl Close	The device sending Client-Server Control messages to the adapter has set the Client-Server Control Timeout to a value of zero.
54	Msg Ctrl Timeout	The adapter has not received a Client-Server Control message for longer than the established timeout period.

Specifications

Appendix A presents the specifications for the adapter.

Topic	Page
Communications	A-1
Electrical	A-1
Mechanical	A-1
Environmental	A-2
Regulatory Compliance	A-2

Communications

Network	
Protocol	ControlNet
Data Rate	5M baud
Media	Coax with BNC connector
Drive	
Protocol	DSI
Data Rate	19.2 kbps

Electrical

Consumption	
Drive	275 mA at 5 VDC, supplied through the drive or DSI External Comms Kit
Network	None

Mechanical

Dimensions	
Height	19 mm (0.75 inches)
Length	86 mm (3.39 inches)
Width	78.5 mm (3.09 inches)
Weight	85g (3 oz.)

Environmental

Temperature Operating Storage	 -10 to 50°C (14 to 122°F) -40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% non-condensing
Atmosphere	**Important:** Adapter **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the adapter is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

Certification	Specification
UL	UL508C
cUL	CAN / CSA C22.2 No. 14-M91
CE	EN50178 and EN61800-3
CTick	AS / NZS 2064, Group 1, Class A

NOTE: This is a product of category C3 according to IEC 61800-3. This product is not intended for use in a domestic environment.

Adapter Parameters

Appendix B provides information about the ControlNet adapter parameters.

Topic	Page
About Parameter Numbers	B-1
Parameter List	B-1

About Parameter Numbers

The parameters in the adapter are numbered consecutively. However, depending on which configuration tool you use, they may have different numbers.

Configuration Tool	Numbering Scheme
• DriveExplorer • DriveExecutive • HIM	The adapter parameters begin with parameter 1. For example, **Parameter 01 - [Mode]** is parameter 1 as indicated by this manual.
• Explicit Messaging • RSNetWorx for ControlNet	Refer to Chapter 6, Using Explicit Messaging, and Appendix C, ControlNet Objects for details.

Parameter List

Parameter No.	Name and Description	Details	
01	**[Mode]** Displays the Single or Multi-Drive operating mode selected with the Operating Mode Jumper (J7) on the adapter.	Default: Values: Type:	0 = Single Drv 0 = Single Drv 1 = Multiple Drv Read Only
02	**[CN Addr Cfg]** Sets the ControlNet node address if the Node Address Switches are set to “00.” (Updates **Parameter 03 - [CN Addr Act]** after a reset.)	Default: Minimum: Maximum: Type: Reset Required:	2 1 99 Read/Write Yes
03	**[CN Addr Act]** Displays the ControlNet node address actually used by the adapter.	Default: Minimum: Maximum: Type:	2 1 99 Read Only

Parameter No.	Name and Description	Details	
04	**[CN Rate Cfg]** Sets the ControlNet data rate (megabits per second) at which the adapter communicates. (Updates **Parameter 05 - [CN Rate Act]** after a reset.)	Default: Values: Type: Reset Required:	0 = 5 Mbps 0 = 5 Mbps Read/Write Yes
05	**[CN Rate Act]** Displays the ControlNet data rate (megabits per second) actually used by the adapter.	Default: Values: Type:	0 = 5 Mbps 0 = 5 Mbps Read Only
06	**[CN Active Cfg]** Displays the source from which the adapter node address is taken. This will either be switches or **Parameter 02 - [CN Addr Cfg]** in EEPROM. It is determined by the settings of the Node Address Switches on the adapter. If the Node Address Switches = "00" on power up, then **Parameter 02 - [CN Addr Cfg]** is used to configure the adapter's ControlNet address.	Default: Values: Type:	0 = Switches 0 = Switches 1 = EEPROM Read Only
07	**[Reset Module]** No action if set to "Ready." Resets the adapter if set to "Reset Module." Restores the adapter to its factory default settings if set to "Set Defaults." This parameter is a command. It will be reset to "0 = Ready" after the command has been performed.	Default: Values Type: Reset Required:	0 = Ready 0 = Ready 1 = Reset Module 2 = Set Defaults Read/Write No
	 **ATTENTION:** Risk of injury or equipment damage exists. If the adapter is transmitting I/O that controls the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.		
08	**[Comm Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that network communications have been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	 **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 08 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).		

Parameter No.	Name and Description	Details	
09	**[Idle Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that the controller is in program mode. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 09 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive when the controller is in program mode. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).		
10	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • **Parameter 08 - [Comm Flt Action]** is set to "Send Flt Cfg" and communications are disrupted. • **Parameter 09 - [Idle Flt Action]** is set to "Send Flt Cfg" and the controller is in program mode. The bit definitions will depend on the product to which the adapter is connected. See Appendix D or the documentation for the drive being used.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 Read/Write No
11	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • **Parameter 08 - [Comm Flt Action]** is set to "Send Flt Cfg" and communications are disrupted. • **Parameter 09 - [Idle Flt Action]** is set to "Send Flt Cfg" and the controller is in program mode.	Default: Minimum: Maximum: Type: Reset Required:	0 0 65535 Read/Write No
12	**[DSI I/O Cfg]** Sets the configuration of the drives that are active in the Multi-Drive mode. Identifies the DSI connections that would be attempted on a reset or power cycle.	Default: Values: Type: Reset Required:	0 0 = Drive 0 1 = Drives 0-1 2 = Drives 0-2 3 = Drives 0-3 4 = Drives 0-4 Read/Write Yes

<table>
<tr><th colspan="2">Parameter
No. Name and Description</th><th>Details</th></tr>
<tr><td>13</td><td>[DSI I/O Act]
Displays the drives that are active in the Multi-Drive mode.</td><td>Default: xxx0 0000
Bit Values: 0 = Drive Active
1 = Drive Inactive
Type: Read Only

<table>
<tr><td>Bit Definition</td><td>Not Used</td><td>Not Used</td><td>Not Used</td><td>Drive 4 Active</td><td>Drive 3 Active</td><td>Drive 2 Active</td><td>Drive 1 Active</td><td>Drive 0 Active</td></tr>
<tr><td>Default</td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>14
15
16
17
18</td><td>[Drv 0 Addr]
[Drv 1 Addr]
[Drv 2 Addr]
[Drv 3 Addr]
[Drv 4 Addr]

Sets the corresponding node addresses of the daisy-chained drives when the Operating Mode Jumper (J7) on the adapter is set for Multi-Drive operation.

Important: The settings for these parameters must match the Comm Node Addr parameter settings in the respective drives. Each setting must also be unique (no duplicate node addresses). See Configuring the RS-485 Network on page 7-7 for a list of other parameters that must be set correctly in each daisy-chained drive.</td><td>Default: 100
Default: 101
Default: 102
Default: 103
Default: 104
Minimum: 1
Maximum: 247
Type: Read/Write
Reset Required: Yes</td></tr>
<tr><td>19</td><td>[Ref Adjust]
Sets the percent scale factor for the Reference from the network.</td><td>Default: 100.00
Minimum: 0.00
Maximum: 200.00
Type: Read/Write
Reset Required: No</td></tr>
<tr><td></td><td colspan="2">ATTENTION: To guard against equipment damage and/or personal injury, note that changes to Parameter 19 - [Ref Adjust] take effect immediately. A drive receiving its Reference from the adapter will receive the newly scaled Reference, resulting in a change of speed.</td></tr>
</table>

ControlNet Objects

Appendix C provides information about the ControlNet objects that can be accessed using Explicit Messages. For information on the format of Explicit Messages and example ladder logic programs, refer to Chapter 6, Using Explicit Messaging.

Object	Class Code Hex.	Dec.	Page
Identity Object	0x01	1	C-2
Assembly Object	0x04	4	C-4
Register Object	0x07	7	C-6
Parameter Object	0x0F	15	C-9
Parameter Group Object (Single Mode only)	0x10	16	C-12

Object	Class Code Hex.	Dec.	Page
PCCC Object	0x67	103	C-14
DSI Device Object	0x92	146	C-20
DSI Parameter Object	0x93	147	C-23
DSI Fault Object	0x97	151	C-27
DSI Diagnostic Object	0x99	153	C-29

TIP: Refer to the ControlNet specification for more information about ControlNet objects. Information about the ControlNet specification is available on the ControlNet web site (http://www.controlnet.org).

Supported Data Types

Data Type	Description
BYTE	8-bit unsigned integer
WORD	16-bit unsigned integer
DWORD	32-bit unsigned integer
LWORD	64-bit unsigned integer
SINT	8-bit signed integer
USINT	8-bit unsigned integer
INT	16-bit signed integer
UINT	16-bit unsigned integer
DINT	32-bit signed integer
UDINT	32-bit unsigned integer
BOOL	8-bit value -- low bit is true or false
BOOL[n]	Array of n bits
STRING[n]	Array of n characters
SHORT_STRING	1-byte length indicator + that many characters
STRUCT	Structure name only - no size in addition to elements
CONTAINER	32-bit parameter value - sign extended if necessary
TCHAR	8 or 16-bit character
REAL	32-bit floating point

Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	Yes	Yes	Get_Attributes_All
0x05	No	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single

Instances – Single Mode

The number of instances is fixed at three and is shown below:

Instance	Description
0	Class
1	Host drive
2	22-COMM-C
3	22-SCM-232 or 22-HIM-* (when present)

Instances – Multi-Drive Mode

The number of instances is fixed at one and is shown below:

Instance	Description
0	Class
1	22-COMM-C

Identity Object *(Continued)*

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	Total number of instances
6	Get	Max ID Number of Class Attributes	UINT	7
7	Get	Max ID Number of Instance Attributes	UINT	100

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	UINT	1 = Allen-Bradley
2	Get	Device Type	UINT	136
3	Get	Product Code	UINT	Number identifying product name and rating
4	Get	Revision: Major Minor	STRUCT of: USINT USINT	 Value varies Value varies
5	Get	Status	WORD	Bit 0 = Owned Bit 2 = Configured Bit 10 = Recoverable fault Bit 11 = Unrecoverable fault
6	Get	Serial Number	UDINT	Unique 32-bit number
7	Get	Product Name	SHORT_STRING	Product name and rating
9	Get	Configuration Consistency Value	UINT	CRC representing the configuration of the product
100	Get	NVS Info	STRUCT of: UDINT SHORT_STRING	 First NVS instance Sub-assembly name

Assembly Object

Class Code

Hexadecimal	Decimal
0x04	4

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

Instance	Description
1	All I/O data being read from the DSI drives (read-only)
2	All I/O data written to the DSI drives (read/write)

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	2
2	Get	Max Instance	UINT	2
100	Set	Control Timeout	UINT	Control timeout in seconds

Assembly Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Number of Members	UINT	1
2	Get	Member List	ARRAY of STRUCT: UINT UINT Packed EPATH	 Size of member data Size of member path Member path
3	Conditional [1]	Data	Array of Bits	Data to be transferred
4	Get	Size	UINT	Size of assembly data in bits

[1] For instance 1, access rule for the data attribute is Get. For instance 2, it is Get/Set.

Important: Setting an Assembly object attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Register Object

Class Code

Hexadecimal	Decimal
0x07	7

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

Instance	Description	Input/ Output	Size (in bits)
1	Logic Command and Reference for all drives	Out	Varies (1)
2	Logic Status and Feedback for all drives	In	Varies (1)
3	Logic Command and Reference for Drive 0	Out	32
4	Logic Status and Feedback for Drive 0	In	32
5	Logic Command and Reference for Drive 1	Out	32
6	Logic Status and Feedback for Drive 1	In	32
7	Logic Command and Reference for Drive 2	Out	32
8	Logic Status and Feedback for Drive 2	In	32
9	Logic Command and Reference for Drive 3	Out	32
10	Logic Status and Feedback for Drive 3	In	32
11	Logic Command and Reference for Drive 4	Out	32
12	Logic Status and Feedback for Drive 4	In	32
13	Logic Command for all drives — mask-and-match register (2)	Out	Varies (1)
14	Logic Command for Drive 0 — mask-and-match register (2)	Out	32
15	Logic Command for Drive 1 — mask-and-match register (2)	Out	32
16	Logic Command for Drive 2 — mask-and-match register (2)	Out	32
17	Logic Command for Drive 3 — mask-and-match register (2)	Out	32
18	Logic Command for Drive 4 — mask-and-match register (2)	Out	32
19	Logic Command for Drive 0	Out	16
20	Logic Status for Drive 0	In	16

(1) The size for this Register Object instance is 32 bits per drive. For example, if the adapter is operating in Multi-Drive mode, and is configured with Drives 0 through 4, then the size is 160 bits.

(2) The structure for this Register Object instance is a Mask word followed by a Command word for each drive. The Logic Command for each drive is set to the value of the second word of the data where there are ones in the first word of the data.

Logic Command = (Logic Command and not Mask word) or (Command word and Mask word)

Register Object *(Continued)*

Instances (Continued)

Instance	Description	Input/ Output	Size (in bits)
21	Reference for Drive 0	Out	16
22	Feedback for Drive 0	In	16
23	Logic Command for Drive 1	Out	16
24	Logic Status for Drive 1	In	16
25	Reference for Drive 1	Out	16
26	Feedback for Drive 1	In	16
27	Logic Command for Drive 2	Out	16
28	Logic Status for Drive 2	In	16
29	Reference for Drive 2	Out	16
30	Feedback for Drive 2	In	16
31	Logic Command for Drive 3	Out	16
32	Logic Status for Drive 3	In	16
33	Reference for Drive 3	Out	16
34	Feedback for Drive 3	In	16
35	Logic Command for Drive 4	Out	16
36	Logic Status for Drive 4	In	16
37	Reference for Drive 4	Out	16
38	Feedback for Drive 4	In	16

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	38
3	Get	Number of Instances	UINT	38
100	Set	Control Timeout	UINT	Control timeout in seconds

Register Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Bad Flag	BOOL	If set to 1, then attribute 4 contains invalid, bad or otherwise corrupt data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Input (drive to network) 1 = Output (network to drive)
3	Get	Size	UINT	Size of register data in bits
4	Conditional (1)	Data	ARRAY of BITS	Data to be transferred

(1) The access rule of Set is optional if attribute 2, Direction = 1. If Direction = 0, the access rule is Get.

Important: Setting a Register Object attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Parameter Object

Class Code

Hexadecimal	Decimal
0x0F	15

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x01	Yes	Yes	Get_Attribute_All
0x05	Yes	No	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4B	No	Yes	Get_Enum_String

Instances – Single Mode

The number of instances is shown below:

Instance	Description
0	Class
1	Drive Parameter 1
↕	↕
n	Drive Parameter n (1)
n + 1	Adapter Parameter 1
↕	↕
n + m	Adapter Parameter m (2)

(1) n represents the number of parameters in the drive.

(2) m represents the number of parameters in the adapter.

Parameter Object *(Continued)*

Instances – Multi-Drive Mode

The number of instances is shown below:

Instance	Description
0	Class
1	Adapter Parameter 1
↕	↕
m	Adapter Parameter m (1)

(1) m represents the number of parameters in the adapter.

In addition, the parameters for the DSI drives can be accessed using the instance-offset encoding shown in the table below:

Instances (Dec.)	Single Mode	Multi-Drive Mode
16384 – 17407	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in the adapter
17408 – 18431	Instances 0 – 1023 in the drive	Instances 0 – 1023 in Drive 0
18432 – 19455	Not supported	Instances 0 – 1023 in Drive 1
19456 – 20479	Not supported	Instances 0 – 1023 in Drive 2
20480 – 21503	Not supported	Instances 0 – 1023 in Drive 3
21504 – 22527	Not supported	Instances 0 – 1023 in Drive 4

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	Number of parameters
8	Get	Parameter Class Descriptor	WORD	0 = False, 1 = True Bit 0 = Supports parameter instances Bit 1 = Supports full attributes Bit 2 = Must do NVS save command Bit 3 = Parameters are stored in NVS
9	Get	Configuration Assembly Instance	UINT	0
10	Get	Native Language	USINT	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	(1)	Parameter Value	(2)	(3)
2	Get	Link Path Size	USINT	0 = No link specified n = The size of Attribute 3 in bytes
3	Get	Link Path		(4)
4	Get	Descriptor	WORD	0 = False, 1 = True Bit 1 = Supports ENUMs Bit 2 = Supports scaling Bit 3 = Supports scaling links Bit 4 = Read only Bit 5 = Monitor Bit 6 = Extended precision scaling
5	Get	Data Type	USINT	0xC2 = SINT (8-bits) 0xC3 = INT (16-bits) 0xC4 = DINT (32-bits) 0xC6 = USINT (8-bits) 0xC7 = UINT (16-bits) 0xCA = REAL (32-bits) 0xD2 = WORD (16-bits)
6	Get	Data Size	USINT	(3)
7	Get	Parameter Name String	SHORT_STRING	(3)
8	Get	Units String	SHORT_STRING	(3)
9	Get	Help String	SHORT_STRING	Null string
10	Get	Minimum Value	(2)	(3)
11	Get	Maximum Value	(2)	(3)
12	Get	Default Value	(2)	(3)
13	Get	Scaling Multiplier	UINT	(3)
14	Get	Scaling Divisor	UINT	(3)
15	Get	Scaling Base	UINT	(3)
16	Get	Scaling Offset	UINT	(3)
17	Get	Multiplier Link	UINT	(3)
18	Get	Divisor Link	UINT	(3)
19	Get	Base Link	UINT	(3)
20	Get	Offset Link	UINT	(3)
21	Get	Decimal Precision	USINT	(3)

(1) Access rule is defined in bit 4 of instance attribute 4. 0 = Get/Set, 1 = Get.

(2) Specified in descriptor, data type, and data size.

(3) Value varies based on parameter instance.

(4) Refer to the ControlNet specification for a description of the link path.

Parameter Group Object (Single Mode only)

Class Code

Hexadecimal	Decimal
0x10	16

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x01	Yes	Yes	Get_Attributes_All

Instances

The number of instances depends on the number of groups in the device. A group of adapter parameters is appended to the list of groups in the device. The total number of groups can be read in Instance 0, Attribute 2.

Number	Description
0	Class Attributes
1	Drive Group 1 Attributes
⋮	⋮
n	Drive Group n Attributes (1)
n + 1	Adapter Group Attributes

(1) n represents the number of parameter groups in the drive.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Parameter Group Version	UINT	1
2	Get	Max Instance	UINT	Total number of groups
8	Set	Native Language	USINT	0 = English 1 = French 2 = Spanish (Mexican) 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

Parameter Group Object (Single Mode only) *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Group Name String	SHORT_ STRING	Group name
2	Get	Number of Members in Group	UINT	Number of parameters in group.
3	Get	1st Parameter Number in Group	UINT	(1)
4	Get	2nd Parameter Number in Group	UINT	(1)
⋮		⋮		
n	Get	n Parameter Number in Group	UINT	(1)

(1) Value varies based on group instance.

PCCC Object

Class Code

Hexadecimal	Decimal
0x67	103

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x4B	No	Yes	Execute_PCCC
0x4C	No	Yes	Execute_DH+

Instances

Supports Instance 1.

Class Attributes

Not supported.

Instance Attributes

Not supported.

Message Structure for Execute_PCCC

Request			Response		
Name	Data Type	Description	Name	Data Type	Description
Length	USINT	Length of requestor ID	Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor	Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor	Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor	Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte	CMD	USINT	Command byte

(Message structure continued on next page.)

PCCC Object *(Continued)*

Message Structure for Execute_PCCC (Continued)

Request			Response		
Name	**Data Type**	**Description**	**Name**	**Data Type**	**Description**
STS	USINT	0	STS	USINT	Status byte
TNSW	UINT	Transport word	TNSW	UINT	Transport word. Same value as the request.
FNC	USINT	Function code. Not used for all CMD's.	EXT_STS	USINT	Extended status. Not used for all CMD's.
PCCC_ params	ARRAY of USINT	CMD/FNC specific parameters	PCCC_ results	ARRAY of USINT	CMD/FNC specific result data

Message Structure for Execute_DH+

Request			Response		
Name	**Data Type**	**Description**	**Name**	**Data Type**	**Description**
DLink	UINT	Destination Link ID	DLink	UINT	Destination Link ID
DSta	USINT	Destination Station number	DSta	USINT	Destination Station number
DUser	USINT	Destination "User" number	DUser	USINT	Destination "User" number
SLink	UINT	Source Link ID	SLink	UINT	Source Link ID
SSta	USINT	Source Station number	SSta	USINT	Source Station number
SUser	USINT	Source User number	SUser	USINT	Source User number
CMD	USINT	Command byte	CMD	USINT	Command byte
STS	USINT	0	STS	USINT	Status byte
TNSW	UINT	Transport word	TNSW	UINT	Transport word. Same value as the request.
FNC	USINT	Function code; not used for all CMD's	EXT_STS	USINT	Extended Status; not used for all CMD's
PCCC_ params	ARRAY of USINT	CMD/FNC specific parameters	PCCC_ results	ARRAY of USINT	CMD/FNC specific result data

PCCC Object *(Continued)*

The adapter supports the following PCCC command types:

CMD	FNC	Description
0x06	0x03	Identify host and some status
0x0F	0x67	PLC-5 typed write
0x0F	0x68	PLC-5 typed read
0x0F	0x95	Encapsulate other protocol
0x0F	0xA2	SLC 500 protected typed read with 3 address fields
0x0F	0xAA	SLC 500 protected typed write with 3 address fields
0x0F	0xA1	SLC 500 protected typed read with 2 address fields
0x0F	0xA9	SLC 500 protected typed write with 2 address fields
0x0F	0x00	Word range read
0x0F	0x01	Word range write

See DF1 Protocol and Command Set Manual, Allen-Bradley Publication No. 1770-6.5.16.

N-Files

<table>
<tr><th>N-File</th><th colspan="4">Description</th></tr>
<tr><td>N40</td><td colspan="4">This N-file lets you use Emulated Block Transfer to send many types of messages. To use Emulated Block Transfer messages, you send a Write message to N40:0 – N40:63, wait until the adapter responds with a reply message, and then read the response data in N40:0 – N40:63 with a Read message.

For details about Block Transfer messages and the data required for each byte in the N-File, refer to the Remote I/O Adapter User Manual, Publication 20COMM-UM004….

Bits 15 to 8 are the Most Significant Byte. Bits 7 to 0 are the Least Significant Byte.</td></tr>
<tr><td></td><td colspan="2">Write</td><td colspan="2">Read</td></tr>
<tr><td>Bits</td><td>15</td><td>0</td><td>15</td><td>0</td></tr>
<tr><td>N40:0</td><td>0x00</td><td>Length (in Bytes)</td><td>0x00</td><td>Length (in Bytes)</td></tr>
<tr><td>N40:1</td><td>DSI Port (1)</td><td>0x81</td><td>Status Size</td><td>Status Type</td></tr>
<tr><td>N40:2</td><td>0x00</td><td>CIP Service</td><td colspan="2" rowspan="5">Data
(length varies based on message)</td></tr>
<tr><td>N40:3</td><td colspan="2">CIP Class</td></tr>
<tr><td>N40:4</td><td colspan="2">CIP Instance</td></tr>
<tr><td>N40:5</td><td colspan="2">CIP Attribute</td></tr>
<tr><td>N40:6
⋮
N40:63</td><td colspan="2">Data
(length varies based on message)</td></tr>
</table>

(1) Use the following DSI Port Assignment table to determine the value for the DSI port.

PCCC Object *(Continued)*

N-Files (Continued)

DSI Port Assignments

DSI Port No.	Single Mode	Multi-Drive Mode
0	The drive	Drive 0
1	The adapter	Drive 1
2	The slave	Drive 2
3	Not supported	Drive 3
4	Not supported	Drive 4
5	Not supported	The adapter

<table>
<tr><th>N-File</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">For Single Mode Only</td></tr>
<tr><td>N41</td><td colspan="2">This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true:
• The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner.
• The value of N42:3 is set to a non-zero value.</td></tr>
<tr><td></td><td>Write</td><td>Read</td></tr>
<tr><td>N41:0</td><td>Logic Command Word</td><td>Logic Status Word</td></tr>
<tr><td>N41:1</td><td>Unused</td><td>Unused</td></tr>
<tr><td>N41:2</td><td>Reference</td><td>Feedback</td></tr>
<tr><td>N42</td><td colspan="2">This N-file lets you read and write some values configuring the port.</td></tr>
<tr><td>N42:3</td><td colspan="2">Control Time-out (read/write): Time (in seconds) allowed between messages to the N41 or N44 file. If the adapter does not receive a message in the specified time, it performs the fault action configured in its [Comm Flt Action] parameter.</td></tr>
<tr><td>N42:7</td><td colspan="2">Adapter Port Number (read only): DSI port on the drive to which the adapter is connected.</td></tr>
<tr><td>N42:8</td><td colspan="2">Peer Adapters (read only): Bit field of devices having Peer capabilities.</td></tr>
</table>

PCCC Object *(Continued)*

N-Files (Continued)

<table>
<tr><th>N-File</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">For Multi-Drive Mode Only</td></tr>
<tr><td>N44</td><td colspan="2">This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true:
• The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner.
• The value of N42:3 is set to a non-zero value.</td></tr>
<tr><td></td><td>Write</td><td>Read</td></tr>
<tr><td>N44:0</td><td>Drive 0 Logic Command</td><td>Drive 0 Logic Status</td></tr>
<tr><td>N44:1</td><td>Unused</td><td>Unused</td></tr>
<tr><td>N44:2</td><td>Drive 0 Reference</td><td>Drive 0 Feedback</td></tr>
<tr><td>N44:3</td><td>Drive 1 Logic Command</td><td>Drive 1 Logic Status</td></tr>
<tr><td>N44:4</td><td>Drive 1 Reference</td><td>Drive 1 Feedback</td></tr>
<tr><td>N44:5</td><td>Drive 2 Logic Command</td><td>Drive 2 Logic Status</td></tr>
<tr><td>N44:6</td><td>Drive 2 Reference</td><td>Drive 2 Feedback</td></tr>
<tr><td>N44:7</td><td>Drive 3 Logic Command</td><td>Drive 3 Logic Status</td></tr>
<tr><td>N44:8</td><td>Drive 3 Reference</td><td>Drive 3 Feedback</td></tr>
<tr><td>N44:9</td><td>Drive 4 Logic Command</td><td>Drive 4 Logic Status</td></tr>
<tr><td>N44:10</td><td>Drive 4 Reference</td><td>Drive 4 Feedback</td></tr>
</table>

PCCC Object *(Continued)*

N-Files (Continued)

Important: If your controller or HMI platform supports CIP messaging, use the CIP Parameter object to get and set parameters.

N-File	Description	
N10 – N18	These N-files let you read and write parameter values in the drive and the adapter.	
	Single Mode	*Multi-Drive Mode*
N10:0	Number of parameters in the drive	Number of parameters in Drive 0
N10:1 – 999	Drive parameters 1 – 999	Drive 0 parameters 1 - 999
N11:0 – 999	Drive parameters 1000 – 1999	Drive 0 parameters 1000 - 1999
N12:0 – 999	Drive parameters 2000 – 2999	Drive 0 parameters 2000 - 2999
N13:0	Number of parameters in this adapter	Number of parameters in this adapter
N13:1 – 999	Parameters 1 – 999 in this adapter	Parameters 1 – 999 in this adapter
N14:0	Number of parameters in this adapter	Number of parameters in Drive 1
N14:1 – 999	Parameters 1 – 999 in this adapter	Drive 1 parameters 1 – 999
N15:0	Number of parameters in the slave	Number of parameters in Drive 2
N15:1 – 999	Parameters 1 – 999 in the slave	Drive 2 parameters 1 – 999
N16:0	Not supported	Number of parameters in Drive 3
N16:1 – 999	Not supported	Drive 3 parameters 1 – 999
N17:0	Not supported	Number of parameters in Drive 4
N17:1 – 999	Not supported	Drive 4 parameters 1 – 999
N18:0	Not supported	Number of parameters in this adapter
N18:1 – 999	Not supported	Parameters 1 – 999 in this adapter

DSI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the number of components in the device. The total number of components can be read in Instance 0, Class Attribute 4.

Instances (Dec.)	Single Mode	Multi-Drive Mode
0 – 16383	Instances 0 – 16383 in the drive	Instances 0 – 16383 in Drive 0
16384 – 17407	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in the adapter
17408 – 18431	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in Drive 1
18432 – 19455	Instances 0 – 1023 in the slave	Instances 0 – 1023 in Drive 2
19456 – 20479	Not supported	Instances 0 – 1023 in Drive 3
20480 – 21503	Not supported	Instances 0 – 1023 in Drive 4
21504 – 22527	Not supported	Instances 0 – 1023 in the adapter

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	BYTE	Code identifying the device.
1	Get	Family Text	STRING[16]	Text identifying the device.
2	Set	Language Code	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

DSI Device Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Product Series	BYTE	1 = A 2 = B …
4	Get	Number of Components	BYTE	Number of components (e.g., main control board, I/O boards) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	BYTE	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	WORD	0x0001 = Allen-Bradley
11	Get	NVS Checksum	WORD	Checksum of the Non-Volatile Storage in the device.
12	Get	Class Revision	WORD	2
13	Get	Character Set Code	BYTE	0 = SCANport HIM 1 = ISO 8859-1 (Latin 1) 2 = ISO 8859-2 (Latin 2) 3 = ISO 8859-3 (Latin 3) 4 = ISO 8859-4 (Latin 4) 5 = ISO 8859-5 (Cyrillic) 6 = ISO 8859-6 (Arabic) 7 = ISO 8859-7 (Greek) 8 = ISO 8859-8 (Hebrew) 9 = ISO 8859-9 (Turkish) 10 = ISO 8859-10 (Nordic) 255 = ISO 10646 (Unicode)
15	Get	Languages Supported	STRUCT of: BYTE BYTE[n]	 Number of Languages Language Codes (See Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: WORD BYTE BYTE	 Year Month Day
17	Get	Product Revision	STRUCT of: BYTE BYTE	 Major Firmware Release Minor Firmware Release
18	Get	Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DSI Device Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Component Name	STRING[32]	Name of the component
4	Get	Component Firmware Revision	STRUCT of: BYTE BYTE	 Major Revision Minor Revision
5	Get	Component Hardware Change Number	BYTE	
8	Get	Component Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DSI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

Instances

The number of instances depends on the number of parameters in the device. The total number of parameters can be read in Instance 0, Attribute 0.

Instances (Dec.)	Single Mode	Multi-Drive Mode
0 – 16383	Instances 0 – 16383 in the drive	Instances 0 – 16383 in Drive 0
16384 – 17407	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in the adapter
17408 – 18431	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in Drive 1
18432 – 19455	Instances 0 – 1023 in the slave	Instances 0 – 1023 in Drive 2
19456 – 20479	Not supported	Instances 0 – 1023 in Drive 3
20480 – 21503	Not supported	Instances 0 – 1023 in Drive 4
21504 – 22527	Not supported	Instances 0 – 1023 in the adapter

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	WORD	Number of parameters in the device
1	Set	Write Protect Password	WORD	0 = Password disabled n = Password
2	Set	NVS Command Write	BYTE	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory
3	Get	NVS Parameter Value Checksum	WORD	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	WORD	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	WORD	First parameter available if parameters are protected by passwords. A “0” indicates all parameters are protected.
7	Get	Class Revision	WORD	2
8	Get	First Parameter Processing Error	WORD	The first parameter that has been written with a value outside of its range. A “0” indicates no errors.
9	Set	Link Command	BYTE	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

DSI Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
7	Get	Online Read Full	STRUCT of: BOOL[32] CONTAINER(1) CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT BYTE[3] BYTE STRING[16]	 Descriptor (Refer to pages C-25 – C-26) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (e.g., Amp, Hz) Multiplier (2) Divisor (2) Base (2) Offset (2) Link (source of the value) (0 = no link) Always zero (0) Parameter name
8	Get	Descriptor	BOOL[32]	Descriptor (Refer to pages C-25 – C-26)
9	Get/Set	Parameter Value	Various	Parameter value in NVS. (3)
10	Get/Set	RAM Parameter Value	Various	Parameter value in temporary memory.
11	Get/Set	Link	BYTE[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	WORD	ID for help text for this parameter
13	Get	Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	 Descriptor (Refer to pages C-25 – C-26) Parameter value Minimum value Maximum value Default value Parameter name Units (e.g., Amp, Hz)
14	Get	Parameter Name	STRING[16]	Parameter name
15	Get	Parameter Alias	STRING[16]	Customer supplied parameter name.
16	Get	Parameter Processing Error	BYTE	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. Refer to Formulas for Converting on page C-26.

(3) Do NOT continually write parameter data to NVS. Refer to the attention on page 6-1.

DSI Parameter Object *(Continued)*

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = BYTE used as an array of Boolean 001 = WORD used as an array of Boolean 010 = BYTE (8-bit integer) 011 = WORD (16-bit integer) 100 = DWORD (32-bit integer) 101 = TCHAR (8-bit (not unicode) or 16-bits (unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = Parameter can sink a link 1 = Parameter cannot sink a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (e.g., drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Reserved	Must be zero
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 1)	Right bit is least significant bit (16). 000 = Reserved 001 = DWORD used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 2)	
18	Extended Data Type (Bit 2)	
19	Parameter Exists	Reserved
20	Not Used	Reserved
21	Formula Links	Reserved

DSI Parameter Object *(Continued)*

Descriptor Attributes (Continued)

Bit	Name	Description
22	Access Level (Bit 1)	Reserved
23	Access Level (Bit 2)	Reserved
24	Access Level (Bit 3)	Reserved
25	Writable ENUM	Reserved
26	Not a Link Source	0 = Parameter can be a source for a link 1 = Parameter cannot be a source for a link
27	Enhanced Bit ENUM	Reserved
28	Enhanced ENUM	Reserved
29	Not Used	Reserved
30	Not Used	Reserved
31	Not Used	Reserved

Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x $10^{\text{Decimal Places}}$)

Internal Value = ((Display Value x Divisor x $10^{\text{Decimal Places}}$) / (Multiplier x Base)) - Offset

Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Object Specific Services

Service Code	Service Name
0x32	Get_Attributes_Scattered (1)
0x34	Set_Attributes_Scattered (1)

(1) The instance and attribute are ignored for these services.

The table below lists the parameters for the Get_Attributes_Scattered and Set_Attributes_Scattered object-specific service:

Name	Data Type	Description
Scattered Parameters	STRUCT of	—
Parameter Number	WORD	Parameter to read or write
Parameter Value	WORD	Parameter value to read or write (zero when reading)

Important: The STRUCT may repeat up to 64 times in a single message.

DSI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

Products such as PowerFlex drives use this object for faults. Adapters use this object for events.

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the maximum number of faults or events supported in the queue. The maximum number of faults/events can be read in Instance 0, Attribute 2.

Instances (Dec.)	Single Mode	Multi-Drive Mode
0 – 16383	Instances 0 – 16383 in the drive	Instances 0 – 16383 in Drive 0
16384 – 17407	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in the adapter
17408 – 18431	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in Drive 1
18432 – 19455	Instances 0 – 1023 in the slave	Instances 0 – 1023 in Drive 2
19456 – 20479	Not supported	Instances 0 – 1023 in Drive 3
20480 – 21503	Not supported	Instances 0 – 1023 in Drive 4
21504 – 22527	Not supported	Instances 0 – 1023 in the adapter

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	Revision of object
2	Get	Number of Instances	WORD	Maximum number of faults/events that the device can record in its queue
3	Set	Fault Command Write	BYTE	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device

DSI Fault Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
4	Get	Fault Trip Instance Read	WORD	Fault that tripped the device. For adapters, this value is always 1 when faulted.
5	Get	Fault Data List	STRUCT of: BYTE BYTE WORD[n]	Reserved
6	Get	Number of Recorded Faults	WORD	Number of faults/events in the queue. A “0” indicates the fault queue is empty.
7	Get	Fault Parameter Reference	WORD	Reserved

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of: WORD STRUCT of: BYTE BYTE STRING[16] STRUCT of: LWORD BOOL[16] WORD CONTAINER[n]	 Fault code Fault source DSI port DSI Device Object Fault text Fault time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used Reserved Reserved
1	Get	Basic Information	STRUCT of: WORD STRUCT of: BYTE BYTE STRUCT of: LWORD BOOL[16]	 Fault code Fault source DSI port DSI Device Object Fault time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used

DSI Diagnostic Object

Class Code

Hexadecimal	Decimal
0x99	153

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the maximum number of diagnostic items in the device. The total number of diagnostic items can be read in Instance 0, Attribute 2.

Instances (Dec.)	Single Mode	Multi-Drive Mode
0 – 16383	Instances 0 – 16383 in the drive	Instances 0 – 16383 in Drive 0
16384 – 17407	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in the adapter
17408 – 18431	Instances 0 – 1023 in the adapter	Instances 0 – 1023 in Drive 1
18432 – 19455	Instances 0 – 1023 in the slave	Instances 0 – 1023 in Drive 2
19456 – 20479	Not supported	Instances 0 – 1023 in Drive 3
20480 – 21503	Not supported	Instances 0 – 1023 in Drive 4
21504 – 22527	Not supported	Instances 0 – 1023 in the adapter

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	1
2	Get	Number of Instances	WORD	Number of diagnostic items in the device
3	Get	ENUM Offset	WORD	DSI ENUM object instance offset

DSI Diagnostic Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Info	STRUCT of: BOOL[32] CONTAINER (1) CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT DWORD STRING[16]	 Descriptor (Refer to pages C-25 – C-26) Value Minimum value Maximum value Default value Pad Word Pad Word Units (e.g., Amp, Hz) Multiplier (2) Divisor (2) Base (2) Offset (2) Link (source of the value) (0 = no link) Always zero (0) Parameter name
1	Get/Set	Value	Various	Diagnostic item value

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the value between display units and internal units. Refer to Formulas for Converting on page C-26.

Logic Command/Status Words

Appendix D provides the definitions of the Logic Command/Logic Status words that are used for some products that can be connected to the adapter. If you do not see the Logic Command/Logic Status for the product that you are using, refer to your product's documentation.

PowerFlex 4/40/400 Drives

Logic Command Word

Logic Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Command**	**Description**
															x	Stop	0 = Not Stop 1 = Stop
														x		Start (1)	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = No Command
									x							Not used	
								x								Not used	
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select	000 = No Command 001 = Freq Source = Select 010 = Freq Source = Int. Freq 011 = Freq Source = Comm 100 = Preset Freq 0 101 = Preset Freq 1 110 = Preset Freq 2 111 = Preset Freq 3
x																Not used	

(1) A "0 = Not Stop condition (logic 0)" must first be present before a "1 = Start condition" will start the drive.

PowerFlex 4/40/400 Drives *(Continued)*

Logic Status Word

Logic Bits															Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
						x										Main Freq	0 = Not Controlled By Comm 1 = Controlled By Comm
					x											Operation Command	0 = Not Controlled By Comm 1 = Controlled By Comm
				x												Parameters	0 = Not Locked 1 = Locked
			x													Digital Input 1 Status	
		x														Digital Input 2 Status	
	x															Digital Input 3 Status [1]	
x																Digital Input 4 Status [1]	

[1] This status is available for only PowerFlex 40 drives with firmware version 2.xx (or higher).

A

Adapter

Devices such as drives, controllers, and computers usually require an adapter to provide a communication interface between them and a network such as ControlNet. An adapter reads data on the network and transmits it to the connected drive. It also reads data in the drive and transmits it to the network.

The 22-COMM-C ControlNet adapter connects PowerFlex 4-Class drives to a ControlNet network. Adapters are sometimes also called “cards,” “embedded communication options,” “gateways,” “modules,” and “peripherals.”

B

Bridge

A bridge refers to a network device that can route messages from one network to another.

A bridge also refers to a communications module in a ControlLogix controller that connects the controller to a network. See also Scanner.

C

CIP (Common Industrial Protocol)

CIP is the transport and application layer protocol used for messaging over EtherNet/IP, ControlNet, and DeviceNet networks. The protocol is used for implicit messaging (real-time I/O) and explicit messaging (configuration, data collection, and diagnostics).

ControlFLASH

ControlFLASH is an Allen-Bradley software tool that lets users electronically update firmware on printed circuit boards. The tool takes advantage of the growing use of flash memory (electronic erasable chips) across industrial control products.

Controller

A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. See also Scanner.

ControlNet

An open producer-consumer communication network with features such as redundant media and deterministic I/O timing, designed for high performance or time critical requirements.

D

Data Rate

The data rate is the speed at which data is transferred on the ControlNet network (fixed at 5Mbps).

DSI (Drive Serial Interface)

DSI is based on the Modbus RTU serial communication protocol and is used by PowerFlex 4-Class drives.

DSI Peripheral

A device that provides an interface between DSI and a network or user. Peripheral devices are also referred to as “adapters” and “modules.” The 22-COMM-C, 22-SCM-232 serial converter, and PowerFlex 4-Class HIMs (22-HIM-xxx) are examples of DSI peripherals.

DSI Product

A device that uses the DSI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex 4-Class drive is a DSI product. In this manual, a DSI product is also referred to as “drive” or “host.”

DriveExplorer Software

DriveExplorer software is a tool for monitoring and configuring Allen-Bradley products and adapters. It can be run on computers running various Microsoft Windows operating systems. DriveExplorer (version 3.xx or higher) can be used to configure this adapter and PowerFlex drives. Information about DriveExplorer software and a free lite version can be accessed at http://www.ab.com/drives/driveexplorer.

DriveTools SP Software

A software suite designed for running on various Microsoft Windows operating systems. This software suite provides a family of tools, including DriveExecutive (version 3.01 or higher), that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. DriveTools SP (version 1.01 or higher) can be used with PowerFlex drives. Information about DriveTools SP can be accessed at http://www.ab.com/drives/drivetools.

E

EDS (Electronic Data Sheet) Files

EDS files are simple text files that are used by network configuration tools such as RSNetWorx for ControlNet to describe products so that you can easily commission them on a network. EDS files describe a product device type, revision, and configurable parameters. EDS files for many Allen-Bradley products can be found at http://www.ab.com/networks/eds.

Explicit Messaging

Explicit Messages are used to transfer data that does not require continuous updates. They are typically used to configure, monitor, and diagnose a device over the network.

F

Fault Action

A fault action determines how the adapter and connected drive act when a communications fault (for example, a cable is disconnected) occurs or when the scanner is switched out of run mode. The former uses a communications fault action, and the latter uses an idle fault action.

Fault Configuration

When communication is disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive using specific fault configuration parameters in the adapter. When a fault action parameter is set to use the fault configuration data and a fault occurs, the data from these parameters is sent as the Logic Command and Reference.

Flash Update

The process of updating firmware in the adapter. The adapter can be flash updated using the Allen-Bradley software tool ControlFLASH, the built-in flash capability of DriveExplorer (version 4.01 or higher), or when the adapter is installed in a DSI External Comms Kit, the X-Modem protocol and a 22-SCM-232 serial converter (version 3.xx or higher firmware).

H

HIM (Human Interface Module)

A device that can be used to configure and control a PowerFlex 4-Class drive. PowerFlex 4-Class HIMs (22-HIM-xxx) can be used to configure connected peripherals.

Hold Last

When communication is disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond by holding last. Hold last results in the drive receiving the last data received via the network connection before the disruption. If the drive was running and using the Reference from the adapter, it will continue to run at the same Reference.

I

I/O Data

I/O data, sometimes called “implicit messages” or “input/output,” transmit time-critical data such as a Logic Command and Reference. The

terms “input” and “output” are defined from the scanner’s point of view. Output is produced by the scanner and consumed by the adapter. Input is produced by the adapter and consumed by the scanner.

L

Logic Command/Logic Status

The Logic Command is used to control the PowerFlex drive (for example, start, stop, direction). It consists of one 16-bit word of output to the adapter from the network. The definitions of the bits in this word depend on the drive.

The Logic Status is used to monitor the PowerFlex drive (for example, operating state, motor direction). It consists of one 16-bit word of input from the adapter to the network. The definitions of the bits in this word depend on the drive.

N

Node Address

The valid range of ControlNet addresses is 1-99. The 22-COMM-C adapter includes two rotary switches to allow the ControlNet address to be set. The adapter reads the values of the switches only at power-up.

NVS (Non-Volatile Storage)

NVS is the permanent memory of a device. Devices such as the adapter and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called “EEPROM.”

P

PCCC (Programmable Controller Communications Commands)

PCCC is the protocol used by some controllers to communicate with devices on a network. Some software products (for example, DriveExplorer and DriveExecutive) also use PCCC to communicate.

PowerFlex 4-Class (Component-Class) Drives

The Allen-Bradley PowerFlex 4-Class (Component-Class) family of drives include the PowerFlex 4, PowerFlex 40, and PowerFlex 400. These drives can be used for applications ranging from 0.2 kW (0.25 HP) to 7.5 kW (10 HP).

R

Reference/Feedback

The Reference is used to send a setpoint (for example, speed, frequency, torque) to the drive. It consists of one 16-bit word of output to the adapter from the network.

Feedback is used to monitor the speed of the drive. It consists of one 16-bit word of input from the adapter to the network.

RSLogix 5/500/5000

RSLogix software is a tool for configuring and monitoring controllers to execute logic and communicate with connected devices. It is a 32-bit application that runs on various Microsoft Windows operating systems. Information about RSLogix software can be found at http://www.software.rockwell.com/rslogix.

RSNetWorx for ControlNet

RSNetWorx for ControlNet software is a tool for configuring and monitoring ControlNet networks and connected devices. It is a 32-bit application that runs on various Microsoft Windows operating systems. Information about RSNetWorx for ControlNet software can be found at http://www.software.rockwell.com/rsnetworx.

S

Scanner

A scanner is a separate module (of a multi-module controller) or a built-in component (of a single-module controller) that provides communication with adapters connected to a network. See also Controller.

Status Indicators

Status indicators are LEDs that are used to report the status of the adapter, network, and drive. They are on the adapter and can be viewed on the front cover of the drive when the drive is powered.

Z

Zero Data

When communications are disrupted (for example, a cable is disconnected), the adapter and drive can respond with zero data. Zero data results in the drive receiving zero as values for Logic Command and Reference data. If the drive was running and using the Reference from the adapter, it will stay running but at zero Reference.

Notes:

A

adapter
- applying power, **2-7**
- compatible products, **1-3**
- components, **1-1**
- definition, **G-1**
- features, **1-2**
- grounding, **2-4**
- illustration, **1-1**
- installing, **2-1 to 2-7**
- mounting, **2-4 to 2-5**
- node address, **3-3**
- parameters, **B-1 to B-4**
- resetting, **3-6**
- Single versus Multi-Drive mode of operation, **7-1**
- specifications, **A-1**
- switches, **1-1**
- tools to configure, **3-1**
- troubleshooting, **8-1 to 8-8**

applying power to the adapter, **2-7**

Assembly object, **C-4**

attentions, **1-4**

B

baud rate, *see data rate*

bit definitions for Logic Command/ Status word, **D-1**

bridge, **G-1**

C

cables
- ControlNet, **2-3**
- DSI Internal Interface, **2-4**

CIP (Common Industrial Protocol), **G-1**

CN Active Cfg parameter, **B-2**

CN Addr Act parameter, **B-1**

CN Addr Cfg parameter, **B-1**

CN Rate Act parameter, **B-2**

CN Rate Cfg parameter, **B-2**

Comm Flt Action parameter, **B-2**

communications module, *see adapter*

compatible products, **1-3**

components, **1-1**

configuration tools, **3-1**

connecting adapter to the network, **2-3**

ControlFLASH, **G-1**

controller, **G-1**

ControlLogix controller
- example network, **4-1**
- with adapter in Multi-Drive mode
  - Explicit Message example, **7-22**
  - I/O example, **7-9**
- with adapter in Single mode
  - Explicit Message example, **6-3**
  - I/O example, **5-5**

ControlNet
- adapter, *see adapter*
- cable, **2-3**
- connector on adapter, **1-1**
- data rates, **A-1**

ControlNet Objects
- list of, **C-1 to C-30**

D

data rate, **G-2**

diagnostic items
- for Multi-Drive mode, **8-6**
- for Single mode, **8-5**

dimensions, **A-1**

DriveExplorer
accessing parameters with, **3-1**
definition, **G-2**
free lite version, **G-2**
drives, *see PowerFlex drives*
DriveTools SP
accessing parameters with, **3-1**
definition, **G-2**
Drv 0 - 4 Addr parameters, **B-4**
DSI
connector on adapter, **1-1**
definition, **G-2**
Internal Interface cable, **2-4**
peripheral, **G-2**
products, **G-2**
DSI Device object, **C-20**
DSI Diagnostic object, **C-29**
DSI Fault object, **C-27**
DSI I/O Act parameter, **B-4**
DSI I/O Cfg parameter, **B-3**
DSI Parameter object, **C-23**

E

EDS (Electronic Data Sheet) files
definition, **G-2**
web site, **G-2**
EEPROM, *see Non-Volatile Storage (NVS)*
environmental specifications, **A-2**
equipment required, **1-3**
events
clearing, **8-7**
list of, **8-7**
viewing, **8-7**
Explicit Messages
about, **6-1**
definition, **G-3**
performing, **6-2**
with adapter in Multi-Drive mode
ControlLogix example, **7-22**
with adapter in Single mode
ControlLogix example, **6-3**
PLC-5 example, **6-6**

F

fault action
configuring the adapter for, **3-4**
definition, **G-3**
fault configuration
configuring the adapter for, **3-4**
definition, **G-3**
faults, *see events*
features, **1-2**
firmware release, **P-2**
flash update, **G-3**
Flt Cfg Logic parameter, **B-3**
Flt Cfg Ref parameter, **B-3**

G

grounding the adapter, **2-4**

H

HIM (Human Interface Module)
accessing parameters with, **3-1**
definition, **G-3**
using, **3-2**
hold last
configuring the adapter for, **3-4**
definition, **G-3**

I

I/O
- about, **5-1**
- configuring the adapter for, **3-3**
- configuring the network for
  - ControlLogix controller, **4-1**
  - PLC-5 controller, **4-12**
- definition, **G-3**
- image, **5-2**, **7-5**
- using example program for
  - ControlLogix controller, **5-5**
  - PLC-5 controller, **5-8**

Identity object, **C-2**

Idle Flt Action parameter, **B-3**

installation
- applying power to the adapter, **2-7**
- connecting to the drive, **2-4**
- connecting to the network, **2-3**
- preparing for, **2-1**

Internal Interface cable
- connecting to the adapter, **2-4**
- connecting to the drive, **2-4**
- illustration, **2-4**

L

LEDs, *see status indicators*

Logic Command/Status
- bit definitions, **D-1**
- definition, **G-4**
- in I/O image, **5-2**, **7-5**
- using, **5-3**

M

manual
- conventions, **P-2**
- related documentation, **P-1**
- web site, **P-1**

mechanical dimensions, **A-1**

messages, *see Explicit Messages or I/O*

MOD status indicator
- locating, **8-1**
- troubleshooting with, **8-3**

Mode parameter, **B-1**

modes of operation, **1-6**

mounting the adapter, **2-4 to 2-5**

Multi-Drive mode
- additional information, **7-36**
- operating in, **7-1**
- setting with jumper (J7), **2-2**
- system wiring, **7-4**
- using ControlLogix controller
  - Explicit Message example, **7-22**
  - I/O example, **7-9**
- using PLC-5 controller
  - I/O example, **7-24**
- versus Single mode, **7-1**

N

NET A status indicator
- locating, **8-1**
- troubleshooting with, **8-4**

NET B status indicator
- locating, **8-1**
- troubleshooting with, **8-4**

node address
- definition, **G-4**
- setting with parameters, **3-3**
- setting with switches, **2-2**

Non-Volatile Storage (NVS)
- definition, **G-4**
- in adapter, **3-1**
- in drive, **6-1**

O

operating status, **1-6**

P

Parameter Group object, **C-12**
Parameter object, **C-9**
parameters
  accessing, **3-1**
  convention, **P-2**
  editing with PowerFlex 4-Class HIM, **3-2**
  list of, **B-1 to B-4**
  numbers, **B-1**
PCCC (Programmable Controller Communication Commands), **G-4**
PCCC object, **C-14**
PLC-5 controller
  example network, **4-12**
  with adapter in Multi-Drive mode I/O example, **7-24**
  with adapter in Single mode Explicit Message example, **6-6**
  I/O example, **5-8**
PORT status indicator
  locating, **8-1**
  troubleshooting with, **8-2**
power consumption, **A-1**
PowerFlex drives
  compatible with adapter, **1-3**
  definition, **G-4**
  HIM, **3-2**
  installing adapter on, **2-4**
  Logic Command/Status, **D-1**
preparing for an installation, **2-1**
processor, *see controller*
programmable logic controller, *see controller*

Q

quick start, **1-5**

R

Ref Adjust parameter, **B-4**
Reference/Feedback
  definition, **G-4**
  in I/O image, **5-2**, **7-5**
  using, **5-3**
Register object, **C-6**
regulatory compliance, **A-1**
related documentation, **P-1**
requested packet interval, **4-6**
Reset Module parameter, **B-2**
ribbon cable, *see Internal Interface cable*
RSLinx, **P-2**
RSLogix 5/500/5000, **G-5**
RSNetWorx for ControlNet
  definition, **G-5**
  web site, **G-5**

S

safety precautions, **1-4**
scanner, **G-5**
Single mode
  setting with jumper (J7), **2-2**
  using ControlLogix controller Explicit Message example, **6-3**
  I/O example, **5-5**
  using PLC-5 controller Explicit Message example, **6-6**
  I/O example, **5-8**
  versus Multi-Drive mode, **7-1**
specifications for adapter, **A-1**
status indicators
  definition, **G-5**
  locating, **8-1**
  normal operation, **1-6**
  troubleshooting with, **8-1**

switches on adapter
locating, **1-1**
setting node address, **2-2**

T

technical support, **P-3**
tools required, **1-3**
troubleshooting, **8-1 to 8-8**

U

update, *see flash update*

W

web site
for DriveExplorer software, **G-2**
for DriveTools SP software, **G-2**
for EDS files, **G-2**
for manuals, **P-1**
wiring, *see cables*

Z

zero data
configuring the adapter for, **3-4**
definition, **G-5**

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